

Bimodal and unimodal comprehension and reception of discipline-specific audiovisual texts among students in a Faculty of Health Sciences

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Abstract: Over the past 30 years, the educational applications of subtitling, such as incidental language learning, and improved literacy, comprehension and retention of visual content, have been well documented. Seminal studies confirming the educational benefits of subtitled texts were done in Europe. Several studies also confirmed the educational benefits of subtitling in Africa, some specifically in South Africa. This study aimed at measuring the difference in the comprehension of a technical, subject-specific audiovisual text for healthcare students between a control group who viewed the video unimodally and an experimental group who viewed it bimodally. To achieve this aim, quantitative and qualitative data were collected from 182 students from the Faculty of Health Sciences. A quasi-experimental design was used to randomly assign participants to experimental and control groups, and ANOVA was used to analyse pre- and post-test quantitative results. Qualitative data were collected using an open-ended questionnaire, and the data were sorted and analysed for emergent themes. Analyses of both data sets confirmed findings from numerous international studies that the use of subtitling improves comprehension. Qualitative data, in particular, showed that respondents perceived subtitles as assisting with the retrieval and retention of information. Contrary to these positives, the data also revealed that subtitling could, in some cases, be perceived as a form of distraction and a barrier to comprehension.

Keywords: Subtitling, Bimodal, Unimodal, Intralingual, Interlingual, Academic Literacy

1. Introduction

Subtitling is the use of onscreen text in either the same language as that of the soundtrack (intralingual or same-language subtitles – SLS) or a different language (interlingual or translated subtitles). Over the past 30 years, the educational applications of subtitling – such as incidental language learning and improved literacy, comprehension, and retention of visual content – have been well documented. Although the seminal studies confirming the educational benefits of subtitled texts (Borrás and Lafayette 1994; Cohen and Macaro 2007; d'Ydewalle et al. 1991; Vanderplank and Jung 1994; d'Ydewalle and Pavakanun 1995; d'Ydewalle and Pavakanun 1997; d'Ydewalle and Van de Poel 1999; Koolstra and Beentjes 1999; Vanderplank 2010; Williams and Thorne 2000) were done in Europe, a number of studies confirmed the educational benefits of subtitling in Africa, some of them in South Africa (Ayonghe 2009a; Ayonghe 2009b; Kruger and Kruger 2004; Lacroix 2012; Nely and Suzanne 2015; Suzanne 2013). The present study is a continuation of a pilot study conducted in the Faculty of Health Sciences at the University of Pretoria (UP), South Africa on the impact of bimodal exposure (English subtitling with English audiovisual text) compared to unimodal exposure (no subtitling, English audiovisual text) on students' comprehension. The result of this small pilot study confirmed the hypothesis that SLS improves their understanding of discipline-specific audiovisual texts.

1.1. Subtitling, language learning and the language of learning

Subtitles (or captions in the US) have been called underrated strategies for language acquisition (Danan 2004), while Baltova (1999) describes the use of subtitling in audiovisual texts as “a powerful instructional tool known to have a motivational, attentional and affective impact on viewers, which in turn facilitates auditory processing”.

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Several studies have confirmed the advantages of subtitling in second or foreign language acquisition (Borrás and Lafayette 1994; Cohen and Macaro, 2007; Danan 2004; d'Ydewalle and Pavakanun 1995; d'Ydewalle and Pavakanun 1997; d'Ydewalle and Van de Poel 1999; Ghia 2012; Koolstra and Beentjes 1999; Van Lommel, Laenen, and d'Ydewalle 2006; Vandergrift and Goh 2012; Vanderplank 2010). In 2010, Perego et al. published a seminal study in which they used a combination of eye-tracking (as a proxy for attention) and the relation between word and scene recognition (as a proxy for cognitive processing) to determine the trade-off involved in cognitive processing between text (subtitle) reading and image viewing (Perego et al. 2010). The study finds that the cognitive processing of interlingually subtitled (translated) films was robust enough for participants to perform well in word and scene recognition testing, confirming that the use of subtitles didn't cause negative interference between the processing of text and images. In the context of cognitively demanding audiovisual texts, this finding not only supports the benefits of previous research that indicates benefits of using simultaneous audio, visual and textual channels, but also the non-interference of text in the visual processing of the audiovisual text. Research into subtitling and cognitive load continues to refine ways of measuring cognitive load and to provide guidelines for the optimal use of subtitling as a pedagogical tool (Kruger et al. 2018; Crosby and Notley 2014).

