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# **The Effect of Subtitling and Voice-Over on Content Comprehension and Language Identification in Multilingual Movies**

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## **Abstract**

The present article analyzes how viewers process information of subtitled and voiced-over multilingual movies. In an experimental study, we tested if comprehension of multilingual movies depends on whether subtitling or voice-over is used as an Audiovisual Translation Mode. Hierarchical Multiple Regression yielded support for this hypothesis indicating higher levels of comprehension performance in the condition with the subtitled movie excerpt. Following theoretical argumentation of the psycholinguistic literature, we also tested two hypotheses which assumed that the effect of Audiovisual Translation Mode on 1) the Detection of the Number of Languages Spoken by Character and 2) on the Character–Language Pair Identification in a multilingual movie differs for Multilingual and Monolingual characters. Generalized Estimating Equations (GEEs) showed that Audiovisual Translation Mode Condition is not a significant predictor either of Detection of the Number of Languages Spoken by a Character or Character–Language Pair Identification in a multilingual movie. However, the post-hoc pairwise comparison led to interesting observations showing that the performance on Detection of Number of Languages Spoken for Multilingual Characters is better in the voice-over condition than in the subtitling one. The article discusses the theoretical and applied implications of the findings for information processing of subtitled and voiced-over multilingual movies.

**Keywords:** Audiovisual Translation; Information Processing; Multilingual Movies; Subtitling; Voice-over.

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## **1. Introduction**

In the last two decades, Audiovisual Translation (AVT) has become an increasingly prominent field within Translation Studies. Research on AVT is no longer limited to linguistic and cultural matters [1]; its interdisciplinary nature has contributed to incorporating more aspects from other disciplines such as film studies, sociology or psychology [2,3,4].

### ***1.1. Previous research***

The psychological approach, mainly cognitive, verifies and often questions the validity of general, sometimes purely theoretical and speculative paradigms on audiences' perception of audiovisual products [5]. On the one hand, this line of research has focused on the effects of subtitles and their efficiency for comprehension and memory [6,7,8,9]. According to those empirical studies, the effect of subtitling on comprehension and memory is correlated with viewers' language fluency [6,9], showing a disrupting effect of subtitles on comprehension when they are superfluous [6] as opposed to a facilitating effect when the viewers' knowledge of the language of the movie is insufficient [6, 9].

Other studies [10,11] have also addressed the factor of viewers' familiarity with subtitles. The findings show a strong tendency to initiate reading subtitles at their onset regardless of viewers' experience with this mode of providing information [8,10,12] suggesting that reading subtitles is a semiautomatic task which requires relatively low effort due to learning processes [13].

On the other hand, some scholars contrasted subtitling and dubbing in order to test which of those two AVT modes provides a better understanding of the translated text. One of the pioneer experiments was carried out by von Feilitzen, Filipson and Schyller [14] on 7 to 11-year-old children with an objective to compare how effectively dubbed and subtitled texts were processed. The findings showed that subtitled programs were more difficult to understand than dubbed ones. Similar results were reported by Peeters, Scherpenzeel and Zantinge [15] who conducted research on 6 to 12-year-old children and concluded that dubbed programs were processed more easily. Though interesting, the conclusions of these two studies cannot be generalized beyond the studied population as reading proficiency depends on developmental, cognitive and linguistic factors [16] that are age-related.

A recent study comparing subtitling and dubbing was presented by Perego, Del Missie and Battiroli (2014) and addressed the aspects of comprehension and memory, and overall satisfaction with the viewing of both subtitled and dubbed movies. The results showed that "general comprehension of film content and visual scene recognition are achieved equally with both translation methods, and that subtitling is more effective than dubbing when some lexical aspects of performance are considered" [13,14]. Unfortunately, to the best of our knowledge, no empirical research contrasting voice-over with other modalities such as subtitling or dubbing has been carried out.

### ***1.2. Multilingualism in movies***

The previous research has provided some valuable insights on the cognitive aspects of information processing of interlingual subtitled or dubbed monolingual movies and constitutes a referential framework for the present article. In this study, the focus is shifted towards multilingual voiced-over movies. Introducing several languages in movies is a deliberate strategy and, as observed by Heiss [17], traces of the phenomenon of multilingualism has always been present in movies. According to Wahl, “languages are used in the way they would be used in reality. They define geographical or political borders, ‘visualise’ the different social, personal or cultural levels of the characters and enrich their aura in conjunction with the voice” [18,2]. Some previous research focused on multilingual movies indicated that audiences appear to prefer “a rich and balanced depiction of multilingual phenomena in movie dialogues” [19,155], and displayed interesting differences among monolingual and multilingual characters in, for example, narrative importance [20]. Thus, considering the importance of this character’s feature, the challenge of translating multilingual movies is to maintain or at least mark not only the overall multilingual context of the movie, but also to make the audience aware of how many and which languages characters speak. To date, research on translation of multilingual movies is scarce and mainly approached from three major perspectives: as a narrative and aesthetic element of a movie, from a reception point of view, and as a specific problem for translators who devise various strategies to solve it [21]. All those issues are tackled from a rather theoretical point of view and very little empirical research addressing those questions can be found (see [22]).

