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Physiological Instruments Meet Mixed Methods in Media Accessibility

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Abstract

Mixed methods have an established trajectory in the social sciences. Audiovisual Translation and Media Accessibility (MA) Studies are also increasingly applying the "third research paradigm" (Johnson, Onwuegbuzie and Turner, 2007, 112). Yet, publications in our field often fail to discuss the mixed-method nature of the study in depth, be it because of space limitations or a lack of deliberate integration of the methods. Concurrently, MA has seen a boom in experimental research, as descriptive approaches have given way to reception and user-centred studies that engage in the cognitive processes and immersion of audiences (Orero et al. 2018). This article proposes a methodological basis for MA researchers to design studies employing physiological instruments within a mixed methods framework. The core mixed methods designs (convergent, explanatory, and exploratory) are presented, and examples of their applications to research employing physiological instruments are discussed.

Keywords: Media Accessibility, experimental research, physiological instruments, methodology, mixed methods, research design

1. *Introduction*

Media Accessibility (MA) is an interdisciplinary area closely associated with Audiovisual Translation (AVT) Studies and enclosed in the overarching field of Accessibility Studies (Greco 2019). MA is devoted to researching media access services, which Jankowska (2019) classifies into two categories: content-based and technology-based. Content-based services involve a translation process, namely audio description (AD), audio subtitling, audio introduction, subtitles for the deaf and hard of hearing (SDH), sign language interpreting, and touch tours, among others. Conversely, technology-based services involve digital processing or enhancing of existing products,

i.e., clean audio and slow reproduction (Jankowska 2019, 233). Previous literature in MA has mostly addressed the former, adopting a myriad of methodological approaches.

In recent years, MA has taken a turn toward reception studies, what Greco (2018) calls the shift from *maker-centred* to *user-centred* approaches. MA practice has also started to embrace these user-centred approaches (see Di Giovanni 2018 for an overview of the participatory accessibility experience). On the one hand, reception studies with users based on self-reported measures have employed questionnaires, interviews and focus groups in order to assess both established and novel practices in AD, sign language, "traditional" interlingual subtitling, SDH, etc. For instance, synthetic voices in AD have been deemed an acceptable solution among AD users, particularly in certain genres such as documentaries (Szarkowska 2011; Walczak and Fryer 2018), while always-visible SDH (also known as static-follow subtitles: "positioned in front of the viewer, responding immediately to their head movements") (Agulló and Matamala 2020, 647) have proven to be preferred over fixed-position SDH ("subtitles attached to three different fixed positions in the sphere, spaced evenly") (ibid., 648) in 360º content.

On the other hand, physiological instruments from the field of Psycholinguistics (electrodermal activity, electroencephalography [EEG], eye tracking, heart rate, etc.) have been adopted in the context of MA to better understand the reception and cognitive processing of audiovisual texts (Kruger 2016). It is worth establishing that, throughout this article, I will favour the term *physiological instruments* over the more general notion of experiments or objective measures, as this study reflects on how the aforementioned instruments are combined with self-reported measurements.

MA studies combining physiological instruments and self-reported measures are not only interested in the preferences and needs of users, but also in their objective immersion and cognitive load (Kruger, Doherty and Ibrahim 2017; Szarkowska and Gerber-Morón 2019), psychophysiological reactions, and emotional response (Ramos 2015, 2016; Iturregui-Gallardo and Matamala 2021). These studies follow a similar procedure: (1) participants are asked to complete a pre-stimulus questionnaire; (2) stimuli are screened and the participants' response to the stimuli is monitored through physiological instruments; and (3) participants are interviewed or asked to complete a self-report questionnaire to assess their sense of immersion, preferred version of the stimuli, etc. Indeed, studies combining physiological instruments and users' self-reported input constitute an excellent opportunity for a mixed methods approach. My

aim is to report on the mixed methods designs applied so far in our field and the possibilities that less prevalent designs may open up. Specifically, sequential designs – where each research phase is conducted separately, and its results are intended to be used as a basis to design the next phase – allow for participants' input to guide the experiment or can help explain the original results.

The mixed methods approach was first coined during the 1980s, although researchers had arguably been combining qualitative and quantitative data, methods, and inquiry logics since the days of Galileo (Maxwell 2016). Self-identified mixed methods research later flourished throughout the 2000s, with the thematic *Journal of Mixed Methods Research* being founded in 2007. To identify mixed methods research, Johnson, Onwuegbuzie and Turner (2007, 112) review several definitions of the "third research paradigm" and come up with the following formulation:

> Mixed methods research is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purpose of breadth and depth of understanding and corroboration.
>
> (ibid., 123)

Mixed methods combine qualitative and quantitative elements at one or several stages throughout a project, which can range from the formulation of research questions, sampling and data collection to data analysis (Bryman 2006, 101). Yet in the context of AVT and MA, mixed methods research is oftentimes not thoroughly acknowledged: studies combining methods in our field do not explicitly adopt specific mixed methods designs – convergent, explanatory, and exploratory (Creswell and Plano Clark 2017) – and, more generally, they do not reflect on the overarching paradigms and data integration frameworks. Meister (2018, 77) discusses this very phenomenon in the overarching context of Translation Studies: although researchers apply "different types of data, methods and theories", they often do not take full advantage of the "integrative methodological framework" mixed methods have to offer.

With this paper, my aim is to provide a methodological basis for the purposeful application of mixed methods designs in MA experiments employing physiological instruments. The rationale behind this aim is that existing studies using physiological instruments have not yet exploited the full potential that mixed methods designs have to offer, even though they are almost never applied without including some form of self-reported input by the participants. The article is structured as follows: I summarise the methodological foundations of mixed methods designs in Section 2. Section 3 follows with a literature review of the application of physiological instruments in MA. Section 4 goes on to illustrate the already existing (implicit or explicit) application of mixed methods in MA. In Section 5, I discuss the rationales and possibilities for applying mixed methods designs to MA. Overall, this article demonstrates that mixed methods is already a widespread approach in MA studies that apply physiological instruments. By explicitly acknowledging the mixed methods design they are applying, researchers can gain in transparency, replicability, and methodological soundness.

2. *Core mixed methods designs*

The mixed methods approach brings together quantitative and qualitative research to provide "informative, complete, balanced, and useful research results" while recognising and remaining inclusive of "local and broader socio-political realities, resources and needs" (Johnson, Onwuegbuzie and Turner 2007, 129). As argued by Shannon-Baker (2016), this approach can adopt several philosophical paradigms or worldviews, namely pragmatism, dialectics, critical realism, and transformative-emancipation. In what follows, I briefly outline the definitions of these paradigms which are worth bearing in mind when designing mixed methods studies. When mixing methods, we need to reflect on whether one method is insufficient and whether we hypothesise that our (qualitative and quantitative) results will diverge.