A comparative study on the use of subtitles at North-West University and the University of Buea in Cameroon (Ayonghe 2009b) reports a statistically significant improvement in the academic literacy of respondents who watched subtitled videos compared to those who watched unsubtitled videos. It also reports cases of academic vocabulary acquisition, improved text comprehension and improved text editing as a result of exposure to subtitled videos. Furthermore, the improvement is independent of the video genre, and anglophone and francophone students benefitted equally from the methodology (Ayonghe 2009a; Ayonghe 2009b).

Another study at North-West University reports improvement in the receptive academic literacy ability of students, as well as their subject-specific comprehension (Lacroix 2012). It recommends the use of subtitled videos as an integral part of the teaching repertoire at South African Universities (ibid.).

While it is clearly widely accepted that subtitling can be used to improve comprehension, the reception of subtitles among different audiences is an area of research that is relatively new and has long been neglected. In the past, brief references have been made to the reception of subtitles by the audience (often referred to as affective factors) (Borrás and Lafayette 1994; Danan 2004; Kothari et al. 2002). Subtitling was seen as a factor that motivated students to achieve pedagogical goals. Kruger and Kruger (2004) indicate a list of user-based parameters for the training of subtitlers in South Africa. However, this study does not report on affective aspects of subtitle reception, but rather on the functional requirements for subtitles for the respective audiences in a multilingual developing country, notably users with hearing-impairment, illiterate users and second-language users.

The first fully fledged audience reception study of subtitling was done in Malaysia by Melin and Kuses (2011). Audience reception, specifically audience perception, of subtitling has been the poor cousin of subtitling research and has only recently started to attract the attention it deserves, with studies by Perego et al. (2016) and Kirk (2019). One of the conclusions by Perego et al. (2016) is that all tested populations in their study benefited from the use of subtitles, regardless of whether they were familiar with the use of subtitles or not. However, the study finds that there are differences in the level of enjoyment among the tested populations concerning the use of subtitles (Perego et al. 2016). Kirk (2019) finds that even in a small country such as New Zealand, participants hold widely polarised attitudes towards subtitling and that this influences their willingness to accept subtitled material, even for purposes such as the inclusion of differently abled viewers. She concludes that where subtitled content is well received, there is a distinct preference for internationally subtitled content, as opposed to content subtitled in local languages (Kirk 2019). Kirk ascribes this phenomenon to a strong preference for international content over local

productions, as well as the pervasive stigmatisation of two of the official languages in New Zealand (Kirk 2019, 182–183).

1.2. Language in the Faculty of Health Sciences at the University of Pretoria

In 2016, the University of Pretoria (UP) adopted a new language policy, according to which English would be the only medium of instruction from 2018. Due to legal action against the University, the policy was only implemented at the beginning of 2019 to be phased in over the following two years. The majority of UP students hail from non-English speaking backgrounds, and most students completed English at First Additional Language (FAL) level in grade 12. According to Van Rooy and Coetzee-Van Rooy (2015, 31), language is regarded as one of the most critical issues in poor academic performance at South African universities. The impact of non-first language instruction on university throughput is also felt in other multilingual, and even monolingual, countries. In 1995, after a review of 400 samples of first-year writing in Britain, which is considered to be a monolingual country, Winch and Wells (1995, 77) concluded that

there is a prima facie cause for concern that standards of student literacy are not what one might expect (i.e. either hope for or predict) at the level of higher education. Indeed, it does not appear to be too outrageous to claim that most of these abilities should have been achieved by the end of the compulsory phase of education at the very latest.

Students in the Faculty of Health Sciences are no exception to this rule. Language is not only key to their academic progress, but also to their professional success. The Health Professions Council of South Africa (HPCSA) includes language skills in its list of critical skills for undergraduate students in the clinical associate and dentistry teaching and learning programmes at South African universities (HPCSA 2014, 6; Kickbusch 2001).

UP's curricula in the Faculty of Health Sciences are designed to be transformative and to equip its students with a medley of healthcare literacies for multidimensional 21st-century health science and health education (Hugo et al. 2012; Kickbusch 2001). Given this, students require decoding and comprehension skills for complex tasks related to academic success and job readiness (Dreyer and Nel 2003; Pretorius 2002). However, the acquisition of these skills does not take place organically for second and third language speakers of English, who comprise the majority of students enrolled for degree programmes in the Faculty of Health Sciences. Many of these students struggle to read and make meaning of discipline-specific texts and professional documents written in English. To achieve academic and professional success, healthcare students need to hone their decoding and comprehension skills using different modes of communication.