Similarly, very little research has been carried out on voice-over and voice-over perception as this AVT mode is usually associated with non-fiction movies [23]. However, in some Central and Eastern-European countries, voice-over is also used as a dominant mode in television to translate fiction movies [24,25,26,27]. Hence this study shifts its focus toward subtitled and voiced-over multilingual movies with a twofold objective: 1. to examine if there is a difference between subtitling and voice-over in content comprehension; 2. to examine if there is a difference between these two modes in detection and identification of multilingual content. As for the latter, this study aims to analyze whether the audience distinguishes not only the presence of different languages in a movie but if they are also able to identify which languages are spoken by which characters. This question is especially significant in the case of multilingual characters as opposed to monolingual characters.

For the purpose of this study, content comprehension will be defined as a process of simultaneously processing information and constructing meaning of the movie fragment. Detection of multilingual content will be defined as a process of recognizing how many languages a character speaks in the movie. Identification of multilingual content will be defined as a process of identifying which language(s) a character speaks in the movie.

### ***1.3. Information processing in subtitled in voiced-over movies***

The potential difference between subtitling and voice-over might be ascribed to dissimilar information processing in those AVT modes. In subtitled programs, as pointed out by d’Ydewalle and De Bruycker [28], information processing is based on three different sources: the visual image, the subtitles in the viewers’ native language, and the soundtrack in foreign language(s). It should be stressed that d’Ydewalle and De Bruycker [28] use the term “soundtrack in foreign language”. As this study focuses on multilingual movies where there is more than one language present in the soundtrack, “soundtrack in foreign language(s)” will be used throughout this

article to reflect this multilingual characteristic of the movie.

The first source, the visual image, sets viewers in the situational context [24]. The subtitles in the viewers' native language provide viewers with the translation of the verbal information (for example the dialogues, the narration, etc.). And finally, the soundtrack in the foreign language(s) complements the verbal information with important clues (such as emotions or intonation) required for understanding and interpreting the verbal information. While the soundtrack in foreign language(s) is provided by the audio channel, both image and subtitles depend on the visual channel. However, as observed in previous research on effectiveness of subtitle processing [13], no tradeoff between image processing and subtitle processing is observed, suggesting that information processing in subtitled movies is cognitively effective.

Following the same reasoning, information processing in voiced-over movies would also be based on three sources: the visual image, the soundtrack in foreign language(s), and the soundtrack in the viewers' native language. The visual image and the soundtrack in foreign language(s) have the same functions as in the case of subtitling. While the image sets viewers in the situational context [24], the soundtrack in foreign language(s) allows for proper understanding of verbal information. In contrast to subtitling, the translation of verbal information in voiced-over movie is provided with the soundtrack in the viewers' native language, which partially overlays the soundtrack in the foreign language(s). The translation of verbal information depends, then, not on the visual channel as in subtitling but the on audio channel. The two soundtracks appear almost simultaneously but with a different level of sound volume. It should be added that as observed by Orero [29], there is no universal convention regarding the level of reduction of the soundtrack in foreign language(s), and this level may vary across programs. The soundtrack in foreign language(s) is lowered and layered by the soundtrack in the viewers' native language. At this point it should be clarified that voice-over takes different forms in different countries. For instance, in Ukraine, Russia and Lithuania, the choice of the voice-artist depends on the gender of the character being translated. Male voice-artists read male characters, while female voice-artists read the translations of female characters [27]. In Poland, on the other hand, there is only one voice-artist (in fiction movies, usually male) translating all the characters [30]. Regardless of the number of voice-artists, they usually start reading the translation after hearing the original utterance. So although the soundtracks are overlaid, in some cases viewers can hear the beginning and/or the ending of characters' utterances (see Sepielak in press) as the duration of the voice-over translation is shorter than the original soundtrack. This phenomenon, called voice-over isochrony [29,23], may allow viewers to identify characters' intonation and emotion. Moreover, in the case of multilingual movies, voice-over isochrony would also be a crucial and unique way to highlight the different languages characters speak.

