



BILINGUAL PROCESSING OF EVIDENTIALITY IN BULGARIAN

Bachelor's Project Thesis

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Abstract: Studies on bilingualism are ever-growing in the field of linguistics. This research will concentrate on the processing of evidentiality in L1 and L2 immigrant speakers of Bulgarian. Evidentiality is a unique grammatical category that provides the source of information to the listener. This grammatical category is only present in some languages like Bulgarian in which it is manifested as a morphological marker. Previous research shows that evidentiality takes longer to be fully acquired in Bulgarian children (from ages 4 to 6). This paper aims to provide insight into the later acquisition of evidentiality by adult second-language learners of Bulgarian through the use of a self-paced reading experiment. The results show a significant difference in the reading speed between the two groups but not between the types of evidential markers. Moreover, significant differences were found between the evidential markers and between the groups in the grammatical judgement accuracy of evidential sentences.

1 Introduction

The grammatical category of evidentiality does not manifest universally across languages (Matsui & Fitneva, 2009). Therefore, it requires an upper intermediate or advanced level of acquisition for second-language learners to master it, especially if their first language does not have evidentiality as a grammatical category (Leclercq & Mélac, 2021). Because research on the concept of evidentiality is scarce in general, there has also not been much research on how second-language learners acquire it. Thus we aim to expand on this area of study and investigate evidentiality in the Bulgarian language (Smirnova, 2012; Izvorski, 1997; Sauerland & Schenner, 2007; Koev, 2011). Concentrating on the extent to which adult second language learners can gain proficiency in this grammatical category, this paper will explore the acquisition of evidentiality at later stages in adulthood, by utilising a self-paced reading experiment to provide more context on the complexity surrounding evidentiality acquisition.

1.1 Concept of Evidentiality

Evidentiality is a linguistic phenomenon that speakers use to provide details about their source of information through their utterances (e.g. De Haan, 1999; Palmer, 2007; Aikhenvald, 2004, 2012, 2015; Aikhenvald & Dixon, 2014, 2003). Types of information that can be expressed through evidentiality marking include: witnessed events (where the speaker has seen the event), inferential events (where the speaker used evidence to deduce the information about the event), reported events (where the speaker has heard the information from someone else) or assumed events (Kroeger, 2022; Rozumko, 2019; Aikhenvald, 2015, 2004, 2012). However, different languages can implement only some of the sources mentioned above or even refer to a different list, depending on their language system.

The first time the term evidentiality was used and explained was by Jakobson (1957/1971), who gave the specific meaning that is still used by linguists today (Aikhenvald, 2004; Chafe & Nichols, 1986; De Haan, 1999; Faller, 2006; Lazard, 2001; Willett, 1988). He defined evidentiality as a marker that indicates how the speaker acquired the

knowledge of the event they are referring to in their speech. Jakobson (1957/1971) also categorised evidentiality into two distinct types: direct and indirect by providing examples from languages such as Bulgarian (Jakobson, 1957/1971; Aikhenvald, 2004).

In her work, Aikhenvald (2004) explains the concept of evidentiality by distinguishing 14 different types of evidential systems across languages. She also makes an important distinction between the lexical and grammatical use of evidentiality as every language can lexically report the source of information through adverbs like ‘reportedly’ or lexical explanations like ‘I saw’ (Aikhenvald, 2004). However, languages with evidentiality as a grammatical system do not have the option to not use it, as it would result in an incorrect or non-intuitive sentence (Aikhenvald, 2004). The classification of a language into a system depends on the number of information sources that require a specific grammatical marking. For example in Nhẽngatú and Estonian, they only have a marking for the reported evidential (Aikhenvald & Dixon, 2003). Other languages might require two or more distinct evidential markings. In this paper, the A1 system is explained, the evidentiality system that Bulgarian (the language used in this research) belongs to. In particular, the A1 system is a two-term evidential system that categorises the markers into two distinct types, which she refers to as “firsthand” (witnessed evidential) and “non-firsthand” (non-witnessed evidential). Additionally, she examines the fusion of the evidential markers with the past tense forms in languages of an A1 system (Aikhenvald, 2004). Hence, we will further explain the Bulgarian past tense and its connection to the evidential markers (see section 1.2).

1.2 Evidentiality in Bulgaria

As mentioned, Jakobson (1957/1971) was the first to assign the term evidentiality to a Bulgarian grammatical category. He used an example of the Bulgarian perfect (past indefinite) “zaminál” (it is claimed to have sailed) and the simple preterit (past aorist) “zamina” (I bear witness it sailed) to illustrate the indirect narration and direct narration. Similar examples include (1) and (2).

- (1) **Direct**
Tq chète.
She read._{direct_evidential}
“I witnessed that she was reading.”
- (2) **Indirect**
Tq chè-la.
She read-*indirect_evidential*.
“It was claimed that she was reading.”

However, these are not the only aspects of the past tense in Bulgarian that carry evidentiality, all past tense aspects in Bulgarian can carry evidentiality (past imperfect, aorist, perfect and indefinite as seen in Nicolova, 2017; Kutsarov, 2007; Tarpomanova, 2015).