In view of the documented benefits of subtitling in a pedagogical environment, particularly in a context where the learning of language is part of and instrumental to the overall learning, the researchers in the present study hypothesised that the comprehension of a subject-specific audiovisual text will be enhanced by the use of SLS within the context of the Faculty of Health Sciences at UP. This hypothesis was borne out by the pilot study among clinical associate students in the Faculty of Health Sciences. The main study aimed at confirming that there was a statistically significant difference in the comprehension of a technical, subject-specific audiovisual (AV) text for healthcare students between the control group who viewed the video unimodally (English audio, no subtitles) and the experimental group who viewed it bimodally (English audio, English subtitles). Although the main study did confirm the benefit of SLS for comprehension in a subject-specific discipline, the degree to which it enhanced understanding was not statistically measurable due to a deviation in the methodology. However, the participant-driven deviation catapulted the present study into an area that was meant to be firmly secondary to the already stated hypothesis, namely audience perceptions. As such, this research, in addition to confirming the value of subtitles as a pedagogical tool in South Africa, yielded thick data on differences in audience perception of subtitles, which, as indicated above, is currently receiving attention from some of the most eminent scholars in the field of subtitling and being recognised as a previously neglected field.

1.3. Research methodology and design

The study used a quasi-experimental design, commonly employed in educational research (Cook et al. 2002), to compare the English comprehension results of two randomly assigned groups of a convenience sample of healthcare students (Okeke and Van Wyk 2015). The directional hypothesis stated that comprehension of a subject-specific AV text would be enhanced by the use of SLS within the context of the healthcare programme at UP. The most important, and initially the only independent variable was subtitling (although the number of viewings was later introduced as another independent variable), with the difference in comprehension as a dependent, quantitative variable and subtitle reception as a dependent, qualitative variable. Extraneous variables included final school results for English, whether respondents completed English at home language (HL) or FAL level in grade 12, their age, provenance, race, home language, gender, and self-rated reading and listening comprehension skills. Extraneous variables were measured to determine if they were confounding variables that had an impact on the research results and for which controls therefore needed to be introduced in a future study. In the case of this study, extraneous variables were particularly relevant because of the very diverse language and social backgrounds of the subjects.

1.4. Context and participants

A total of 182 first-year students of radiology, oral hygiene, nursing and physiotherapy participated in this study, and they were divided into an experimental group (n=88) and a control group (n=94). All participants were registered for two mandatory literacy courses called Academic Literacy for Health Sciences (ELH 121 and ELH 122). These courses are compulsory for students in the programmes mentioned above regardless of English language proficiency levels and the grades obtained for English in grade 12. In the context of the Faculty of Health Sciences, the courses are designed to provide students with the academic and professional literacy skills needed to understand critical disciplinary concepts and to communicate effectively in a healthcare environment, and they offered an ideal research space to pilot this project.

1.5. Research procedures

Two English-language discipline-specific AV texts, one relatively simple and one with reasonably technical content, were provided by the Faculty of Health Sciences and professionally subtitled in English. The first AV text (AV1) dealt with diabetes, and the second, more complex text (AV2) dealt with the endocrinal system. Both texts included technical language (the latter significantly more so), and both narrators had a moderate American accent.

Before viewing AV1, participants completed a demographic questionnaire on their final school results for English, whether they completed English at HL or FAL level in grade 12, their age, provenance, race, home language, gender, and self-rated reading and listening comprehension skills.

Both groups watched AV1 once and completed short-answer questions on the text to establish a baseline according to which the groups could be compared in terms of potential. Participants were allowed to take notes during the screening. The experimental group then watched the English-audio AV2 with English subtitles, and the control group watched the same English-audio AV2, but, very importantly, without subtitles. Again, participants had to complete short-answer questions on the topic. Up to this point, the planned research methodology was followed. The aim was to compare the difference in the test results for each group to the difference in comprehension between the two groups.

On completion of the screening of AV2, the experimental group completed the short-answer questions as per design and then proceeded to answer the open-ended reflective questions. However, at this point, the researcher in the control group was confronted with a decision which had to be made within seconds and which did not allow for consultation with the second researcher. The majority of participants in the control group indicated that they felt utterly unable to answer

the short-answer questions on AV2 as they could not recall what had been said (in itself a telling event). They requested a second screening of the video. To deny them their request at this stage could have had several unwanted consequences, namely:

- removing agency, which could have jeopardised future relationships between the faculty and the students in this module;
- termination of participation, which was voluntary; or
- impacting the reliability of data collection, particularly in the reflective section.