Some significant implications arise from this model of information processing. First, the distinction between the lines of different characters often becomes unclear or even confusing as the characters' voices blend with the voice-artist voice. Second, as the volume of soundtrack in foreign language(s) is reduced, viewers have limited access to this source of information which provides them with important clues regarding intonation or emotion. Third, voice-over isochrony might be not sufficient to effectively extract all the contextual information concerning verbal information. In fact, it should be highlighted that although voice-over isochrony appears in the definition of the voice-over mode (see [29]) it is not considered to be an intentional practice. In fact, some

previous research (see [33]) show that the percentage of voice-over isochrony is retained in less than 70% of the utterances.

If this is the case, processing and integration of information in voiced-over movies might be considered cognitively demanding, which would be reflected in general comprehension of the movie. Moreover, those limitations might pose a serious obstacle, especially in multilingual movies, where being able to identify different languages that characters use might be essential for a complete understanding of the plot.

These theoretical assumptions seem to be in line with some previous research [31,32] on the effect of background noise on memory and some cognitively demanding tasks. These studies show that background noises can have a disruptive effect on cognitive tasks such as memorizing prose, conducting arithmetic tasks or recalling memorized digits. Bearing in mind the above-mentioned characteristics of the soundtrack in foreign language(s)–being lowered and overlaid by the soundtrack in original language—we could assume that information processing based on this source of information could also have a disruptive effect on such cognitive tasks as general comprehension or multilingual content detection and identification. However, it is important to underline that those assumptions have not been experimentally evaluated. Therefore, the opposite situation that focuses on audio could possibly enhance comprehension or multilingual content detection and identification cannot be discarded. In particular, this might depend on the number of languages used in a multilingual movie and a complexity of their use (e.g. a character using several languages throughout a movie interchangeably).

Based on those theoretical assumptions and in order to answer the research questions regarding the effect of Audiovisual Translation mode on comprehension, as well as on detection and identification of multilingual content, we have put forward the following research hypotheses: ( $H_1$ ): Comprehension of multilingual movies depends on whether subtitling or voice-over is used as an Audiovisual Translation mode; ( $H_2$ ): The effect of Audiovisual Translation mode on the detection of the number of languages spoken by character in a multilingual movie differs for multilingual and monolingual characters; ( $H_3$ ): The effect of Audiovisual Translation mode on the character–language pair identification in a multilingual movie differs for multilingual and monolingual characters.

## **2. Research methods**

### ***2.1 Participants***

In order to address empirically the debated issues, and verify those hypotheses, an experiment was carried out. The experiment was approved by the Institutional Review Board at the University of Texas at Brownsville and conducted in accordance with ethical procedures. One hundred and thirteen undergraduates and graduates from a Polish university (96 women and 17 men), ranging in age from 20 to 50 years old ( $M = 23.69$ ,  $SD = 5.66$ ), volunteered to participate. The participants were assigned two groups at random: Group 1 or Group 2. Group 1 watched a video fragment in a subtitled version. Group 2 watched the same fragment in a voiced-over version. Both subtitled and voiced-over versions were identical in terms of verbal content. The only difference between them was the channel that provided this verbal content. Participants reported being habitual viewers of subtitled

and voiced-over movies with a mostly positive attitude toward subtitling and voice-over. In particular, on a 7-point Likert scale regarding how often participants watched subtitled movies (1 being never and 7 very often), 78.5% of participants marked over 5. Next, on a 7-point Likert scale regarding their attitude toward watching subtitled movies (1 being not liking at all, and 7 liking very much), 78.6% of participants marked over 5. Respectively, 66.9% of participants marked 5 or over on the Likert scale stating that they are used to watching voiced-over movies and 59.2% expressed positive attitude (marking 5 or over on the Likert scale) regarding watching voiced-over movies. None of the participants had watched the movie fragment before the experiment.

## **2.2 Procedure**

The participants were assigned to subtitling and voice-over conditions. The participants were given instructions and an informed consent form. Before the projection, the participants were asked to fill in: 1) the Polish translation of The Memory Assessment Clinics Self-Rating Scale; 2) Foreign Language Familiarity and AVT Modes Habits and Preferences Questionnaire. Next, each group watched the fragment of the movie in their AVT mode. After the projection, the participants were given the Filler task, Viewing Experience Questionnaire, Face-language Association Test, and General Comprehension Measure in that order.

## **2.3 Materials**

### **Video**

A 15-minute video fragment was used in the experiment. The video was a selected fragment from the Polish version of the movie *Le Mépris* (1963, Jean-Luc Godard) and was shown in its subtitled and voiced-over versions depending on the condition assigned. The scene was chosen deliberately as: 1) it uses different national languages (English, French, German and Italian), 2) two characters use only one language while two other characters use more than one language.