Taking into account the different terms authors use for the two types of evidential markers, this paper will categorise them, as Jakobson (1957/1971) did, into direct or indirect. The direct evidential (firsthand/witnessed) indicates that the speaker was present and witnessed the event/action they are referring to (see example 1 and 6). In other words, the information the speaker is presenting was directly observed by them. The indirect evidential (non-firsthand/non-witnessed), indicates that the event is either inferred by the speaker or was inquired from a secondary source and is being reported (see example 2). In other words, the speaker acquired the information indirectly (De Haan, 1999; Slobin & Aksu-Koç, 1982; Underhill, 1976).

Tarpomanova & Aleksova (2022) subcategorise the indirect evidential into three morphological evidential markers: inferential, marked by the presence of the auxiliary in the 3rd person (see examples 3 and 7); reported, marked by the omission of the auxiliary in the 3rd person (see examples 4 and 8); and dubitative, marked by the auxiliary “bil” (бил) (see examples 5 and 9) in all persons (Nicolova, 2017; Kutsarov, 2007; Tarpomanova, 2015). However, the main evidential marker that is consistent for all sub-types of indirect evidential is the participle “-l” (or, as Friedman (1997, 2003, 2012) refers to it, “-li”)*. The differences in these forms can be seen in the examples below (see section 1.3). The origins of

*The participle also changes depending on the gender or number of the subject. In the examples given the subject is a single feminine therefore we use the SG.F. form of the participle which is “-la”.

this participle are associated with the old Bulgarian past tense. From Friedman’s (2004) investigation of the Balkan evidential origins, we know that the old Bulgarian perfect (which is unmarked past) evolved to be an evidential marker. This is why we chose only to explore evidentiality in the past tense for this research.

- (3) **Inferential - with auxiliary**
 Tq e ch̀e-la.
 She AUX.3sg.PRS read-
indirect_evidential.
 “I inferred that she was reading.”
- (4) **Reported - without auxiliary**
 Tq ch̀e-la.
 She read-*indirect_evidential*.
 “I was told that she was reading.”
- (5) **Dubitative - with “bil” auxiliary**
 Tq bila ch̀e-la.
 She AUX.3sg.f.PST read-
indirect_evidential.
 “I was told that she was reading, but I doubt it.”

Because of this evolution in the language, the morphological markers for evidentiality in Bulgarian indicate both the tense and the source of information. Moreover, there is no clear morphological distinction between the standard tense form and the direct evidential form of a verb (see example 1). Unlike, the indirect evidential marking that uses the participle “-l” to indicate the source of information (see example 2). However, an important distinction should be noted, evidentiality is a separate system from tense that has grammatical categorization and is part of the morphological syntax of the language. These implications highlight the grammatical complexity of evidentiality in the Bulgarian language (Nicolova, 2017; Kutsarov, 2007).

1.3 Examples of the evidential markers

- (6) **Direct evidential in Past Imperfect**
 Ivan chete-*she* kniga.
 Ivan read.3sg.m.PROG-direct_evidential
 book.ACC.
 “I witnessed that Ivan was reading a book.”

- (7) **Indirect evidential in Past Imperfect**
 Ivan e chetq-l kniga.
 Ivan AUX.3sg.PRS read.3sg.m.PROG-
indirect_evidential book.ACC.
 “I inferred that Ivan was reading a book.”
- (8) **Indirect evidential in Past Imperfect**
 Ivan chetq-l kniga.
 Ivan read.3sg.m.PROG-*indirect_evidential*
 book.ACC.
 “It was reported to me that Maria was reading a book.”
- (9) **Indirect evidential in Past Imperfect**
 Ivan bil chetq-l kniga.
 Ivan AUX.3sg.PST read.3sg.m.PROG-
indirect_evidential book.ACC.
 “It was reported to me but I doubt that Maria was reading a book.”

1.4 Previous Research

One noteworthy study by Ilchovska & Culbertson (2019), investigated the acquisition of diverse evidential systems and cognitive biases. Notably, this experiment involved native Bulgarian immigrant adults and examined whether their native language influenced the acquisition of other evidential systems. Through the use of artificial language learning, they tested if some evidential patterns are less universal and harder to learn than others. Their findings suggest that the topological frequency of the evidential systems does not have a significant effect on the learnability of other evidential systems but the participant’s previous acquisition of evidentiality has a bigger effect on their ability to learn other systems. Therefore from this study, we can expect that the participants’ first language in our experiment could affect their level of acquisition. A similar cross-linguistic study (Saratsli et al., 2020) done on English speakers suggests that the typologically most prevalent system (marking indirect evidential, which is also used in Bulgarian) is easier to learn compared to others. This tells us that the effects of the L1 might be minimal and therefore will not be taken into consideration during the experiment.

There was no research found on Bulgarian evidentiality acquisition in adults, but there are studies investigating Bulgarian children and their use of evidentiality. Fitneva (2008) researched

the role of the different evidential markers of children's reliability judgment. She conducted 2 experiments where she presented 6-year-olds and 9-year-olds with short vignettes and follow-up questions regarding their reliability. They aimed to test if the children's judgments were based on the authorship (who gave the information: first or second hand) or modality information (how it was acquired: cognitive or perceptual), the evidential markers carry. The research found a significant difference between groups only when comparing inference. Specifically, 9-year-olds rely more on direct perceptual information and 6-year-olds rely more on reported-inferential information. Through the experiments and testing stage, Fitneva (2008) also noticed a full use of evidentiality occurring in the 6-year-olds and not in 4-year-olds. This inquiry also follows the findings of other evidential acquisition studies in regard to Turkish (Aksu-Koç, 1988). Hence, we can assume that evidential acquisition starts around the age of 6 for native speakers of Bulgarian and other languages with grammatical evidentiality. Therefore, this brings the question if acquisition occurs later, in adult learners as well, due to conceptual complexity.