On the other hand, granting them their request meant that they had been advantaged by the second viewing (introducing a second independent variable) and that it was no longer possible to draw a narrow quantitative comparison of comprehension between the two groups with subtitling as the only independent variable. The study had to be reconceptualised as a comparison of understanding between two groups exposed to two different interventions (the first being viewing of a subtitled discipline-specific video, and the second being two viewings of the same unsubtitled discipline-specific video). In spite of the deviation from the original research design, the experiment yielded useful information in terms of a between-group comparison but far exceeded this aim by placing the participants and their perceptions at the centre of the study. This deviation not only significantly enriched the results but also confirmed the centrality of audience subtitle reception (including perception) in research on subtitling. From a statistical perspective, the study compared the results of two different interventions (SLS versus viewing AV2 twice), instead of a simpler subtitled versus non-subtitled comprehension and attitudinal comparison.

For the last part of the data collection, participants completed a reflective, open-ended questionnaire on their experience of watching the AV texts.

1.6. Ethical considerations

Before commencing this study, permission was obtained from the Dean of the Faculty of Health Sciences, and the project was ethically cleared by the Faculty of Humanities Ethics Committee. All participants were given an information sheet, which clearly explained the purpose of the study and their rights. Attached to the information sheet was an informed consent form which participants signed, granting the researchers permission to use the data in any research publications.

1.7. Analysis of quantitative and qualitative data

The results of the demographic and academic questionnaire, as well as the short-answer comprehension exercise, were analysed using analysis of variance (ANOVA). Various models were considered, removing variables until all variables in the model were significant. The only variable that influenced the comprehension score in a statistically significant manner was the symbol obtained for English in Grade 12, and only for respondents who received bands 4 or 5.

Qualitative data were collected using an open questionnaire after the second test. The questions provided an opportunity for individual participants to share their perceptions about subtitling (or lack thereof) and whether or not it could be a useful pedagogical instrument in the health sciences. Here, the questions sought to find out from participants how watching a discipline-specific video with or without intralingual subtitles influenced their comprehension of key concepts in the two videos. To make sense of participants' perceptions, the qualitative data were categorised and analysed accordingly. The following themes emerged from the data: 1) subtitling as a strategy for enhancing comprehension of critical concepts; 2) subtitling as a trigger of student memory; 3) subtitling as an instrument for retention of key concepts; and 4) subtitling as a form of distraction and barrier to comprehension. These themes are used as the main points of discussion in the qualitative section of this article.

2. Presentation of quantitative results

2.1. Extraneous variables

When extraneous variables have a systematic impact on the relationship between the independent and dependent variables, they become confounding variables; therefore, they need to be taken into consideration in the interpretation of the results (Gardner and MacIntyre 1993). Given the diverse language and social backgrounds of students at South African universities, the research identified certain extraneous variables that could have an impact on the results of the study and included these in a brief respondent questionnaire.

Based on self-reported information in the questionnaire, 98% (178 out of 182) of respondents obtained more than 60% for English in grade 12. A between-group comparison indicated that the two groups were similar in potential based on their matric symbols. In terms of the number of participants who completed English in grade 12 at HL or FAL level, the spread between the two groups was very similar, with 34% (30 out of 88) HL participants in the control group and 40% HL participants in the experimental group. However, when the symbols and levels of English were cross-referenced, there was no significant statistical difference between the ability of the two groups.

Groups were similar in terms of age distribution, occupation the year before commencement of studies, geographical provenance, race distribution, home language, gender, and self-rated comprehension skills. At 32.2%, almost a third of participants came from an Afrikaans home language environment. Of the remainder, 12.8% were English home language speakers, 20.6% spoke a Nguni language at home, and 22.8% spoke one of the Sotho languages as their first language. The female to male ratio was 17:3, with the between-group distribution reasonably similar.

In terms of self-rated listening comprehension, 33,8% of participants estimated their skill level to be “excellent”. The remainder of participants estimated their listening comprehension skills to be “good enough”; self-rated reading skills were very similar with 36.6% of participants rating themselves as “excellent” and the remainder rating themselves as “good enough”.

2.2. Quantitative results

The boxplot in Figure 1 (below) indicates the differences in comprehension results for the two groups in the analysis. Group 3 is the group who watched AV2 once with subtitles and group 4 is the group who watched AV2 twice without subtitles. From Figure 1 it is apparent that the differences in the results were similar (p -value = 0.630), with average values of 28.5 and 27.0, respectively. Although group 4 indicated a much more significant variation in comprehension difference than group 3, further research is required to determine a cause for this.