In this movie fragment, Paul Javal meets Francesca Vanini and Jeremy Prokosh in a movie studio. Jeremy, an American movie producer, is dissatisfied with Fritz Lang's script of the movie *Odyssey* and wants to hire Paul to rework it. Paul, Francesca and Jeremy go to the projection room where they meet Lang. After watching a brief fragment of Lang's movie, Jeremy and Lang argue about the artistic nature of the movie. Jeremy writes a check to hire Paul, who accepts the job and leaves to meet his wife. Lang and Francesca stay in the projection room. Lang recites a poem in German and Francesca translates it into French. After a while both leave. In this scene, the characters speak the following languages:

- Paul Javal: French
- Francesca Vanini: English, German, French, Italian
- Jeremy Prokosch: English
- Fritz Lang: English, German, French

The following documents were handed out prior to exposure to stimuli.

#### ***2.4 Basic demographic questionnaire***

In this measure, participants were asked some basic demographic questions such as their age, sex and nationality.

The Memory Assessment Clinics Self-Rating Scale (MAC-S)

The Polish translation of this scale includes 21 ability-to-remember items, 24 items assessing frequency-of-occurrence of memory failures, and four global rating items assessing overall comparison to others, comparison to the best one's memory has been, speed of recall, and concern or worry over memory function [34]. This measure is included in the experiment to control for possible effects of differences in memory on the dependent variable.

Foreign Language Familiarity and AVT Modes Habits and Preferences Questionnaire

In this measure, participants were asked about their and their parents' native languages. Additionally, they had to self-evaluate what foreign languages they knew and mark their proficiency level on a seven-point Likert scale (1 being very weak and 7 being very good). This questionnaire also included 7-point Likert scale questions regarding how often participants watched foreign movies with subtitles, voice-over, dubbing or with no translation provided (1 being never and 7 being very often), and their attitude toward each AVT mode (1 for not liking at all and 7 liking very much). This measure controlled for three possible covariates: 1) Foreign Language Proficiency (FLP), 2) Frequency of Exposure to AVT Mode (FEAVTM), and 3) Attitude towards the AVT Mode (AAVTM).

After the completion of the above-mentioned measures the participants were exposed to the stimuli. After the exposure, the following measures were administered.

#### ***2.5 Filler task***

This instrument included 10 mathematical addition problems the participants had to solve within one minute. This task was used to eliminate the possible group differences in working memory processing and any possible bias caused by a rehearsal mechanism after the projection [35].

#### ***2.6 Viewing Experience Questionnaire***

This measure questioned participants' previous knowledge regarding the viewed movie fragment, enjoyment of it, and attention paid to the movie projection (1 being highest and 7 being lowest). The last one was used as Attention paid to Movie Projection (AMP) covariate in the analysis.

#### ***2.7 Face-language Association Test***

Participants were shown four freeze-frames, each displaying one of four characters from the fragment, and were asked to determine how many languages those characters spoke and also identify those languages. This test

measured two outcomes: 1) Detection of the Number of Languages Spoken by Character (DNLSC), and 2) Identifying the Character–Language Pair (ICLP)

### **2.8 General Comprehension Measure**

Twenty multiple questions with three possibilities (yes, no, don't know) were administered to examine whether participants understood the main conceptual aspects of the movie fragment. This questionnaire measured an observed outcome: Comprehension. The questionnaire included four still frames, each displaying one of four characters with their names, in order to eliminate a possible bias resulting from an erroneous identification of the character.

### **3. Results**

Data were analyzed using SPSS 19 for Windows with an assigned significance level of  $p = .05$  (two-tailed). During the data prescreening, ten cases, including cases not adhering to research design assumptions (e.g. non-Polish native speakers), missing data cases, and outliers, were eliminated from further analysis.<sup>1</sup> The pre-analysis data screening also detected possible multicollinearity problems among the Frequency of Exposure to AVT Mode and Attitude towards the AVT Mode covariates. In order to avoid further problems with understanding which variable contributes to the variance explained, the Attitude towards the AVT Mode offending variable was dropped from the analysis. Dropping the Attitude towards the AVT Mode covariate additionally limited the number of independent variables in the model which enables avoidance of decline of the reliability estimates caused by the presence of the combinations where there are few cases.