As such, research on evidentiality acquisition predominantly centres around children's learning of the concept (such as Aksu-Koç et al., 2009 on Turkish; de Villiers et al., 2009 on Tibetan). Studies on the first language (L1) acquisition of evidentiality in English and European languages are relatively scarce (Papafragou et al., 2007; Rett & Hyams, 2014 on Korean and English, and works like Ifantidou, 2005 on Modern Greek; Koring & de Mulder, 2014 on Dutch). The area of second language (L2) acquisition of evidentiality remains largely uncharted, with only a few pioneering studies addressing the adoption of hearsay evidentials (Ishida, 2006; Narita, 2012b; Kamada, 1990; Narita, 2012a on Japanese learners), the comprehension of grammatical evidentiality in distinguishing between direct and indirect evidentials (Arslan et al., 2015; Tokac-Scheffer, 2023) focusing on bilingual heritage learners of Turkish), and the discourse role of inferential expressions (Leclercq & Edmonds, 2017, on the learning of verbal modality or Leclercq & Mélac, 2021 on functional and developmental perspectives in French and English as L2 and Trajchevska, 2021 in English as L2 by Macedonian-

speaking learners). In this paper, we endeavour to advance this research area by exploring how Bulgarian learners grasp the appropriate evidential markers.

This shows us that a notable gap exists in the literature concerning the acquisition and learnability of evidentiality by second-language learners of Bulgarian, with scarce research in this domain (though similar studies on English native speakers, such as Leclercq & Mélac, 2021, do exist). Moreover, the majority of prior research on Bulgarian evidentiality predominantly comprises of linguistic analyses or cross-linguistic examinations delving into the morphological and semantic levels of evidentiality. Notably, limited experimental inquiries have been undertaken. Therefore, exploring this aspect could offer valuable insights for broader cross-linguistic studies investigating the acquisition of evidential systems in adults.

There is a significant increase of research in the field of bilingualism. Increased globalisation and migration solidified an interest and necessity for many people to learn a second language (L2) (Schmid & Yilmaz, 2021). In this paper, both of the experimental groups are bilinguals as we consider bilinguals people who use one or more non-native languages on a daily basis. This boost of interest motivated us to research late bilinguals as there are a number of studies investigating bilingual children but limited research on adult bilinguals. From such studies like Haman et al. (2017), we know that in every bilingual there is a transfer between languages. These conclusions lead us to assume that both of the bilingual groups in our research will experience some difficulties with the grammatical judgement task. Moreover, a bilingual study testing L2 learners and L1 attriters found that they are equally fluent and significantly more disfluent than monolingual speakers (Bergmann et al., 2015). Other studies on immigrant children also show their proficiency difference compared to their monolingual counterparts (in Turkish children Akoğlu & Yağmur, 2016). This motivated us to see if that would be the case in terms of evidentiality processing. Testing immigrant Bulgarian L1 speakers to L2 learners can show us if the immigrant speakers also have any language deficiencies as a result of immigrating and having a different dominant language in their environment.

Another language acquisition study on adult immigrant learners of English (as L2) saw an effect of the age of arrival on the speaker’s proficiency level, with later arrivers performing significantly worse on grammatical judgment tasks compared to younger immigrants (Jia et al., 2002). The experiment was conducted on US residents (with different L1 origins) as most previous research on immigrant speakers focuses on the length of their stay as the main factor for their proficiency (Grenier, 1984; Stevens, 1992, 1994). This gives us the motivation to investigate further the effects of age and not the length of the stay on language acquisition and proficiency in immigrant speakers. Other studies, such as Akresh et al. (2014), also consider other factors, which contribute to proficiency (before immigration proficiency, L1 usage, etc.), but we only want to investigate if the acquisition of an L2 in your adult life (after puberty) can reach accurate evidential use proficiency. The missing factors in the immigrant studies that we want to cover with this research are the specialisation on evidentiality and the exploration of immigrants in different countries such as Bulgaria.

1.5 Research aims

The investigation focuses on comparing the comprehension of evidentiality among second language learners of Bulgarian (non-native speakers who started learning the language of their host country Bulgaria after puberty) and immigrant speakers (individuals originally native in Bulgarian who have resided in the Netherlands for at least two years). Immigrant bilingual speakers are chosen for comparison due to their potential language proficiency issues and struggles with the intricacies of evidentiality. An important factor for both groups is the switch of their dominant language as they were both not living in their country of origin at the time of the experiment.

The study aims to address the following research question: Do late second-language learners of Bulgarian differ from immigrant native speakers in terms of reading speed and accuracy in grammatical evaluations of evidential markers? Additionally, the research seeks to analyze distinctions among the two evidential markers, considering that some may be conceptually more

accessible than others. The overall aim of this study is to explore the bilingual processing of Bulgarian evidentiality, which is lacking in the current research. Our paper will further expand research in multiple fields such as late second-language learning, bilingualism and Bulgarian linguistics.