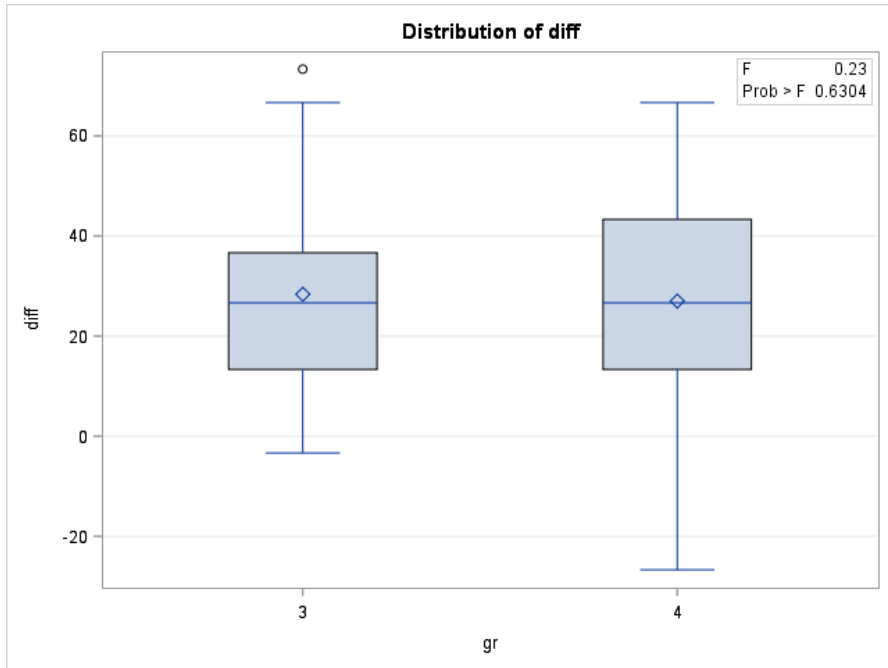


Figure 1: Boxplot of the Differences in Results for the Two Groups in the Analysis

It is crucial to note that the difference in comprehension scores between the pre- and post-test should be seen not only as a between-group comparison but also against the background of AV2 being much more complicated than AV1. As a result, respondents in both groups scored lower in the post-test than in the pre-test. The difference in comprehension, therefore, indicates a drop in comprehension where a small difference suggests a result that is close to that of the pre-test (thus a 'better' result), and a large difference suggests a result that differs significantly from the pre-test (thus a 'poorer' result).

Figure 2 (below) demonstrates that students in both groups 3 and 4 who obtained a band 4 or 5 for English in grade 12 displayed the greatest difference between pre- and post-test comprehension scores. It can therefore be said that they benefitted to a lesser degree from the interventions, regardless of the nature of the intervention.

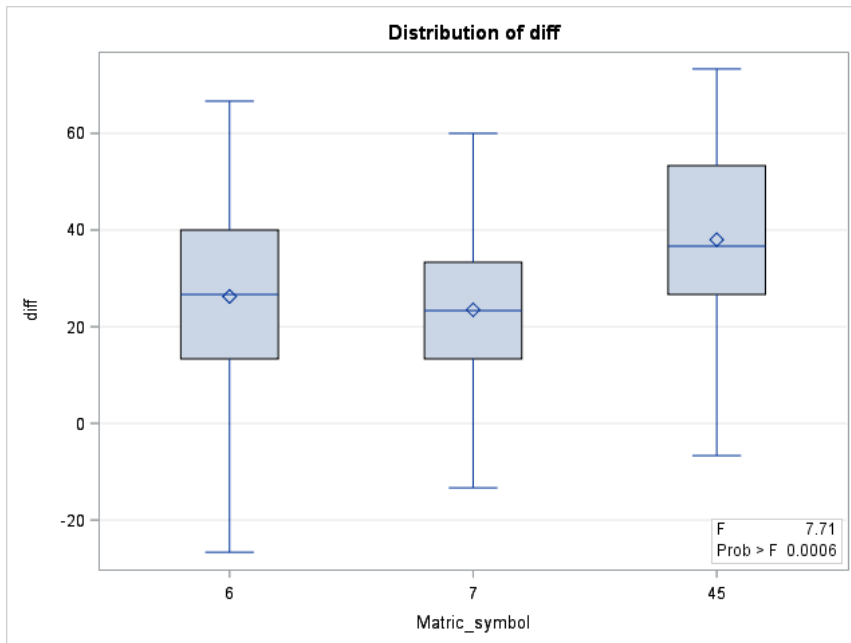


Figure 2: Boxplot of the Differences in Results for All Respondents Grouped According to Grade 12 Results

A smaller difference in pre- and post-test scores was observed between respondents who obtained higher bands (6 and 7) in grade 12, with 78.7% of students in this category benefiting equally from both interventions. On the other hand, a larger difference between pre- and post-test scores was observed for the 21.3% of respondents who obtained lower bands (4 or 5) for English in grade 12 (p -value < 0.01). It is unclear whether this statistically significant difference is a reflection of the lack of effectiveness of the interventions for this group of respondents or that these respondents depart from such a low base in language proficiency that they are unable to harness either of the interventions to their benefit.