1. Pragmatism is an outcome-oriented, practice-based paradigm that turns away from positivist/postpositivist and constructivist hierarchies (Onwuegbuzie and Leech 2005). In the words of Moseholm and Fetters (2017, 2), pragmatism "emphasizes creating shared meaning and joint action, and this emphasis points to the underlying belief in *complementarity*"[1] [emphasis added].

[1] Complementarity refers to the combination of quantitative and qualitative approaches in an attempt to balance out the advantages and disadvantages of each approach (Shannon-Baker 2016, 325).

2. According to Shannon-Baker (2016, 328), dialectics considers the use of two or more philosophical paradigms "instead of conceptualizing another 'paradigm' or perspective entirely". The author goes on to explain that dialectics "offers the most emphasis on *divergence*[2] [emphasis added] in the data and results together".
3. Critical realism integrates "a realist ontology (there is a real world that exists independently of our perceptions, theories, and constructions) with a constructive epistemology" (our vision of the world is a construction based on our perspectives) (Creswell and Plano Clark 2017, 40). The keyword here is the *compatibility* of worldviews.
4. The transformative-emancipation paradigm is defined by close collaboration "with minority and marginalised groups whose voice is not typically heard on particular issues" (Shannon-Baker 2016, 326). Groups directly involved in the research participate in the process by developing research questions, determining culturally appropriate methods, recruiting participants effectively, collecting sensitive data, etc. (ibid., 327). Within this paradigm, the aim is *to achieve change*.

Given the evident connection between MA and persons with disabilities, there is a pressing need to further mainstream the transformative-emancipation paradigm in our field. Accessibility users are involved in MA research as participants, interviewees, testers, etc., but they could be further involved throughout the different stages of the mixed methods design. Scholars have convincingly argued for the involvement of access service users in the creation of a given (audiovisual) product. Accessible filmmaking (Romero-Fresco 2019) and poietic design (Greco 2018) are two examples. The same logic could be applied to MA research itself. Users of accessible services may actively participate as full members of MA research projects by pinpointing priority topics, helping to design the project so that it meets their demands, interpreting the data, disseminating the results, etc. In brief, mixed methods research framed within this paradigm may provide an opportunity to narrow the maker-expert-user gap (Greco 2018).

When embarking on a mixed-methods study, researchers make two initial decisions, according to Johnson and Onwuegbuzie (2004): to operate within one dominant

[2] Within the dialectics paradigm, divergence alludes to addressing the conflicting ideas and dissonances in the data and results from the different paradigms when they are brought together (Shannon-Baker 2016, 328).

paradigm or not, and to conduct the research in a concurrent or sequential manner. For now, I will focus on the phases or, rather, the main designs in mixed methods research. Creswell and Plano Clark (2017) have narrowed down to three mixed methods designs[3]:

a. The convergent design compares or merges results. Qualitative and quantitative data are collected and analysed during the same phase and then merged to identify similarities, contradictions, etc., in the results (for instance, through joint-display tables). Alternatively, the data can be merged by transforming the qualitative data into quantitative variables (or vice versa) (Creswell and Plano Clark 2017, 68–72).
b. In an explanatory sequential design, the research is done in two separate phases. First, researchers collect and analyse the quantitative data, which in turn inform the qualitative strand (Ivankova, Creswell and Stick 2006). Second, the qualitative strand explains, "follows up", or illustrates the quantitative results. In this design, the integration occurs at two stages: (1) when "connecting the quantitative results to the qualitative data collection", and (2) when the qualitative phase is finished and the researcher "draws integrated conclusions about how the qualitative results explain and extend specific quantitative results" (Creswell and Plano Clark 2017, 80).
c. The exploratory sequential design also consists of two phases: researchers first collect and analyse the qualitative data, which in turn inform the quantitative strand. During the second phase, researchers "interpret the two sets of results together so that quantitative results can verify, confirm, or generalize the initial exploratory qualitative findings" (Plano Clark and Ivankova 2015, 124).

Fetters, Curry and Creswell (2013) discuss four larger frameworks which can apply the convergent, explanatory sequential and exploratory sequential designs: multistage, intervention (or experimental), case study, and participatory mixed methods frameworks. For the purposes of this article, I will now delve into the mixed methods experimental design.

Creswell and Plano Clark (2017, 108) define the intent of incorporating qualitative data into experimental research "to provide personal, contextual, qualitative experiences drawn from the setting or culture of the participants along with the quantitative outcome measures". In MA, the qualitative and quantitative scenario is fully met when

[3] Creswell and Plano Clark's (2017, 60–61) typology of mixed methods designs has fluctuated over time. The authors have disregarded the timing of data collection and the prioritisation of each method in favour of the *intent* of the design.

physiological instruments are combined with qualitative methods (interviews, focus groups, think-aloud protocols, recordings, diaries kept by participants, etc.). Yet physiological instruments are often employed in tandem with self-report questionnaires which may adopt a quantitative stance (through Likert scales, close-ended questions, etc.) or a qualitative stance (through open-ended questions). Regardless of the adopted stance, the intent of these questionnaires is to draw on the participants' own perceptions, understandings, expectations, etc. to complement their physiological reactions to stimuli. For the purposes of MA, in Sections 3 and 4 I draw a comparison between physiological instruments and self-reported measures and the classical mixed quantitative and qualitative methods.

In mixed methods experimental research, all three core designs outlined above can be applied. Within the convergent design, researchers may "ask process questions to identify how participants experience the intervention" (Creswell and Plano Clark 2017, 108–109). Within the explanatory sequential design, the self-reported data gathered after the trial may, for instance, be used to assess with the participants why the intervention worked or not. Within the exploratory sequential design, qualitative (in our case, self-reported) data collection and analysis is done in order to tailor or plan the physiological measure. Overall, even if the physiological measure is the core of the study, the mixed methods experimental design highlights the need to incorporate the participants' perspectives. This is even more relevant in a context where vulnerable audiences are involved.

3. *Physiological instruments in Media Accessibility: A literature review*

Physiological instruments applied to MA thus far include eye tracking, EEG, electrodermal activity, and heart rate (Orero et al. 2018). To inform my argument for the deliberate application of mixed methods, I conducted a literature review of studies employing physiological instruments in AVT and MA utilising the Media Accessibility Platform (MAP)[4] database. Among other features, MAP keeps an updated database of AVT and MA publications which includes keyword tagging. I thereby defined four inclusion criteria. The search was narrowed down to (1) publications containing the keywords "eye-tracking", "electrophysiological measures", "heart rate" and "EEG"; (2)

[4] https://mapaccess.uab.cat/

journal articles in English; (3) articles reporting on experiments employing physiological instruments, thus excluding methodological publications or literature reviews; and (4) institutional access to the publishing journals.