2 Methods

2.1 Participants

A total of 28 Bulgarian-speaking adults ($M_{age} = 29$ years) participated in this study. The participants were divided into two groups based on their Bulgarian acquisition: the control group and the experimental group. The control group comprised 17 native speakers of Bulgarian ($M_{age} = 23$ years) who were exposed to Bulgarian since birth and had been residing in the Netherlands for at least 2 years during the time of testing. They spoke English at a level of B2 or higher. For the aims of this experiment, we sought participants who had switched their dominant language to English and/or Dutch, as it would be their most frequently used language during their studies in the Netherlands. The experimental group included 11 second-language learners of Bulgarian ($M_{age} = 41$ years) residing in Bulgaria for over two years with a certain degree of proficiency in English. The participants in the experimental group were asked to self-rate their Bulgarian proficiency ($M_{score} = 6$, out of 10). The intention for this group was to have participants with Bulgarian as their dominant language.

The experiment was distributed online among students of English-speaking institutions and on online forums and groups. Before commencing the experiment, all participants gave consent to participate in this experiment and they answered the language background questionnaire (see Appendix B for the questionnaire). At the end of the experiment, the participants were thanked for their participation, albeit without reimbursement.

2.2 Stimuli

The stimuli consisted of 60 sentences in Bulgarian, which were grouped into sentences with direct

evidential marking, sentences with indirect evidential marking, and filler sentences. Each group included grammatical and ungrammatical sentences, resulting in four target conditions with two evidential markers and two filler conditions, each containing ten sentences.

The target sentences followed a consistent structure, comprising of a main clause, which provided context for the information source indicating either witnessing or not witnessing an action. This was conveyed through the use of a context verb, which indicated the way the information was obtained (e.g., "I saw" for witnessed actions and "She told me" for non-witnessed actions). The second part of the sentence was a dependent clause containing the target verb with the evidential marker, presented at the same region (6th position) across sentences (see Table 1). In grammatical sentences, the marker matched the indication phrase of the main clause, while in ungrammatical sentences, a mismatch occurred between the marker and the context verb. Filler sentences lacked any specific grammatical indication of evidentiality. A detailed list of stimuli is provided in Appendix A.

Main clause					Dependent clause				
1	2	3	4	5	6	7	8	9	10
Видях	вчера	вечерта	как	Крис	пристигна-л	с	нова	луксозна	кола.
Context verb "I saw"					Target verb with evidential marker				

Table 1: Sentence structure

2.3 Design

The experiment was designed, and the data were collected via the web service PsyToolkit (Stoet, 2010, 2017, which employs its proprietary code for experiment construction. We designed a remote self-paced reading (SPR) experiment where sentences are presented in a self-controlled manner, depending on the individual participant. This design helped us accurately record the reading speed of each participant. The experiment began with a trial session of five runs (each involving a single sentence), with the intention of familiarizing the participants with the SPR format. This also increased the chances that the experiment was conducted correctly, as per the instructions. The actual experiment comprised 60 runs, encompassing all stimuli. The visual

design throughout the experiment featured a black background screen with white Arial font text, sized at 20px for instructions and 30px for stimuli. The font choice was grounded in its widespread use, ensuring recognition without distraction (Beier & Larson, 2013). The font size was determined to strike a balance between readability and adherence to the screen restrictions of the experiment software (800 by 400px). Emphasis was placed on a larger font size for stimuli to enhance visibility and captivation. The stimuli were left-aligned for a more natural reading simulation. Each sentence was presented individually, with masking applied to conceal all other words in the sentence.

The participants were first shown a consent screen where they were instructed about the purpose of the experiment and the data collection. If they checked the box and chose to continue to the next stage, they consented to participate in the experiment and agreed to have their data used for this study. Afterwards, they proceeded to a questionnaire, that linked the participants seamlessly to the actual experiment after they completed all the questions. This questionnaire comprised 10 questions aimed at collecting essential data for the research, mainly focused on their language background. The specific questions are detailed in Appendix B. This pre-experiment questionnaire served as a crucial component in gathering participant information and contextualizing the subsequent experimental data. The integration of the questionnaire into the overall experimental procedure ensured a comprehensive and streamlined approach to data collection.

Subsequently, an instructional screen was presented at the beginning of the experiment, elucidating the experiment process and providing information on the response keys (sentence reading and answering questions). This enhanced participant understanding and engagement throughout the study.

For the actual experiment, a non-cumulative self-paced design was adopted, coupled with the uniform mask technique, to ensure participants focused on one fragment at a time. In other words, the stimuli were presented word by word, and the previous and following words in the sentence were covered throughout the parsing of the sentence. This design choice also indicated the boundaries

of the sentences, all standardized at 10 words in length. Segments transitioned with the press of the space bar, marking the commencement of the reading time counter for each segment and it concluded with the presentation of the next one. After each sentence, a sentence judgment question prompted participants to categorise the sentence as either grammatical or not by pressing “A” for yes and “L” for no. The selection of these keys was intended to make them easily reachable yet sufficiently spaced apart to reduce errors. The response keys were also provided on the screen in green for yes and red for no. Their answers were recorded as either correct or incorrect. At the end of both the trials and the experiment, the participants were notified with an information screen.

2.4 Procedure

The complete experiment comprised a digital self-paced reading task, all participants participated online. This choice was made to ensure consistency despite the difference in the participants’ locations. They were all sent a link and accessed the experiment through the Psytoolkit platform.