2.3. Presentation of qualitative results

2.3.1. Student experiences and perceptions of same-language subtitling

To understand participants' experiences and perceptions of SLS of discipline-specific videos, participants completed a post-project qualitative questionnaire. The questions focused on the cognitive effects of watching a discipline-specific video with or without subtitling and their implications for comprehension of key concepts. This reflective process provided space for participants to share their thoughts, feelings and challenges about an unfamiliar teaching and learning instrument. Although student reflections produced conflicting perspectives about the learning potential of subtitles, there was enough evidence to suggest that subtitles can enhance student comprehension of video content, retrieval and retention of information and vocabulary building, as well as developing critical reading and listening skills. The following themes emerged from the analysis of the qualitative data: 1) subtitling as a strategy for enhancing comprehension; 2) subtitling as a trigger of participants' memory and retention; 3) subtitling as an instrument for retrieval of key concepts; and 4) subtitling as a form of distraction and a barrier to comprehension. This section of the article uses excerpts from student reflections to understand their perceptions of subtitling and the implications of using intralingual subtitling as a teaching and learning instrument in health sciences.

2.3.2. Subtitling as a strategy for enhancing comprehension of critical concepts

Previous studies have shown that intralingual subtitling is an effective teaching and learning application, which “presents a series of benefits for comprehension and vocabulary development” (Talaván 2010, 286). Since the participants of this project were mainly second and third language speakers, both groups saw subtitling as a useful way of accessing and making meaning from complex medical concepts and terminologies in the videos. For example:

Without subtitles it was a bit difficult. I couldn't hear the words properly or know the spelling. With subtitles I was able to answer more questions compared to watching the video with no subtitles (Student reflection).²

The subtitles helped me remember the information given in the video. It was easier to answer the questions afterwards because I could see where the words are the pictures helped me to remember. Without subtitles, I could not always hear the words and the woman talked very fast (Student reflection).

Subtitling interconnects sound, image and text in one learning video “which may lead to better processing and recall...” (Danan 2004, 72). The reflections above show that this interconnection can foster both listening and reading comprehension. In these two cases, subtitles are seen as a learning tool for the reception and comprehension of complex scientific terms because they assisted in improving participants' ability to identify and acquaint themselves with keywords used in the video (Danan 2004; Markham 1999; Talaván 2010).

2.3.3. Subtitling as a trigger of student memory and retrieval

Learning is driven by implicit memory often associated with “changes in performance or behaviour that are produced by prior experiences on tests that do not require intentional or conscious recollection of those experience” (Schacter 1992, 244). This type of memory allows participants to unintentionally acquire new skills while honing existing skills during the process of learning. Learning also involves explicit memory, which is “intentional or conscious recollection of prior experiences, as assessed by traditional tests to recall and recognition” (Schacter 1992, 244). Explicit memory helps participants to evaluate the process of meaning making while they read, see and listen to the information in different forms (Bird and Williams 2002; Ellis 1994). In the subtitled video, the interplay of image, sound and text “acted as a comprehensible information source allowing [participants] to begin to develop a superior memory trace for spoken nonwords because they were more certain of what they were hearing” (Bird and Williams 2002, 525). For example:

With the subtitles, it is easier to remember, and when they are speaking during the video you remember more if you have heard and seen the information... I am a visual learner and cannot remember or understand an audio presentation. I never do (Student reflection).

Subtitles helped me to remember words better as well as hear them clear. They also helped me to follow the content better while making notes. They helped me and I prefer to watch videos with subtitles (Student reflection).

² All student responses are cited verbatim in the article.

It was easier for me to remember information that I read so without subtitles it was difficult for me to remember the specific facts in the video. I had to concentrate more to grasp the information without the subtitles (Student reflection).

As evidenced in the excerpts above, participants in this study were able to make use of implicit and explicit memory, firstly during the screening of the videos with or without subtitles, and secondly when they were completing the test questions. For example, during the test, they were able to recall and recognise words and concepts more readily because the image, sound and text intersection helped to bolster their memory. Here, we see how subtitles assisted participants with both visual and auditory recognition, which enabled them “to resolve phonological ambiguities in some of the spoken targets” in the video, especially since the accent was foreign (Bird and Williams 2002, 510). Given that the participants were mostly second and third language speakers of the source language (English), they were able to “associate the aural and written forms of words more easily and quickly” (Borrás and Lafayette 1994, 70).