In order to test the  $H_1$  that the comprehension of multilingual movies depends on whether subtitling or voice-over is used as an Audiovisual Translation Mode, a Hierarchical Multiple Regression was conducted. The analysis examined the relationship between the independent variable of Audiovisual Translation Mode Condition (AVTMC) and dependent variable of Comprehension, while controlling for Memory (underlying MAC-S scale had a high level of internal consistency, as determined by a Cronbach's alpha of 0.852), Frequency of Exposure to Audiovisual Translation Mode (FEAVTM), and Attention to the Movie Projection (AMP) covariates. In order to assess the importance of the AVTMC after all covariates have been controlled for, the covariates were entered first in the regression equation. After this, the IV was entered into the model. The results for the first step, which includes Memory, FEAVTM, and AMP covariates indicated that model significantly explained a small to moderate proportion [22.9%] of variance in Comprehension [ $R = .479$ ,  $R^2 = .229$ ,  $\text{adj.}R^2 = .206$ ,  $F(3, 99) = 9.827$ ,  $p = .000$ ]. The analysis of coefficients shows that AMP was a unique significant predictor of Comprehension [ $\beta = .480$ ,  $t(99) = 5.378$ ,  $p = .000$ ] and indicated the increase in AMP was directly linearly related to increase in Comprehension, while Memory and FEAVTM did not add significantly to the model (see Table 1). The results for the second step, that adds the IV of AVTMC to the model also indicated that this regression model significantly explained a weak to moderate proportion [27.4%] of variance in Comprehension [ $R = .524$ ,  $R^2 = .274$ ,  $\text{adj.}R^2 = .245$ ,  $F(4, 98) = 9.255$ ,  $p = .000$ ]. Although the Change Statistics analysis shows that adding AVTMC explained only an additional 4.5% of the variation in Comprehension [ $\Delta R^2 = .045$ ,  $F(1, 98) = 6.040$ ,  $p = .016$ ], the analysis of coefficients shows that AVTMC is still useful and is a



significant predictor of Comprehension [ $\beta=.221$ ,  $t(98) = 2.458$ ,  $p = .016$ ] indicating that exposure to subtitling significantly predicted an increase in Comprehension when controlled for the covariates entered in the first step (see Table 1).

**Table 1:** Hierarchical Multiple Regression Predicting Comprehension from Audiovisual Translation Mode Condition (AVTMC), while controlling for Memory, Frequency of Exposure to Audiovisual Translation Mode (FEAVTM), and Attention to the Movie Projection (AMP) Information processing in voiced-over movies

	Comprehension			
	Model 1		Model 2	
<b>Variable</b>	<b>B</b>	<b>B</b>	<b>B</b>	<b>B</b>
Constant	8.319*		9.300*	
Memory	.126	.013	-.101	-.011
FEAVTM	-.093	-.041	-.179	-.078
AMP	1.039**	.480	.958**	.442
AVTC			1.474*	.221
$R^2$	.229		.274	
F	9.827**		9.255**	
$\Delta R^2$	.229		.045	
$\Delta F$	9.827**		6.040*	

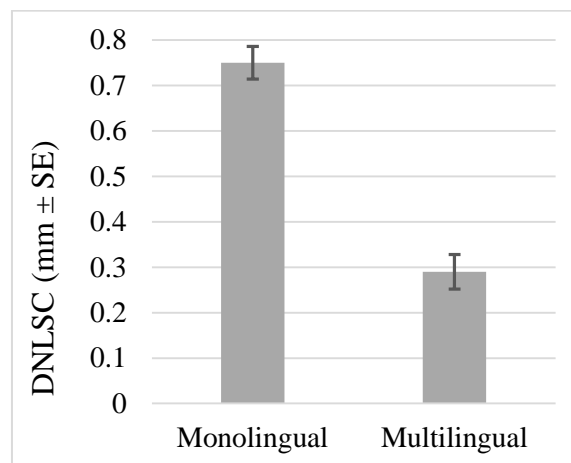
Note.  $N = 103$ . \* $p < .05$ , \*\* $p < .001$