Prior to commencing the experiment, all participants completed a consent form, agreeing to complete the experiment in one continuous session and having their data collected. Following that participants were presented with a questionnaire covering linguistic background and personal details such as age, gender, and nationality. If the experiment was exited at some point during the collection their data is considered incomplete and it won’t be saved by the server. Following the initial data collection, the experiment commenced upon agreement. A screen provided instructions and information on the experiment’s procedures and expectations. Subsequently, sentences were presented one by one, in a non-cumulative manner, with each word revealed sequentially upon pressing the space bar. After each sentence, participants were prompted to respond to its grammaticality using designated keys on a keyboard. All sentences were randomized for each participant, and participants encountered all four conditions. Importantly, there was no time limit imposed on the experiment, and participants were not informed that their reading speed was being recorded. This approach aimed to capture participants’ natural

reading habits without inducing additional pressure or time constraints.

2.5 Data Pre-processing

Firstly, the data from the survey were visually examined and one Bulgarian participant had to be excluded from the data since they only lived in the Netherlands for two months, which is not long enough for English/Dutch to become their dominant language.

Secondly, partial data pre-processing was initially conducted using PsyToolkit (Stoet, 2010, 2017), primarily focusing on removing incomplete data files. The remaining pre-processing steps were performed in R Studio version 4.2.2 (RStudioTeam, 2020) and Python version 3.8 (Van Rossum & Drake Jr, 1995). The initial step in the web server involved sorting the reading times for each segment and organizing the data into specific columns. The collected data included the reading speed of the full sentence, the response time for each judgment question, and the reading speed of the Target Verb (the region including the evidentiality marker).

The data were subsequently separated into distinct datasets for further analysis. Each dataset contained 1680 data points, representing 60 sentences across 28 participants. Two main datasets were created:

1. Target Verb Reading Speed Dataset (TVRS): This dataset focused on the reading speed of the Target Verb in each sentence.
2. Judgment Question Response Accuracy Dataset (JQRA): This dataset encompassed the response times for each judgment question and its accuracy.

Implemented data-cleaning procedures, for both datasets, were aligned with the best practices outlined by Nicklin & Plonsky (2020). Visual examinations, involving histograms and Q-Q plots, were conducted to identify outliers and determine appropriate cutoffs. In the Target Verb region, trials faster than 100ms (e.g. Jegerski, 2014; Kim et al., 2018; Luce, 1986; Tokac-Scheffer, 2023) were excluded. Additionally, tests of normality and variance were conducted. The two datasets had different formats and required separate analyses. The TVRS dataset was more complicated and

diverse and was analyzed with the use of Python packages and non-parametric tests. The second dataset was normally distributed and easier to process and was analyzed with R Studio and parametric tests.

Furthermore, the second dataset was utilized to analyze the accuracy of responses by summarizing the overall performance of each participant for each condition as an accuracy percentage, calculated as the sum of accurate responses out of 10 sentences per condition. This resulted in each participant having six accuracy performance values that were used for the analysis (162 values in total). Additionally, for the response times (RTs) of their answers, all data was used, considering both accurate and inaccurate responses. The same principle was also applied to the TVRS. This comprehensive data preprocessing strategy, adhering to established guidelines, set the stage for rigorous and meaningful analyses in subsequent stages of the research. We are planning to examine both within and between group performances, by comparing analysis between all the conditions and between the two groups of participants. This initial reprocessing guided us to use parametric ANOVA tests on the JQRA dataset and non-parametric Kruskal-Wallis H tests (for between-condition comparison) and Mann-Whitney U tests (for between-group comparison) on the TVRS dataset.

3 Results

This section presents the findings from three distinct analyses based on the different datasets examined in this study: an overview of general participant data collected from the survey, an analysis of the Target Verb Reading Speed Dataset (TVRS), and an examination of the Judgment Question Response Accuracy Dataset (JQRA).

3.1 Questionnaire Data

The participant sample finalized for this study comprised 28 individuals, after excluding one Bulgarian participant for not meeting the residency requirement of at least two years in the Netherlands. This requirement ensures a switch in their dominant language from Bulgarian to

English. Moreover, the linguistic profiles of the cohort revealed that, with two exceptions, all participants were proficient in at least English and Bulgarian, qualifying them as bilinguals. An interesting insight that should be pointed out is that the experimental group had resided in Bulgaria for a considerable amount of time ($M = 16$ years), which we expect to have improved and influenced their level of proficiency. Furthermore, none of the second language learners had a first language with a grammatical evidentiality system. This was established in other studies to have an influence on their ability to grasp evidentiality in other languages (Ilchovska & Culbertson, 2019).

3.2 Analysis of Target Verb

The TVRS dataset, focusing on the reading speed of the target verb (TV) marked with evidentiality in each sentence, included 1,680 observations, which was then reduced to 1,425 after outlier exclusion. Given the Shapiro-Wilk test results, the data needed to be analyzed using a non-parametric test to assess if there is a difference between the stimuli conditions and groups. A Kruskal-Wallis H test was conducted to compare the mean reading times for the TV across different conditions. The analysis revealed no statistically significant results of the condition on the mean reading time of TV ($H(5) = 1.625, p > 0.05$). With these results, we fail to reject the null hypothesis that there is a difference in TVRS between conditions.

Subsequent analyses, comparing the direct and indirect evidentials, also showed no significant variance in reading times between the evidential markers. A Mann-Whitney U test was conducted to compare the TVRS between stimuli (U -statistic = 112,277, $p > 0.05$). This suggests that the type of evidentiality (direct vs. indirect) does not significantly affect the distribution of reading speed for the TV, indicating that other factors may be more influential in determining the variations. Contrarily, a comparison between participant groups via the Mann-Whitney U test, yielded (U -statistic of 118,974.5) a highly significant p-value ($p < 0.0001$), suggesting that group type (native vs. second-language learners) significantly affects reading speed distribution, underscoring the influence of participant background over evidentiality in determining reading speeds.