At the time of the writing of this article, the keyword "eye-tracking" yielded 84 publications, "electrophysiological measures" yielded 11, "heart rate" yielded 5, and "EEG" yielded 5 publications. Based on the aforementioned inclusion criteria, 27 articles were eligible for eye tracking, 3 articles for electrophysiological measures, 4 articles for heart rate, and 2 articles for EEG. For illustration, Table 1 presents a summary of the literature review, with an emphasis on the measures applied in each article, the purpose of its application, and additional methods.

Table 1. Physiological instruments and their applications in MA

Physiological instrument	Purpose	Studies	Additional methods
Eye tracking	Assess the time viewers devote to reading SDH	Jensema, Danturthi and Burth (2000)	Post-stimuli feedback
	Assess the cognitive effectiveness in processing subtitled stimuli (the film is well understood in spite of the audience focusing on the subtitles)	Perego et al. (2010)	Post-stimuli questionnaires
	Compare narrative comprehension scores with the viewers' visual behaviour	Kruger (2012)	Post-stimuli narrative report
	Utilise eye-tracking (fixations and gaze control) data from sighted viewers to later apply them to the creation of an AD	Orero and Vilaró (2012), Vilaró and Orero (2013), Di Giovanni (2014)	Post-stimuli questionnaires
	Assess re-reading of subtitles displayed over shot changes	Krejtz, Szarkowska and Krejtz (2013)	Post-stimuli (comprehension) questionnaire
	Assess the effects of segmentation (on comprehension) in respoken live subtitles	Rajendran et al. (2013)	Post-stimuli and post-experiment questionnaire
	Assess children's visual attention patterns in subtitled cartoons	Cambra et al. (2014)	-
	Assess the effect of colloquial language use in subtitle reception	Fernández-Torné, Matamala and Vilaró (2014)	Post-stimuli questionnaire
	Assess visual attention distribution of deaf and hearing audiences in news broadcasting with sign language interpretation	Wehrmeyer (2014)	Post-stimuli interview

Analyse the process of reading content vs. function words in subtitles (among deaf and hearing participants)	Krejtz, Szarkowska and Łogińska (2016)	Post-stimuli questionnaire
Test comprehension scores for professional vs. non-professional subtitles	Orrego-Carmona (2016)	Post-stimuli interviews
Measure the reading speed (for long one-line vs. two-line subtitles), the perception of sound effects and speaker portraits in subtitles for videogames	Mangiron (2016)	Post-stimuli questionnaires
Compare the visual processing of dubbed vs. subtitled products	Perego, Orrego-Carmona and Bottiroli (2016)	Post-stimuli questionnaires (viewing habits, comprehension, and evaluation)
Test the effect of edited vs. verbatim subtitles and presentation rates on comprehension and reading patterns	Szarkowska, Krejtz, Pilipczuk et al. (2016)	Post-stimuli comprehension questionnaire
Measure viewers' preferences on subtitle segmentation (line breaks)	Gerber-Morón and Szarkowska (2018)	Follow-up question and post-stimuli semi-structured interviews
Assess the subtitling production process (temporal, cognitive and production effort) of professional and trainee subtitlers	Orrego-Carmona, Dutka and Szarkowska (2018)	Screen recording, mouse clicks, keystroke logging and post-experiment interviews
Test the (visual and verbal) reception of subtitled audiovisual texts with screens of different sizes	Di Giovanni (2019)	Post-stimuli comprehension questionnaire
Test users' preferences, comprehension, and enjoyment of two-line vs. three-line subtitles	Szarkowska and Gerber-Morón (2019)	Post-stimuli questionnaires and interviews
Measure the effects of the size and position of sign language interpretation on TV	Bosch, Soler-Vilageliu and Orero (2020)	Post-stimuli questionnaires
Assess gaze fixation in close-up scenes of dubbed/voice-over vs. original films	Flis, Sikorski and Szarkowska (2020); Romero-Fresco (2020)	Post-stimuli questionnaires
Compare children's reception of standard and integrated subtitles	Black (2020)	Post-stimuli tests, questionnaires, and interviews
Compare the reception of raw machine translation, post-edited machine translation and human translation in MOOC subtitles	Hu, O'Brien and Kenny (2020)	Post-stimuli questionnaire

	Test the effect of literal vs. non-literal reversed subtitles on processing and memorisation	Ragni (2020)	Post-stimuli verbatim test and open questionnaire
	Assess the impact of automatic speech recognition on effort in transcription tasks	Tardel (2020)	Keylogging
Electrodermal activity	Measure the emotional response to audio subtitles with voice-over vs. dubbing effect	Iturregui-Gallardo and Matamala (2021)	Heart rate and tactile version of the SAM questionnaire
EEG	Measure the cognitive load in intralingual and interlingual respeaking	Szarkowska, Krejtz, Dutka et al. (2016)	Self-report questionnaires and semi-structured interviews
	Measure the impact of subtitles on the cognitive processing of and psychological immersion into a fiction film	Kruger, Doherty and Ibrahim (2017)	Pre-stimuli and post-stimuli self-report questionnaires
Heart rate	Measure the emotional elicitation to audio described audiovisual stimuli	Ramos (2015, 2016)	Post-stimuli questionnaires
	Measure sexual arousal and engagement in audio described porn	Rojo, Ramos and López (2021)	Cortisol responses and post-stimuli questionnaires

As can be observed in Table 1, eye tracking has been the most widespread instrument of choice in MA so far. This is no surprise given its potential to provide information on attention, attention distribution, and processing of a scene (Orero et al. 2018, 114). For the study of subtitles and SDH processing, for instance, common measurements are mean fixation duration, time to first fixation, fixations per subtitle, dwell time, and gaze control. Perhaps surprisingly, eye tracking has also been applied to AD research (Orero and Vilaró 2012; Vilaró and Orero 2013; Di Giovanni 2014), as sighted viewers' fixations and points of interest can be examined to provide guidance on AD scripting. These three studies also differ from the rest of the (convergent) eye-tracking studies in Table 1 in that the results of the eye tracking experiments are analysed first to tailor the questionnaires which are distributed at a later stage. They thus apply an explanatory sequential design, as explored further in Section 5.