In order to test the  $H_2$  that the effect of Audiovisual Translation Mode on the Detection of the Number of Languages Spoken by Character in a multilingual movie differs for Multilingual and Monolingual characters, multivariable Generalized Estimating Equations (GEEs) were used. The probability of Detecting the Number of Languages Spoken by Character (DNLSC) in a multilingual movie depending on Monolingualism/Multilingualism of a Character (MOMUC), controlling for Memory, FEAVTM, and AMP was evaluated with participants exposed to a subtitled or voiced-over multilingual movie fragment which was one of two dichotomous explanatory variables (AVTMC). MOMUC was used as a second dichotomous explanatory variable, followed by the interaction between AVTMC and MUMOC, and controlling for the covariates mentioned above. The use of GEEs allowed adjustment for a correlated data structure arising from the fact that the same participants were measured repeatedly regarding DNLSC for each of four Characters showcased in the movie. In particular, the GEE parameter estimates were based on empirical standard error estimates, using an unstructured working correlation. Additionally, GEEs allowed to appropriately handle the dichotomous outcome variable DNLSC (i.e. Not-Detected / Detected), and provided post-hoc pairwise comparisons of expected marginal means with Sequential Bonferroni adjustment. According to the GEE model (see Table 2), AVTMC was non-significant predictor of DNLSC (Wald  $\chi^2(1) = .430$ ,  $p = .512$ ). GEE also revealed that the DNLSC significantly differed among the Monolingual and Multilingual characters independently of the AVTMC (Wald  $\chi^2(1) = 61.073$ ,  $p = .000$ ).

**Table 2:** Results of generalized estimating equations (GEE) on the effect of Audiovisual Translation Mode Condition (AVTMC) on Detection of the Number of Languages Spoken by Character (DNLSC) in Monolingual and Multilingual Characters (MOMUC), while controlling for Memory, Frequency of Exposure to Audiovisual Translation Mode (FEAVTM), and Attention to the Movie Projection (AMP).

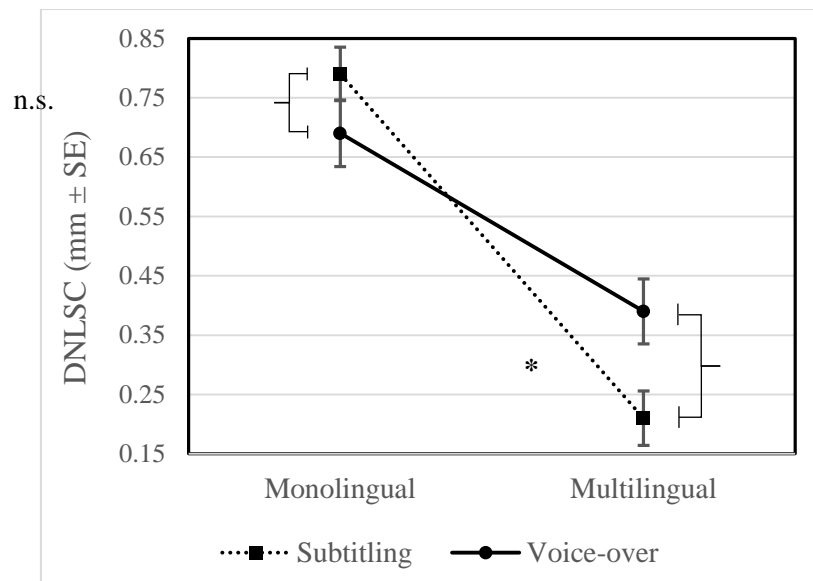
Source of variation	Wald- $\chi^2$	DF	p
(Intercept)	.013	1	.908
Memory	.413	1	.521
FEAVTM	.154	1	.695
AMP	1.917	1	.166
MUMOC	61.073	1	.000
AVTMC	.430	1	.512
MUMOC * AVTMC	7.910	1	.005

Pairwise comparisons (see Figure 1) of the estimated marginal means after Sequential Bonferroni adjustment showed that Number of Languages Spoken by Monolingual characters was more often correctly detected than Number of Languages Spoken by Multilingual characters (MD  $\pm$  SE: 0.46  $\pm$  0.05,  $p < .000$ ).



**Figure 1:** Detection of the Number of Languages Spoken by Character (DNLSC mm; mean  $\pm$  SE) n Monolingual and Multilingual Characters (MOMUC). The pairwise comparisons of marginal means (Sequential Bonferroni tests following GEE) showed significant difference at  $p < 0.001$  level.

The interaction term between MOMUC and AVTMC turned out to be significant (Wald  $\chi^2(1) = 7.910$ ,  $p = .005$ ). In particular, pairwise comparisons (see Figure 2) of the estimated marginal means after Sequential Bonferroni adjustment showed that Number of Languages Spoken by Multilingual characters was more often correctly detected in the voice-over than subtitles condition (MD  $\pm$  SE: 0.18  $\pm$  0.072,  $p = .022$ ). There was no significant difference regarding the Detection of the Number of Languages Spoken by Monolingual characters between the voice-over and subtitles conditions (MD  $\pm$  SE: -0.10  $\pm$  0.072,  $p = .166$ ).