The analyses suggest that their reading speed was not affected by the occurrence of an evidential marking or not. However, most importantly there was a significant difference between the native and the second-language learner group. This was to be expected as there was a significant difference in their overall reading speed ($M = 7492$ ms and $M = 11818$ ms per sentence, $t = 5.90$ and a p -value < 0.0001). The analysis is plotted on the graphs below (see Figures 1 & 2).

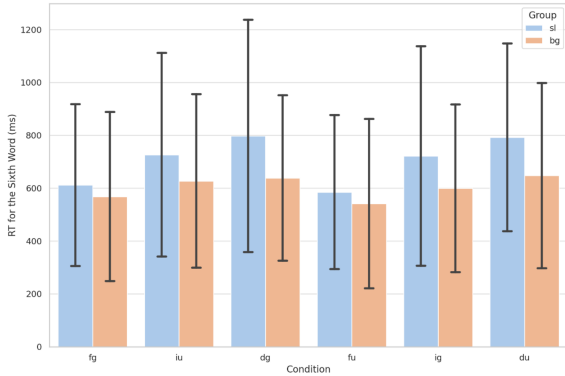


Figure 1: Bar plot of the average reading speed of the TV in each stimuli condition. The x-axis indicates the different conditions and the y-axis shows the mean TVRS for each condition and group. (“d” stands for direct evidential marking, “i” stands for indirect marking, “f” is for filler sentences, furthermore “g” is for grammatical sentences and “u” is for ungrammatical) The legend further indicated the two groups (“bg” marks the Bulgarian native speakers and “sl” indicates the second-language learners).

3.3 Analysis of Judgment Questions

The JQRA dataset analysis incorporated two variables: grammatical judgement accuracy and response times (RTs). For the within-participants analysis, we compared all six conditions to each other and we used a one-way ANOVA test. The analysis revealed a significant effect of condition on accuracy ($F(5,162) = 33.34$, $p < 0.00001$), indicating that the means of at least one pair of stimuli conditions are statistically significantly different. The effect size, calculated using eta squared, was $\eta^2 = 0.326$, implying that the condition accounts for approximately

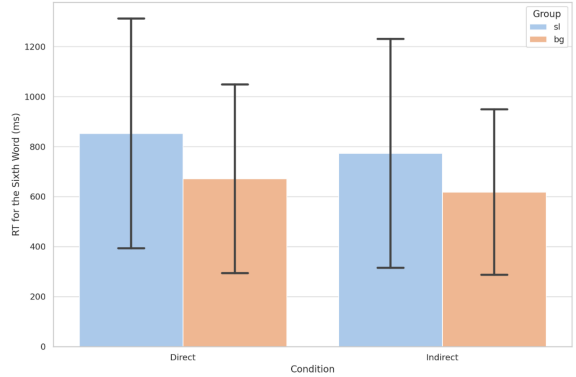


Figure 2: Bar plot of the average reading speed of the TV with the two evidential markings between the groups.

32.6% of the variance in participant accuracy. The results showed a significant difference in both between conditions and between groups ($F(1,166) = 49.88$, $p < 0.00001$). The test also showed a significant interaction between the group and stimuli conditions. The accuracy analysis is plotted in Figure 3.

Further investigation into the results with the use of Tukey’s HSD test showed us that the significant difference that should be taken into consideration is the performance with the indirect ungrammatical stimuli (“iu”). The post hoc comparison indicated a significant difference for both groups and conditions. These results were expected as previous research shows that the indirect evidential markers are considered harder to process compared to the direct markers. These false positive results show that both groups are not sensitive to evidential violations. We can speculate multiple reasons for these results one being the over-complexity of some sentences. Another possible reason is the processing load that the masking of the sentences in the self-paced reading could cause.

These results led us to further investigate the performance between the groups. We only analyzed the performance between the indirect and direct evidential stimuli across the two groups. An ANOVA test was used again due to multiple comparisons. The results showed a significant difference in accuracy for both between evidential markings ($F(1,166) = 13.831$, $p < 0.05$) and between the groups ($F(1,166) = 25.982$, $p < 0.05$).

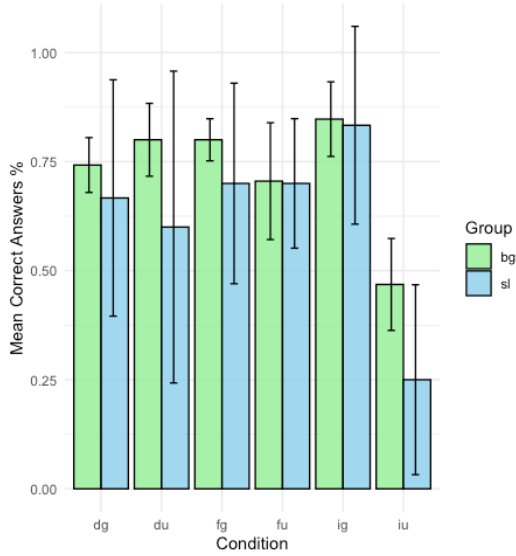


Figure 3: Bar plot of the mean percentage of correct judgements per condition and group. (“d” stands for direct evidential marking, “i” stands for indirect marking, “f” is for filler sentences, furthermore “g” is for grammatical sentences and “u” is for ungrammatical). The x-axis indicates the different conditions, and the y-axis shows the mean correct accuracy for each condition and group. The legend further indicates the two groups.