Electrodermal activity (or galvanic skin response) is a non-invasive measure of skin conductance to monitor changes in emotional and cognitive states. This measure has been applied to MA research (Iturregui-Gallardo and Matamala 2021) to "assess emotional activation of users when exposed to audiovisual stimuli […] made accessible" (Matamala et al. 2020, 134). Given that electrodermal activity devices are less intrusive than other methods, they may have the potential to be applied in contexts

where ecological validity is difficult to achieve in laboratory conditions, for instance in the scenic arts. Like electrodermal activity measures, heart rate activity is monitored to assess the physiological elicitation of emotions as users are exposed to different audio described (Ramos 2015, 2016; Rojo, Ramos and López 2021) or audio subtitled (Iturregui-Gallardo and Matamala 2021) stimuli. EEG is a less explored measure in MA which allows for analysing variations in cognitive load and immersion through signals in task-relevant brain regions (Kruger, Doherty and Ibrahim 2017; Orero et al. 2018).

The findings from the literature review presented in Table 1 suggest that both electrodermal activity and heart rate have been combined mostly with post-stimuli questionnaires and interviews. All the data is collected during the same session and analysed at the same stage, meaning that the design applied is convergent. The studies by Rojo, Ramos and López (2021) and Iturregui-Gallardo and Matamala (2021) are the most complex because they combine two physiological instruments (respectively, heart rate monitoring and cortisol responses, and electrodermal activity and heart rate) with questionnaires. This is indeed another possibility in the mixed methods experimental research framework.

Overall, the Additional methods column in Table 1 evidences that physiological instruments are almost never applied in isolation in the context of MA and AVT. In fact, the only quoted study in the literature review that relies on physiological instruments alone is Cambra et al.'s (2014). The following section further argues that mixed methods is already the most widespread approach in MA studies employing physiological instruments, mostly in an implicit manner, but also increasingly explicitly.

4. *Mixed methods in Media Accessibility*

4.1. *Implicit mixed methods*

Physiological instruments in MA are routinely combined with one or several self-reported measures. They apply an implicit mixed methods approach because, even though they do not frame themselves within the mixed methods paradigm (they do not thoroughly acknowledge the underlying implications nor the stage where the data and results are embedded, and they don't adhere to any particular mixed methods design), they do aim to reconcile at least two sets of data from different sources (participants' physiological reactions to stimuli and self-report questionnaires and interviews), and

they apply the mixed methods rationales discussed in Section 5, such as cross-checking the same phenomenon from different standpoints, seeking divergence, etc. In the following paragraphs, some examples presented in Section 3 are illustrated with their mixed methods rationales (see also Section 5) and the buzzword "triangulation" is problematised.

EEG data have been used both to assess the users' reception of accessible services and to research the working process of professionals. Kruger, Doherty and Ibrahim (2017) "triangulate" EEG data with data from both pre-stimuli and post-stimuli self-report questionnaires to measure the audience's sense of immersion when watching subtitled products. Their rationale for combining methods is to compensate for the shortcomings of post-hoc measures that rely on memory. In Szarkowska, Krejtz, Dutka et al. (2016), the purpose is to measure effort when performing interlingual vs. intralingual respeaking tasks. EEG data are contrasted with self-report questionnaires rating mental load, mental effort and performance; and semi-structured interviews. Their justification for combining methods is to seek comparison between the self-report and EEG results, and they find that these results are contradictory.

Similarly, eye-tracking studies have often been combined with post-stimuli questionnaires (Mangiron 2016; Bosch, Soler-Vilageliu and Orero 2020) or interviews (Orrego-Carmona 2016; Orrego-Carmona, Dutka and Szarkowska 2018) to assess users' reception of different stimuli, particularly in terms of comprehension, cognitive load, presence, and enjoyment. Romero-Fresco (2020) conducts an eye-tracking study to find out how viewers react to close-up scenes with and without dialogues in both original and dubbed films. His rationale for combining methods is to compare data from the participants' eye movements and their subjective perceptions. Again, the findings from the eye-tracking experiment and self-reported measures do not align. Flis, Sikorski and Szarkowska (2020) replicate this study, but, instead of dubbing, they test the same effect in voice-over. In both cases, the eye-tracking portion of the study is the principal approach, but, as clarified by Creswell and Plano Clark (2017) (see Footnote 3), methods do not have to be of equal relevance for the study to be framed within a mixed-methods approach.

As for the emerging research on heart rate and electrodermal activity measures, studies employing these methods can also be framed within the mixed methods approach. Ramos's (2015, 2016) experiments test emotional response to audio narrations vs. ADs

via heart rate and post-stimuli questionnaires, and the author's rationale for mixing methods is to compare results and overcome the shortcomings of self-reported measures. In Iturregui-Gallardo and Matamala (2021), electrodermal activity measures are combined with heart rate and post-stimuli questionnaires in order to assess emotional reactions to audio subtitles with voice-over vs. dubbing effect. They seek to analyse "the relationship between the psychophysiological results and the dimension of arousal in the self-report questionnaire" (Iturregui-Gallardo and Matamala 2021, 8), but they find no correlations between the self-reported results and the results obtained from the physiological instruments. As highlighted below, the divergence of results in the context of mixed methods is relevant because not only can it be one of the possible outcomes of the study, but also one of the rationales of mixed methods itself (Bryman, 2006).

Interestingly, several of the studies from the literature review (Mangiron 2016; Kruger, Doherty and Ibrahim 2017; Tardel 2020) claim to triangulate two or more methods, even if the study is not framed within a mixed methods design. Triangulation has "a long history of multiple meanings and insufficient clarity" (Morgan 2019, 6). According to Hammersley (2008), its most common meaning is associated with the compensation of strengths and weaknesses of each method:

> The use of different methods to investigate a certain domain of social reality can be compared with the examination of a physical object from two different viewpoints or angles. Both viewpoints provide different pictures of this object that might not be useful to validate each other but that might yield a fuller and more complete picture of the phenomenon concerned if brought together.
>
> (Erzberger and Kelle 2003, 461)

More recently, Fetters and Molina-Azorin (2017) cite up to six reasons to replace the term "triangulation" with the updated terminology of "integration" at different levels of the mixed methods design. Among these reasons, the polysemic nature of the term has made it lose in meaning. Triangulation has been cited as a rationale to apply a mixed-

methods approach (Bryman 2006), and the "triangulation design" was also one of the former mixed methods designs. Its very formulators have since replaced it with the *convergent design*: "instead of focusing on the triangulation of data sources, we now emphasize what the researcher does with the data sources within the intent of the study, e.g., to *converge* the results for enhanced understanding" (Creswell and Plano Clark 2017, 60).