**Figure 2:** Detection of the Number of Languages Spoken by Character (DNLSC mm; mean  $\pm$  SE) between subtitling and voice-over Audiovisual Translation Mode Condition (AVTMC) in Monolingual and Multilingual Characters (MOMUC). Asterisk denotes significant difference (\* $p < 0.05$ ) while n.s. denotes non-significance in pairwise comparisons of marginal means (Sequential Bonferroni tests following GEE).

In order to test the  $H_3$  that the effect of Audiovisual Translation Mode on the Identification of the Character–Language Pair in a multilingual movie differs for Multilingual and Monolingual characters, Multivariable Generalized Estimating Equations (GEEs) were used. The probability of Identifying the Character–Language Pair (ICLP) in a multilingual movie depending on Monolingualism/Multilingualism of a Character (MOMUC), controlling for Memory, Foreign Language Proficiency (FLP), FEAVTM, and AMP was evaluated. The comparisons were made between the participants exposed to a subtitled or voiced-over multilingual movie fragment which was one of two dichotomous explanatory variables (AVTMC). MOMUC was used as a second dichotomous explanatory variable, followed by the interaction between AVTMC and MUMOC, and controlling for the covariates mentioned above. The use of GEEs allowed for adjustment of a correlated data structure arising from the fact that the same participants were measured repeatedly regarding ICLP for each of nine Character–Language pairs showcased in the movie. In particular, the GEE parameter estimates were based on empirical standard error estimates, using an unstructured working correlation. GEEs allowed the appropriately handling of the dichotomous outcome variable ICLP (i.e. Identified / Non-Identified). According to the GEE model (see Table 3), AVTMC (Wald  $\chi^2(1) = .448$ ,  $p = .503$ ) and MOMUC (Wald  $\chi^2(1) = 2.441$ ,  $p = .118$ ) were non-significant predictors of ILUC. The interaction term between MOMUC and AVTMC also turned out to be non-significant (Wald  $\chi^2(1) = .002$ ,  $p = .965$ ). While we were initially interested in examining Multilingual and Monolingual characters separately, we were not justified in doing so because of the absence of a significant interaction effect among AVTMC and MUMOC.

#### 4. Discussion

The experiment presented in this article was carried out with the aim of examining the effect of subtitles and

voice-over on general comprehension, as well as detection and identification of multilingual content.

On the one hand, the results obtained for general comprehension were consistent with the first hypothesis ( $H_1$ ), and provided evidence that content comprehension depends on the Audiovisual Translation Mode. In particular, an analysis of coefficients indicated higher levels of performance in the condition with the subtitled movie excerpt. These findings are in line with some previous research [10], [13] and support the complementary function of different sources of information and effective information processing in subtitled programs. At the same time, the findings suggest that information processing in voiced-over programs is not as efficient. These findings seem to support Banbury and Berry's [32] results suggesting that background noises—in our case, the soundtrack in the foreign language(s)—might in fact have a disruptive effect on content comprehension.

**Table 3:** Results of generalized estimating equations (GEE) on the effect of Audiovisual Translation Mode Condition (AVTMC) on Identification of the Character–Language Pair (ICLP) in Monolingual and Multilingual Characters (MOMUC), while controlling for Memory, Foreign Language Proficiency (FLP), Frequency of Exposure to Audiovisual Translation Mode (FEAVTM), and Attention paid to the Movie Projection (AMP).

Source of variation	Wald- $\chi^2$	DF	p
(Intercept)	1.539	1	.215
Memory	.338	1	.561
FLP	17.943	1	.000
FEAVTM	1.838	1	.175
AMP	8.809	1	.003
MOMUC	2.441	1	.118
AVTMS	.448	1	.503
MOMUC * AVTMC	.002	1	.965

The second hypothesis ( $H_2$ ) assumes that the effect of Audiovisual Translation Mode on the Detection of the Number of Languages Spoken by Character in a multilingual movie differs for Multilingual and Monolingual characters. On the one hand, the theoretical assumptions, which highlight an unlimited access to the soundtrack in foreign language(s) in the case of subtitling and an obstructed one by the soundtrack in viewers' language in the case of voice-over, would allow us to expect that the subtitling condition favors correct identification. However, the results showed that Audiovisual Translation Mode Condition is not a significant predictor of Detection of the Number of Languages Spoken by a Character. The results also indicated that the fact of a character being Monolingual or Multilingual is a significant predictor of Detection of the Number of Languages Spoken by a Character. The post-hoc analysis indicated that the number of languages spoken is more often correctly detected for monolingual characters than multilingual characters regardless of the AVT mode. More importantly, the analysis showed a significant interaction between multilingual or monolingual characters and AVT mode. Further post-hoc pairwise comparisons led to even more interesting observations, indicating that the performance on Detection of Number of Languages Spoken for Multilingual Characters is better in the voice-