2.3.4. Subtitling as an instrument for retention of key concepts

Since participants’ implicit and explicit memory activities were bolstered during the screening phase, information retention and retrieval were enhanced significantly for those who watched the video with subtitles. Although there was no significant difference in the test results, participants who viewed the video without subtitles requested a second screening before they could retain the concepts. Therefore, the subtitles led to improved memory, information retrieval and retention, which helped participants with “the processing of phonological and phonetic information along with semantic context cues” during the screening phase (Bird and Williams 2002, 529; Mendelsohn 1994). This is evident in the following quotes:

Being able to read the subtitles you can understand and hear more clearly what the voice in the video said. The information is captured better when it can be read instead going in the one ear and going out the other. I found the second video more difficult because I couldn’t hear clearly what the voice was saying and only realised it at the second time (Student reflection).

Watching the video without subtitle made it hard for me to remember and retain some information that was stated. I retain information better when I get to actually see the words. I cannot learn by just watching a video (Student reflection).

These quotations show that with the right set of academic skills, university students should be able to watch, listen and read at the same time. This is possible because, usually, “subtitling should not detract from the overall viewing experience, and therefore attention should be distributed more equally between subtitle reading and scene viewing, instead of focusing on any one aspect for too long” (Hefer 2013, 648). These student responses tell us that subtitling could drive meaningful learning if we “optimised subtitle presentation rates to facilitate the viewing and reading of subtitles” since they are still very novel in the South African higher education landscape (Hefer 2013, 648).

2.3.5. Subtitling as a form of distraction and barrier to comprehension

Studies on subtitling also argue that the effectiveness of SLS depends on the systematic introduction of this learning instrument and on the development of strategies that can allow students to pay attention to both oral and written text (Ayonghe and Tiokou 2015; Danan 2004; Vanderplank 1999). Furthermore, Perego et al. (2016) argue that although unfamiliarity may not

influence the cognitive performance of viewers, it does have an impact on the overall subtitling experience. In the context of this study, participants were not experienced users of subtitles because this teaching and learning instrument is still new in South Africa. As a result, some of the reflections revealed that subtitles were not perceived as beneficial for them.

With subtitles it was difficult to focus on what was being said while at the same time trying to read the subtitles. Watching it with subtitles shifted the focus and I could not even see the pictures in the video as the focus was on the subtitles (Student reflection).

Watching the video without subtitles allow for more focus and also gave me a better understanding of the video. The subtitles do not intrigue me and they cause me to focus less. Without subtitles made it slightly easier to focus on the information and it was easier to recall information (Student reflection).

Without subtitles made it easier to listen than to concentrate on reading the subtitling and listening or reading the subtitles and the questions at the same time would have been more difficult. I would prefer to listen than see (Student reflection).

Contrary to the previous reflections, these participants perceive subtitles as a form of distraction that interferes with their ability to listen to and concentrate on the contents of the video. These student perceptions dovetail with studies that have highlighted similar criticisms in different contexts. These studies point out that sceptics often criticise subtitling “for encouraging viewers to rely on the written text, taking attention away from the actual spoken language and even fostering a form of laziness bordering on cheating” (Danan 2004, 67; Rost 2002). This is expected, especially if the learners are second or foreign language speakers of English who lack the high-order skills needed to make meaning from sound, image and text concurrently. This was the case with the participants in this study. While they consciously tried to listen and read, their listening comprehension was likely to be affected by several phonetic utterances, which were perceived as “slow[ing] down the development of listening ability in learners” (Vanderplank 1988, 272). However, subtitles might have been beneficial for the acquisition of language skills if the participants were taught how “to consciously adopt effective learning strategies, which ultimately play a fundamental role in improving reading and listening skills as well as language acquisition” (Danan 2004, 68). Further negative sentiments were expressed in the following quotes:

With subtitles, it made it difficult to get the necessary information to complete the questionnaire when reading the subtitles ... it was difficult to extract the needed information from the video (Student reflection).

I couldn't concentrate on the reading of the subtitles and listening at the same time, especially because there was a sound in the background of the video (Student reflection).

Since it was the participants' first exposure to subtitles in a learning environment and they lacked the complex skills and learning strategies to process sound, images and text simultaneously, this group of participants saw subtitles as a futile learning add-on that can only impede their ability to listen actively. However, in a study cited in Vanderplank (1988, 277), learners' frequent exposure to subtitles was able “to produce growing confidence in their listening ability and greater enjoyment” as they developed strategies to watch images and read text simultaneously. Given the value and effectiveness of subtitles, Perego et al. (2016, 20) emphasise that “using subtitles more would be advantageous, especially for language learning and acquisition”. We expect a similar

experience in the context of health sciences as the students gradually acclimatise to this new learning space.