Another of the reasons to reject the triangulation terminology is brought forward by Fetters and Molina-Azorin (2017): triangulation assumes that the data gathered from the different datasets will logically reach and confirm the same conclusion. This is not necessarily true. Morgan (2019) argues that there are three possible outcomes when interpreting and comparing quantitative and qualitative results (in our case, results obtained from physiological instruments and self-reported measures): convergence (QUAL = QUAN), formerly known as triangulation; complementarity (QUAL + QUAN); and divergence (QUAL ≠ QUAN). This terminological update is worth introducing in the design and findings sections of experimental mixed methods studies in our field, as it provides more succinct and unambiguous terminology. In any case, triangulation as a synonym for mixed methods research should be disregarded.

4.2.*Explicit mixed methods*

MA and AVT research is increasingly acknowledging the mixed methods approach applied to studies employing physiological instruments. Several of the studies from the literature review state their mixed methods nature, and explicitly combine, compare, or seek divergence in the results from the physiological instruments with the self-reported measures. For example, Orrego-Carmona, Dutka and Szarkowska (2018) study the translation process of professional and trainee subtitlers deploying eye tracking, screen recording, mouse clicks, and keystroke logging with a post-experiment interview. After reporting on the objective results, these are analysed qualitatively, which is indeed one of the possibilities of convergent mixed methods design.

Szarkowska and Gerber-Morón (2019) also adopt an explicitly mixed methods (mixed factorial) approach to study the reception of two- vs. three-line subtitles. They conduct two eye-tracking experiments and follow them with post-stimuli questionnaires and semi-structured interviews. The design is convergent, as results are merged after the

(independent) analysis of the eye-tracking data and the self-reported data. In this case, the results from the physiological instrument and self-reported measures agree in that three-liners induce a higher cognitive load.

Lastly, Black (2020) measures children's reception of standard vs. integrated subtitles by applying Gambier's model of the three *Rs* (2012): *response* is measured via eye-tracking data (visual attention allocation and cognitive effort); *reaction* is measured via scene recognition and content comprehension tests; and *repercussion* is assessed via post-experiment questionnaires and interviews. This model is also convergent and the results from the eye-tracking experiment coincide with the comprehension and the self-reported data.

What we can draw from the studies discussed in Sections 3 and 4 is that (1) research employing physiological instruments in our field does not exist in isolation from the participants' self-reported input and (2) convergent design has been the most frequent type in AVT and MA studies employing these instruments.

5. *Adapting mixed methods designs to experimental research with physiological instruments*

As shown throughout the previous sections, there is no shortage of fruitful combinations between physiological instruments and self-reported measures in MA. To clearly make my case for an explicit acknowledgement of mixed methods in our discipline, I next refer to a number of rationales for applying this research paradigm. Then, I bring forward a number of practical examples for each design.

Greene, Caracelli, and Graham (1989, 258–260) claim that mixed methods can be used to (1) corroborate, (2) enhance or elaborate, (3) develop or (4) contradict the results of each method, and to (5) expand on the topic of inquiry. In a meta-analysis of 232 studies, Bryman (2006) finds that the most commonly cited rationales for applying mixed methods are enhancement of results, triangulation, completeness, illustration, and explanation. Some common rationales for combining methods in our field are correlation (Perego et al. 2010; Orero and Vilaró 2012; Perego, Orrego-Carmona and Bottiroli 2016; Gerber-Morón and Szarkowska 2018; Iturregui-Gallardo and Matamala 2021); comparison, corroboration and contradiction (Fernández-Torné, Matamala and Vilaró 2014; Krejtz, Szarkowska and Łogińska 2016; Orrego-Carmona 2016;

Szarkowska, Krejtz, Pilipczuk et al. 2016; Szarkowska and Gerber-Morón 2019; Romero-Fresco 2020; Flis, Sikorski and Szarkowska 2020); compensation of the shortcomings in one of the methods (Kruger, Doherty and Ibrahim 2017); development of a new practice (Di Giovanni 2014); integration of results (Kruger 2012); and enhancement of results (Mangiron 2016). By means of examples cited throughout the article and others from neighbouring fields of study, I now present a number of mixed methods design possibilities with the potential of opening new horizons.

Eye tracking (Szarkowska and Gerber-Morón 2019; Black 2020), EEG (Szarkowska, Krejtz, Dutka et al. 2016), electrodermal activity (Iturregui-Gallardo and Matamala 2021) and heart rate (Ramos 2015, 2016; Rojo, Ramos and López 2021) studies in MA mostly fall into the category of convergent design. That is, the experiment is prefaced by a questionnaire (usually to gather demographic data, media consumption habits, visual condition, language proficiency, etc.) and immediately followed by either post-stimuli questionnaires or interviews. The data from the physiological instruments and the data from the questionnaires or interviews are analysed independently and their results are compared/cross-checked at the same stage. In this vein, some qualitative methods have yet to be embedded in experimental MA research. Think-aloud techniques in particular have been applied to usability testing and can be utilised to "examine emotional responses to movies and paintings to see how they develop over time during the viewing or reading" (van Peer, Hakemulder and Zyngier 2012, 78). The convergent combination of eye tracking and think-aloud protocols in the usability field, in particular (cf. Elling, Lentz and de Jong 2012), could be replicated in process-based MA studies.

An exception to the "convergent fever" is Di Giovanni's (2014) study on eye-tracking-informed AD, where an explanatory sequential design is applied. The eye-tracking experiment is conducted first, and its results inform the second (self-reported) strand of the project. Namely, two different AD scripts are created, one inspired by the eye-tracking results and a traditional AD. At a later stage, a group of blind participants respond to a questionnaire after being presented with both versions. Eye-tracking-informed AD turned out to be better understood than the traditional AD. This study and its design in itself pose a new opportunity for the empirical updating of accessibility standards and guidelines.

As for exploratory sequential designs with physiological instruments, Kruger, Doherty and Ibrahim (2017) draw on self-reported immersion results from questionnaires to build the EEG experiment. Within this design, there is no denying the potential of first gathering and analysing qualitative (or quasi-quantitative) data from accessibility users and other stakeholders precisely to guide the experiment. We can look at other examples from neighbouring disciplines for inspiration. Harrison and Reilly (2011), for instance, find that exploratory sequential design is the most frequent design in mixed methods marketing research. Therein, qualitative data are collected and analysed for developing the experiment by creating taxonomies and typologies. Within Interpreting Studies, Goldsmith (2018, 345) adopts this design to first "describe how tablets are used for consecutive interpreting" via interviews with professionals and then, drawing on these qualitative results, to "develop an instrument to evaluate the various tools and technology available in this field". An exploratory sequential design would be particularly useful to our field if we adopt a transformative-emancipation paradigm. That is, the qualitative strand of the project can be devoted to users pinpointing unsolved accessibility issues. The experiment can then be carried out to empirically test accessibility solutions to the previously gathered users' demands.