over condition than in the subtitling one. A possible explanation of this pattern could be ascribed to the fact that in subtitling, viewers rely on subtitles (visual channel) in a more attentive way than on the soundtrack in foreign language as subtitles provide them with necessary verbal information. These findings are in line with other research (see [36], [37]) suggesting that “visual stimuli are often processed more efficiently than accompanying stimuli in another modality” [38:2]. In voice-over, since comprehension of verbal information relies on the audio channel, viewers pay more attention to both soundtracks and hence have better results in detecting the Number of Languages used by multilingual characters than in subtitled condition. It could be implied that in voice-over condition, attention is intentionally allocated to the audio channel as it contains verbal information. This hypothesis is consistent with other research [39], [40] that suggests that the dominance of vision over audition could be changed if attention was manipulated by intentional guiding to auditory stimuli.

Finally, the third hypothesis ( $H_3$ ), which assumes that the effect of Audiovisual Translation Mode on the Character–Language Pair Identification in a multilingual movie differs for Multilingual and Monolingual characters was not supported. The analysis indicated that neither the AVT mode nor the Multilingual and Monolingual characters are significant predictors of Character-Language Pair Identification in a multilingual movie. A possible explanation of these findings might be ascribed to the fact that Character-Language pair Identification seems to be a more complex cognitive task than Detection of the Number of Languages Spoken by Character. Particularly, we would hypothesize that Character-Language Pair Identification requires higher level of concentration than Detection of the Number of Languages Spoken by Character. While concentration was not in the focus of this study, the control for Attention paid to the Movie Projection was implemented, and turned out to be a significant covariate with regard to Comprehension and Identification of Language-Character Pairs. This suggests that further research addressing this aspect as a factor should be carried out.

## **5. Conclusion and Recommendation**

There are several important implications that can be drawn from these findings and that should be addressed in further research. First, the model of information processing in subtitled movies proposed by d’Ydewalle and De Bruycker [28] and adopted in this paper should verify and include the level of attention displayed toward each source of information. We would suggest that while in subtitled programs the three sources of information—the visual, subtitles, and the soundtrack in foreign language(s)—are complementary, viewers’ attention is not allocated in an equal manner towards them. Considering our results, it seems that more attention is paid toward subtitles as it provides translation of verbal information. Going further, we could assume that, actually, the attention paid to the visual channel could possibly divert attention from the audio channel and therefore limit access to more complex clues provided in the audio channel only. If this hypothesis is supported, it could have some practical application for subtitled multilingual movies. Considering that viewers process information coming through subtitles more effectively, they could be used to improve the level of performance on the identification of multilingual content. In other words, every time the characters change languages, subtitles would contain information in brackets indicating which language the characters use. Another solution could be adopted from the BBC which uses different colors, each representing different language [41]. Further research should verify, however, whether this kind of information would not distract viewers from the verbal information of the subtitles and whether it would actually improve identification of multilingual content.

The second implication emerging from the findings refers to the model of information processing in voiced-over movies. The theoretical assumption of this model, based on d'Ydewalle and De Bruycker [28], enabled us to distinguish three sources of information: the visual, the soundtrack in foreign language(s) and the soundtrack in viewers' native language. This model also suggested that as two of the sources—the two soundtracks—appear almost simultaneously, information processing could be considered cognitively demanding. The results, however, suggest that the existence of two soundtracks simultaneously might have disruptive effects on some cognitive processes such as comprehension, while enhancing others such as Detection of the Number of Languages spoken by multilingual characters. Auditory dominance seems to be a beneficial factor in multilingual movies. Further research should verify possible ways to improve general comprehension in voiced-over movies. We would suggest that introducing one additional voice-artist could potentially improve general comprehension as the distinction between utterances of different characters would be well defined. Again, this hypothesis should be empirically tested. Research on those aspects would not only shed more light on information processing in voiced-over programs but would also constitute a valuable guideline to improve this AVT mode.

## **6. Limitations of the study**

Though this study will pave ways for other scholars to undertake intensive research on the issue, it was not free of limitations. As the subjects of this study were Polish university students and the movie excerpt under investigation was limited to the Polish voice-over translation, readers should be careful in any generalizations beyond the researched population. On the other hand, the fact that the participants were university students of a social science degree should indicate cautiousness in generalizing the results to general audience of audiovisual products. Also, the languages used in the movie excerpt and the particular context introduced by filmmakers (e.g. scenery) might constitute mediating factors that should be taken into account in the study replications and any further studies.

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