These results were expected as Bulgarian native speakers have not lived outside of Bulgaria to experience any significant change in their language and therefore should perform better than second-language learners. This test also showed us a lower performance with the indirect evidential marker overall. The difference is further illustrated below (see Figure 4), where we compare the performance of the two groups.

Moreover, we also investigated the response times (RTs) for answering each judgment question. An ANOVA analysis showed no significant difference between the evidential types or between the groups. We can assume that the participants had classified the sentence as grammatical or ungrammatical before the question was presented to them. A possible processing period is during the presentation of the last word in the sentence. (see Figure 5).

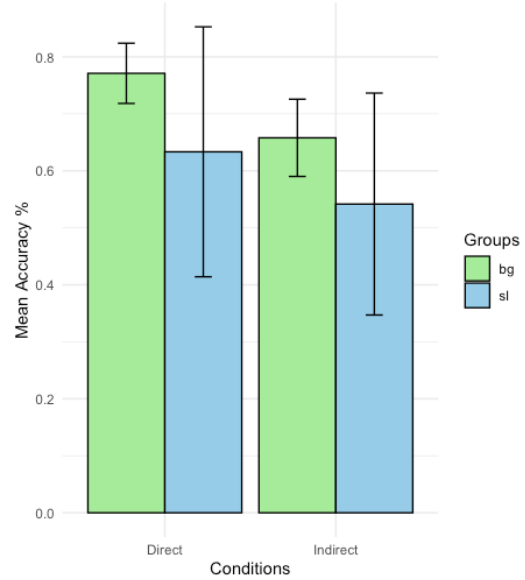


Figure 4: Bar plot of the mean percentage of correct judgements per evidential marking and group.

4 Discussion

This study aimed to investigate the processing and learnability of Bulgarian evidentiality among adult second-language learners. The research was motivated by the lack of experimental studies on Bulgarian evidentiality and the acquisition of Bulgarian as a second language. An online self-paced reading experiment was conducted with native immigrant speakers and second-language learners residing in Bulgaria. The participants were presented with six types of stimuli of grammatical and non-grammatical sentences containing direct evidential, indirect evidential, or filler verbs. The correct match for the type of evidential needed in the sentence was indicated by the first context word in the sentence. As expected, there was a significant difference between the performance of the two groups, with the immigrant speakers outperforming second-language learners overall.

Our research aim was to explore whether adult second-language learners can attain a certain level of proficiency in Bulgarian evidentiality. To have a baseline level of evidentiality acquisition as a control group, their proficiency was compared to another group of bilinguals, Bulgarian native

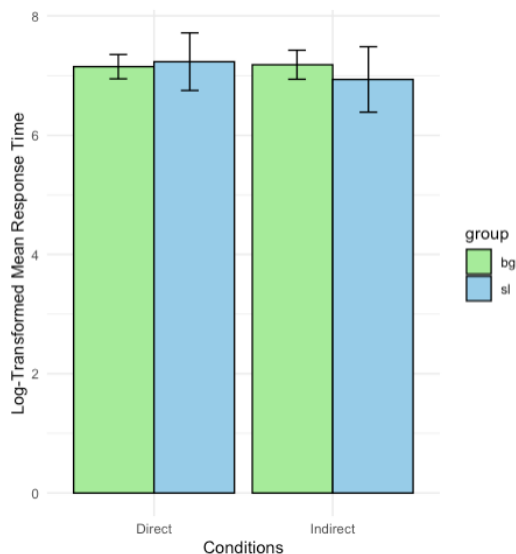


Figure 5: A log-transformed bar plot of the mean response times of the judgment questions per evidential marking and group.

speakers that had immigrated to the Netherlands. Because we aim to provide more information on different types of bilinguals we chose to not use monolinguals as a baseline comparison. However, we still expected a clear distinction between the two groups as the Bulgarian native speakers had not yet experienced attrition. According to Bergmann et al. (2015), who compared attriters to second-language learners, their grammatical proficiency was similar. However, the speakers in the current control group were not classified as attriters, since they had not resided outside of Bulgaria for an extended period (between two to four years). Nevertheless, there were still a noticeable number of errors in their accuracy results. We speculate that the reason for those results may be attributed to the influence of their dominant language, English L2. As shown in a bilingual children study there is an L2 transfer effect that impacts L1 performance, regardless of exposure to their L1 (Haman et al., 2017).

During the self-paced reading experiment, we measured a couple of variables. First, we measured their accuracy in the grammatical judgement task. We compared the performances across different stimuli conditions and participant groups. We observed a significant difference between the group's performance and between the two types of