In summary, convergent designs have allowed for the cross-checking of psychophysiological reactions with self-reported data. This avenue of research offers many possibilities as it is efficient (in MA studies employing the convergent design, participants only have to travel to the lab once) and different members from a team of researchers can distribute the analysis according to their expertise (Creswell and Plano Clark 2017, 72–73). Alternatively, explanatory and exploratory designs open up new research avenues, given that they have been rarely deployed in MA. More importantly, all three possibilities can closely involve accessibility users in the design of the experiment and the interpretation of its results if the research is framed within the transformative-emancipation paradigm.

6. *Conclusions*

The present article has gathered evidence that mixed methods is already a relevant approach in MA research employing physiological instruments, whether researchers acknowledge it or not. In fact, it can be argued that previous experimental research

studies do not utilise physiological instruments as stand-alone methods (see Table 1). Physiological instruments appear inextricably linked to self-reported measures, and the combination of both may adhere to the convergent, explanatory or exploratory mixed methods designs.

More generally, the rationales for choosing mixed method approaches – i.e., enhancement of results, completeness, explanation, contradiction, etc. (Greene, Caracelli and Graham 1989; Bryman 2006) – also apply to MA research employing physiological instruments. Experiments combining physiological instruments and self-reported measures paint a more comprehensive picture of the topic of inquiry and cross-check accessibility users' subjective reflection with empirical evidence. Perhaps more importantly, mixed methods pose an opportunity to establish a productive dialogue with all stakeholders at different stages of the research process and to corroborate their perceptions.

By framing future studies within the existing mixed methods designs and by incorporating the up-to-date terminology of mixed methods, researchers have much to gain in terms of transparency, replicability, and reproducibility. The key here is to outline how datasets are integrated: Are the results from each method compared, used to explain each other, to build the next phase of the study, to expand on the other? (Leavy 2017, 171–172). The literature review leads to the conclusion drawn in Section 4 that convergent designs are the most widespread in MA experimental studies.

As for explanatory and exploratory sequential designs, they are yet to flourish in our field. Exploratory designs in particular have the potential to better inform the experiment by assessing the users' most compelling needs and interests in their own words. As already stated throughout the article, scholars are advocating for the inclusion of users in the design of accessible products: "In order for artefacts to be fully accessible, the knowledge of users and other stakeholders needs to be fully taken into account in the design system because it is as important as maker's knowledge" (Greco 2018, 212). Mixed methods designs can precisely pose an opportunity to apply a transformative-emancipation paradigm.

Mixed methods research is not, however, a panacea. Research that lacks statistical soundness, and ethical and scientific rigour (Orero et al. 2018) cannot be "fixed" by even the most well-planned and well-defined mixed methods design. This paper does

not seek to claim that mixed methods are a "one size fits all" solution for MA research employing physiological instruments. Rather, it argues for the advancement of convergent, explanatory and exploratory designs in studies combining physiological instruments with self-reported measures. An awareness of the characteristics and purpose of each mixed methods design will surely benefit prospective methodological frameworks in MA studies of this nature.

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References

Agulló, Belén, and Anna Matamala. 2020. "Subtitles in Virtual Reality: Guidelines for the Integration of Subtitles in 360º Content." *Íkala*, 25 (3): 643–661.

Black, Sharon. 2020. "Could Integrated Subtitles Benefit Young Viewers? Children's Reception of Standard and Integrated Subtitles: A Mixed Methods Approach Using Eye Tracking." *Perspectives*: 1–17. https://doi.org/10.1080/0907676X.2020.1849324

Bosch-Baliarda, Marta, Olga Soler-Vilageliu, and Pilar Orero. 2020. "Sign Language Interpreting on TV: A Reception Study of Visual Screen Exploration in Deaf Signing Users." *MonTi: Monografías de Traducción e Interpretación*, 12: 108–143.

Bryman, Alan. 2006. "Integrating Quantitative and Qualitative Research: How is it Done?" *Qualitative Research*, 6 (1): 97–113. https://doi.org/10.1177/1468794106058877

Cambra, Cristina, Olivier Penacchio, Núria Silvestre, and Aurora Leal. 2014. "Visual Attention to Subtitles when Viewing a Cartoon by Deaf and Hearing Children: An Eye-

Tracking Pilot Study." *Perspectives*, 22 (4): 607–617. https://doi.org/10.1080/0907676X.2014.923477

Creswell, John W., and Vicki L. Plano Clark. 2017. *Designing and Conducting Mixed Methods Research.* 3rd ed. Thousand Oaks: Sage.

Di Giovanni, Elena. 2014. "Visual and Narrative Priorities of the Blind and Non-Blind: Eye Tracking and Audio Description." *Perspectives*, 22 (1): 136–153. https://doi.org/10.1080/0907676X.2013.769610

Di Giovanni, Elena. 2018. "Participatory Accessibility: Creating Audio Description with Blind and Non-Blind Children." *Journal of Audiovisual Translation*, 1 (1): 155–169.

Di Giovanni, Elena. 2019. "Reception Studies and Audiovisual Translation: Eye Tracking Research at the Service of Training in Subtitling." *Cultus, the Intercultural Journal of Mediation and Communication*, 12: 174–193.

Elling, Sanne, Leo Lentz, and Menno de Jong. 2012. "Combining Concurrent Think-Aloud Protocols and Eye-Tracking Observations: An Analysis of Verbalizations and Silences." *IEEE Transactions on Professional Communication*, 55 (3): 206–220.

Erzberger, Christian, and Udo Kelle. 2003. "Making Inferences in Mixed Methods: The Rules of Integration." In *Handbook of Mixed Methods in Social and Behavioral Research*, edited by Abbas Tashakkori and Charles Teddlie, 457–488. Thousand Oaks: Sage.

Fernández-Torné, Anna, Anna Matamala, and Anna Vilaró. 2014. "The Reception of Subtitled Colloquial Language in Catalan: An Eye Tracking Exploratory Study." *Vigo International Journal of Applied Linguistics*, 11: 63–80.