3. Discussion

The quantitative data analysis confirms the data from the pilot study and numerous international studies that the use of subtitling improves comprehension. This study compared the comprehension of respondents who viewed an English discipline-specific AV text with subtitles in the same language to the comprehension of respondents who viewed an English discipline-specific AV text without subtitles twice. The statistical analysis concluded that there was no statistically significant difference between the comprehension of the two groups and that the two interventions can, therefore, be said to have the same effect on respondent comprehension. In a pedagogical situation, subtitles can significantly enhance comprehension while saving time. Making the AV text available online after class should also benefit students who take more time to get used to and benefit from the intervention.

The quantitative data analysis also confirmed that none of the extraneous variables could be regarded as confounding variables, with no statistically significant associations between comprehension and any of these variables. The only possible exception to this is the significantly lesser degree to which respondents who obtained a band 4 or 5 for English in grade 12 benefitted from either intervention. This group constitutes 21.3% of the tested population, and the lack of benefit from either intervention could be ascribed to the low base (i.e. insufficient English proficiency for academic purposes) from which they start.

The qualitative analysis identified four clear themes, namely:

1. Subtitling as a strategy for enhancing comprehension;
2. Subtitling as a trigger of participants' memory (retrieval);
3. Subtitling as an instrument for retention of key concepts; and
4. Subtitling as a form of distraction and a barrier to comprehension.

Where subtitling is perceived by respondents as enhancing comprehension, it supports findings from numerous studies worldwide indicating improved comprehension of subtitled material among viewers, with particular benefits to second or foreign language viewers.

The robust cognitive processing identified by Perego et al. (2010) that takes place in the viewing of subtitled material, as evidenced by word-scene recognition, could explain why some participants in the present study experience subtitling as a trigger for memory. Memory retrieval is closely linked to association, and it is possible that the written text may make it easier for participants to retrieve existing information from implicit and explicit memory.

Since the Perego et al. (2010) study focused on recognition, which is closely linked to retrieval, the cognitive robustness of the subtitle processing they identified may explain the third theme of the qualitative analysis, namely respondents' perception of subtitling as a way of improving the retention of key concepts. Perego et al. (2010) ascribe the cognitive robustness of the subtitle processing to a deeper level of cognitive processing, which could indicate deeper understanding and may, in turn, create a viewer perception that the information will be retained for longer.

The last important theme identified by the qualitative analysis of the present study is that some participants perceived subtitling as a form of distraction and, therefore, a barrier to comprehension. Although this is not an entirely new theme, it is one which has received very little attention in subtitling research, and which has done so only very recently. Although it has long been known that subtitle reading behaviour is automatic, even for viewers who have not been exposed to it previously (Ayonghe 2009b; d'Ydewalle et al. 1991), and that information processing capacities impact on the usefulness of subtitles (Ayonghe 2009b; De Bruycker and d'Ydewalle 2003), the cognitive benefit of subtitles on comprehension, regardless of the degree to which the tested populations enjoyed the use of subtitles, was only proved recently (Perego et al. 2016). This is not to say that the degree to which audiences enjoy subtitles or are able to process them is irrelevant to subtitling research. On the contrary, Danan (2004) states that subtitling can only be used

effectively if viewers are taught active viewing strategies to benefit from this pedagogical intervention. As with all pedagogic interventions, recipient perception is crucial for obtaining optimal results, and some audiences may need more preparation for the successful implementation of a subtitling overlay in a pedagogical situation. This study is the first in South Africa to focus on viewers' perceptions and to suggest ways of dealing with a diverse subtitling audience in a multilingual developing country, with specific emphasis on a pedagogical situation.

The present study confirmed the usefulness of subtitling as a pedagogical tool at UP. On a quantitative level, the study finds that comprehension tested after watching a subtitled, discipline-specific AV text once is at least as good as when the same AV text is viewed twice unsubtitled, indicating a more efficient way of teaching and learning.

In addition to this, respondents indicated that they also perceive their comprehension and information retrieval and retention to be enhanced through the use of subtitled AV texts. A minority of students experienced subtitling as distracting and, therefore, as an obstacle to learning. However, this may simply highlight the need to prepare the audience if they are not familiar with the use of subtitles, as well as the need to teach active viewing strategies for viewers to benefit optimally from the use of subtitles. Admitting the value of subtitles in a pedagogical environment does not exclude recognition of differing audience perceptions. Indeed, improved understanding of differences with which subtitles are perceived may enhance learning by acknowledging a continuum of viewer perceptions.

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