Fetters, Michael D., and José F. Molina-Azorin. 2017. "The Journal of Mixed Methods Research Starts a New Decade: Principles for Bringing in the New and Divesting of the Old Language of the Field." *Journal of Mixed Methods Research*, 11 (1): 3–10. https://doi.org/10.1177/1558689816682092

Fetters, Michael D., Leslie A. Curry, and John W. Creswell. 2013. "Achieving Integration in Mixed Methods Designs: Principles and Practices." *Health Services Research*, 48 (6-2): 2134–2156. https://doi.org/10.1111/1475-6773.12117

Flis, Gabriela, Adam Sikorski, and Agnieszka Szarkowska. 2020. “Does the Dubbing Effect Apply to Voice-Over? A Conceptual Replication Study on Visual Attention and Immersion.” *The Journal of Specialised Translation*, 33 (3): 41–69.

Gambier, Yves. 2012. “The Position of Audiovisual Translation Studies.” In *The Routledge Handbook of Translation Studies*, edited by Carmen Millán and Francesca Bartrina, 45–59. London: Routledge.

Gerber-Morón, Olivia, and Agnieszka Szarkowska. 2018. “Line Breaks in Subtitling: An Eye Tracking Study on Viewer Preferences.” *Journal of Eye Movement Research*, 11 (3): 1–22.

Goldsmith, Joshua. 2018. “Tablet Interpreting: Consecutive Interpreting 2.0.” *Translation and Interpreting Studies*, 13 (3): 342–365. https://doi.org/10.1075/tis.00020.gol

Greco, Gian M. 2018. “The Nature of Accessibility Studies.” *Journal of Audiovisual Translation*, 1 (1): 205–232.

Greco, Gian M. 2019. “Accessibility Studies: Abuses, Misuses and the Method of Poietic Design.” In *International Conference on Human-Computer Interaction*, edited by Constantine Stephanidis, 15–27. Cham: Springer.

Greene, Jennifer C., Valerie J. Caracelli, and Wendy F. Graham. 1989. “Toward a Conceptual Framework for Mixed-Method Evaluation Designs.” *Educational Evaluation and Policy Analysis*, 11 (3): 255–274.

Hammersley, Martyn. (2008). “Troubles with Triangulation.” In *Advances in Mixed Methods Research*, edited by Manfred M. Bergman, 22–36. London: Sage.

Harrison, Robert L., and Timothy M. Reilly. 2011. “Mixed Methods Designs in Marketing Research.” *Qualitative Market Research: An International Journal*, 14 (1): 7–26. https://doi.org/10.1108/13522751111099300

Hu, Ke, Sharon O’Brien, and Dorothy Kenny. 2020. “A Reception Study of Machine Translated Subtitles for MOOCs.” *Perspectives*, 28 (4): 521–538. https://doi.org/10.1080/0907676X.2019.1595069

Iturregui-Gallardo, Gonzalo, and Anna Matamala. 2021. “Audio Subtitling: Dubbing and Voice-Over Effects and their Impact on User Experience.” *Perspectives*, 29 (1): 64–83. https://doi.org/10.1080/0907676X.2019.1702065

Ivankova, Nataliya V., John W. Creswell, and Sheldon L. Stick. 2006. “Using Mixed-Methods Sequential Explanatory Design: From Theory to Practice.” *Field Methods*, 18 (1): 3–20. https://doi.org/10.1177/1525822X05282260.

Jankowska, Anna. 2019. “Audiovisual Media Accessibility.” In *The Bloomsbury Companion to Language Industry Studies*, edited by Erik Angelone, Maureen Ehrensberger-Dow, and Gary Massey, 231–260. London: Bloomsbury Academic Publishing.

Jensema Carl J., Ramalinga S. Danturthi, and Robert Burch. 2000. “Time Spent Viewing Captions on Television Programs.” *American Annals of the Deaf*, 145 (5): 464–468.

Johnson, R. Burke, and Anthony J. Onwuegbuzie. 2004. “Mixed Methods Research: A Research Paradigm Whose Time Has Come.” *Educational Researcher*, 33 (7): 14–26.

Johnson, R. Burke, Anthony J. Onwuegbuzie, and Lisa A. Turner. 2007. “Toward a Definition of Mixed Methods Research.” *Journal of Mixed Methods Research*, 1 (2): 112–133. https://doi.org/10.1177%2F1558689806298224

Krejtz, Izabela, Agnieszka Szarkowska, and Krzysztof Krejtz. 2013. “The Effects of Shot Changes on Eye Movements in Subtitling.” *Journal of Eye Movement Research*, 6 (5): 1–12.

Krejtz, Izabela, Agnieszka Szarkowska, and Maria Łogińska. 2016. “Reading Function and Content Words in Subtitled Videos.” *The Journal of Deaf Studies and Deaf Education*, 21 (2): 222–232. https://doi.org/10.1093/deafed/env061

Kruger, Jan-Louis. 2012. “Making Meaning in AVT: Eye Tracking and Viewer Construction of Narrative.” *Perspectives*, 20 (1): 67–86. https://doi.org/10.1080/0907676X.2011.632688

Kruger, Jan-Louis. 2016. “Psycholinguistics and Audiovisual Translation.” *Target*, 28 (2): 276–287. https://doi.org/10.1075/target.28.2.08kru

Kruger, Jan-Louis, Stephen Doherty, and Ronny Ibrahim. 2017. "Electroencephalographic Beta Coherence as an Objective Measure of Psychological Immersion in Film." *Rivista Internazionale di Tecnica della Traduzione*, 19: 99–111. https://doi.org/10.13137/2421-6763/17353

Leavy, Patricia. 2017. *Research Design: Quantitative, Qualitative, Mixed Methods, Arts-based, and Community-based Participatory Research Approaches*. Guilford Press: New York.

Mangiron, Carme. 2016. "Reception of Game Subtitles: An Empirical Study." *The Translator*, 22 (1): 72–93. https://doi-org/10.1080/13556509.2015.1110000

Matamala, Anna, Olga Soler-Vilageliu, Gonzalo Iturregui-Gallardo, Anna Jankowska, Jorge L. Méndez-Ulrich, and Anna Serrano. 2020. "Electrodermal Activity as a Measure of Emotions in Media Accessibility Research: Methodological Considerations." *The Journal of Specialised Translation*, 33: 129–151.

Maxwell, Joseph A. 2016. "Expanding the History and Range of Mixed Methods Research." *Journal of Mixed Methods Research*, 10 (1): 12–27. https://doi.org/10.1177/1558689815571132

Meister, Lova. 2018. "On Methodology: How Mixed Methods Research Can Contribute to Translation Studies." *Translation Studies,* 11 (1): 66–83. https://doi.org/10.1080/14781700.2017.1374206

Morgan, David L. 2019. "Commentary: After Triangulation, What Next?" *Journal of Mixed Methods Research,* 13 (1): 6–11. https://doi.org/10.1177/1558689818780596

Moseholm, Ellen, and Michael D. Fetters. 2017. "Conceptual Models to Guide Integration during Analysis in Convergent Mixed Methods Studies." *Methodological Innovations,* 10 (2). https://doi.org/10.1177/2059799117703118.

Onwuegbuzie, Anthony J., and Nancy L. Leech. 2005. "On Becoming a Pragmatic Researcher: The Importance of Combining Quantitative and Qualitative Research Methodologies." *International Journal of Social Research Methodology,* 8 (5): 375–387. https://doi.org/10.1080/13645570500402447

Orero, Pilar, and Anna Vilaró. 2012. “Eye Tracking Analysis of Minor Details in Films for Audio Description.” *MonTI*: *Monografías de Traducción e Interpretación*, 4: 295–319.

Orero, Pilar, Stephen Doherty, Jan-Louis Kruger, Anna Matamala, Jan Pedersen, Elisa Perego, Pablo Romero-Fresco, et al. 2018. “Conducting Experimental Research in Audiovisual Translation (AVT): A Position Paper.” *The Journal of Specialised Translation*, 30: 105–126.

Orrego-Carmona, David. 2016. “A Reception Study on Non-Professional Subtitling. Do Audiences Notice any Difference?” *Across Languages and Cultures*, 17 (2): 163–181. http://dx.doi.org/10.1556/084.2016.17.2.2

Orrego-Carmona, David, Łukasz Dutka, and Agnieszka Szarkowska. 2018. “Using Translation Process Research to Explore the Creation of Subtitles: An Eye Tracking Study Comparing Professional and Trainee Subtitlers.” *The Journal of Specialised Translation*, 30: 150–180.

Perego, Elisa, David Orrego-Carmona, and Sara Bottiroli. 2016. “An Empirical Take on the Dubbing vs. Subtitling Debate: An Eye Movement Study.” *Lingue e Linguaggi*, 19: 255–274. http://dx.doi.org/10.1285/i22390359v19p255

Perego, Elisa, Fabio Del Missier, Marco Porta, and Mauro Mosconi. 2010. “The Cognitive Effectiveness of Subtitle Processing.” *Media Psychology*, 13: 243–272. https://doi.org/10.1080/15213269.2010.502873

Plano Clark, Vicki L., and Nataliya V. Ivankova. 2015. *Mixed Methods Research: A Guide to the Field*. Thousand Oaks: SAGE.

Ragni, Valentina. 2020. “More than Meets the Eye: An Eye-Tracking Study on the Effects of Translation on the Processing and Memorisation of Reversed Subtitles.” *The Journal of Specialised Translation*, 33: 99–128.

Rajendran, Dhevi J., Andrew T. Duchowski, Pilar Orero, Juan Martínez, and Pablo Romero-Fresco. 2013. “Effects of Text Chunking on Subtitling: A Quantitative and Qualitative Examination.” *Perspectives*, 21 (1): 5–21. https://doi.org/10.1080/0907676X.2012.722651

Ramos, Marina. 2015. “The Emotional Experience of Films: Does Audio Description Make a Difference?” *The Translator*, 21 (1): 68–94. https://doi.org/10.1080/13556509.2014.994853

Ramos, Marina. 2016. “Testing Audio Narration: The Emotional Impact of Language in Audio Description.” *Perspectives*, 24 (4): 606–634. https://doi.org/10.1080/0907676X.2015.1120760

Rojo, Ana M., Marina Ramos, and Laura López. 2021. “Audio Described vs. Audiovisual Porn: Cortisol, Heart Rate and Engagement in Visually Impaired vs. Sighted Participants.” *Frontiers in Psychology*, 12. https://doi.org/10.3389/fpsyg.2021.661452

Romero-Fresco, Pablo. 2019. *Accessible Filmmaking: Integrating Translation and Accessibility into the Filmmaking Process*. London: Routledge.

Romero-Fresco, Pablo. 2020. “The Dubbing Effect: An Eye-Tracking Study on How Viewers Make Dubbing Work.” *The Journal of Specialised Translation*, 33: 17–40.

Shannon-Baker, Peggy. 2016. “Making Paradigms Meaningful in Mixed Methods Research.” *Journal of Mixed Methods Research*, 10 (4): 319–334. https://doi.org/10.1177/1558689815575861

Szarkowska, Agnieszka. 2011. “Text-to-Speech Audio Description: Towards Wider Availability of AD.” *The Journal of Specialised Translation*, 15: 142–162.

Szarkowska, Agnieszka, and Olivia Gerber-Morón. 2019. “Two or Three Lines: A Mixed-Methods Study on Subtitle Processing and Preferences.” *Perspectives*, 27 (1): 144–164. https://doi.org/10.1080/0907676X.2018.1520267

Szarkowska, Agnieszka, Izabela Krejtz, Olga Pilipczuk, Łukasz Dutka, and Jan-Louis Kruger. 2016. “The Effects of Text Editing and Subtitle Presentation Rate on the Comprehension and Reading Patterns of Interlingual and Intralingual Subtitles among Deaf, Hard of Hearing and Hearing Viewers.” *Across Languages and Cultures*, 17 (2): 183–204. https://doi.org/10.1556/084.2016.17.2.3

Szarkowska, Agnieszka, Krzysztof Krejtz, Lukasz Dutka, and Olga Pilipczuk. 2016. “Cognitive Load in Intralingual and Interlingual Respeaking: A Preliminary Study.”

Poznań Studies in Contemporary Linguistics, 52 (2): 209–233. https://doi.org/10.1515/psicl-2016-0008

Tardel, Anke. 2020. "Effort in Semi-Automatized Subtitling Processes: Speech Recognition and Experience during Transcription." *Journal of Audiovisual Translation*, 3 (1): 79–102.

van Peer, Willie, Frank Hakemulder, and Sonia Zyngier. 2012. *Scientific Methods for the Humanities*. Amsterdam: John Benjamins Publishing Company.

Vilaró, Anna, and Pilar Orero. 2013. "Leitmotif in Audio Description: Anchoring Information to Optimise Retrieval." *International Journal of Humanities and Social Science*, 3 (5): 56–64.

Walczak, Agnieszka, and Louise Fryer. 2018. "Vocal Delivery of Audio Description by Genre: Measuring Users' Presence." *Perspectives*, 26 (1): 69–83. https://doi.org/10.1080/0907676X.2017.1298634

Wehrmeyer, Jennifer. 2014. "Eye-tracking Deaf and Hearing Viewing of Sign Language Interpreted News Broadcasts." *Journal of Eye Movement Research*, 7 (1): 1–16. https://doi-org/10.16910/jemr.7.1.3

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