evidential markers. Given that the native speakers were not attriters, their performance was expected to be better than second-language learners. Based on the previous research on evidentiality, which suggests that indirect evidentials may pose greater difficulty compared to direct ones, our prediction was confirmed with our experiment yielding the same processing difficulty when it comes to indirect sentences (Leclercq, 2020; Arslan et al., 2015; Tokac-Scheffer, 2023; Fitneva, 2008). Acquisition studies on Bulgarian evidentiality show that evidentiality starts being used correctly at a later stage, with direct evidentials emerging first (Fitneva, 2001, 2008). Our results provide further information to support this claim as there was a significant difference in the accuracy between the direct and indirect sentences. The second-language learners showed a better understanding of the direct evidential compared to the indirect one. A noticeable distinction in our results was the significantly lower performance across groups when it came to the incorrect direct evidential. In other words, when the expected form was indirect but an incorrect direct marking was used, the participants judged the sentence to be grammatically correct. Previous research indicates that the direct evidential marking is simpler and used as the standard past tense verb form in Bulgarian (see section 1.2). Moreover, the indirect evidential is generally more complex both semantically and structurally (Jakobson, 1957/1971; Nicolova, 2017; Kutsarov, 2007; Tarpomanova, 2015). This asymmetry suggests that they may have misjudged the sentences as correct due to the assumption that the target verb was conjugated in the standard past form, which is more frequently used compared to the indirect evidential form. Later acquisition of indirect evidentials in both children and adults is attributed to the lower exposure frequency to indirect evidential examples compared to direct ones (Fitneva, 2018). Tarpomanova & Aleksova (2022) compared the occurrence of direct and indirect evidentials in the Bulgarian corpus and showed a significantly higher occurrence of direct evidential examples. This shows that in general indirect evidential marking is less frequently used in the Bulgarian language, which can explain the lower accuracy performance, particularly regarding the (incorrect) use of indirect evidentials.

Secondly, we analyzed the response speed to

the judgment questions. There was no significant difference between conditions or groups. We argued that the participants had already made their decision on the grammaticality of the sentence prior to the presentation of the question. Previous research shows that in self-paced reading experiments, most of the sentence processing occurs at the last word. This phenomenon is referred to as the “wrap-up effect”, when a participant evaluates the whole sentence and resolves any “inconsistencies” at the end of the sentence (Just & Carpenter, 1980). Similarly, they might have made their judgement as soon as they encountered the mistake in ungrammatical sentences. Tokac-Scheffer (2023) observed a faster reading speed on the last word for ungrammatical sentences among both heritage speakers (second-generation immigrants) and immigrant speakers. The lack of difference between groups indicates that the self-paced reading experiment cannot provide direct evidence for difficulty in processing. Vanpatten & Jegerski (2014) suggest that the relationship between reading speeds and processing times in Self-Paced Reading (SPR) experiments is more nuanced than merely equating slower reading with slower processing.

It is important to note the limitations of this research, particularly the small sample size, which may not represent the actual population. This can be addressed in further research that replicates this experiment with more participants. Larger participant groups would provide more reliable results and potentially a different outcome. However, as an initial step in this research topic, the current study provides reliable assumptions for the obtained results. Furthermore, it allows other researchers to replicate it and compare findings in the future. An additional limitation that could be argued is the setup of the SPR experiment. Previous studies on SPR found that cumulative display of the stimuli, where the words are not masked, is problematic (Jegerski, 2014; Vanpatten & Jegerski, 2014). Most researchers choose the non-cumulative format (the one used in our experiment) to mimic actual reading and avoid the participants developing a strategy where they reveal multiple segments at a time before reading them. However, a couple of participants reported upon participation that they found the stimuli hard to read as the words were masked.

This might have been challenging for them as it required a higher processing load and might have resulted in more mistakes or slower processing. A potential solution would be to increase the number of trial runs. This could familiarize participants with the experiment structure, however it may also lead to fatigue before the actual experiment. One suggestion for improving the experiment is to consider the lengths of the words in the stimuli as this could influence participants’ reading speeds. Moreover, the stimuli can be improved by adding more sentences and having them revised by a second-language teacher of Bulgarian to ensure the appropriateness of the stimuli for second-language learners. Furthermore, the stimuli were specifically constructed for evidential processing and may not reflect the typical structure of a Bulgarian sentence. Potentially, this experiment can also be replicated using a different set of stimuli that aligns with common language patterns. Nevertheless, these limitations do not diminish the significance of this study as it provides the groundwork for further research in this unexplored area of research.

To the best of our knowledge, this study is the first on evidentiality studies with second-language learners of Bulgarian. This makes this research an important part of the field of second-language learning and evidentiality. From previous studies on other languages with the same evidential system (like Turkish as presented in Tokac-Scheffer, 2023 and Arslan & Bastiaanse, 2020) we know that the differences we observed between accuracy in indirect and direct sentences are consistent occurrences across languages with an A1 evidential system. Through this insight from other papers, we can presume that regardless of the limitations concerning our experiment the findings of this paper can be considered as a step in the right direction. Our results and conclusions can therefore be used to inform future cross-linguistic research. Furthermore, this paper can motivate further investigation of evidentiality acquisition in late bilinguals and second-language learners with diverse language backgrounds or inspire needed in-depth research on second-language learners of Bulgarian, which is very under-explored.

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A Appendix

A list of the stimuli sentences:

A.1 Direct grammatical

"Чух тих глас, затова се обърнах бавно и видях Хокинс."

"Видях как огромният войн се взираше в стената много замислено."

"Срещнах познати в парка, които играха фризби на голямото игрище."

"Погалих кучето по главата и разбрах, че не е дружелюбно."

"Усетих студ сутринта и после проверих термометърът, показваше минус трийсет."

"Знаех, че преди да се пенсионира, чичо ми беше оправител."

"Сънувах вечерта как Дядо Коледа влезе през кухнята и падна."

"Видях вчера вечерта как Крис пристигна с нова луксозна кола."

"Бях там, когато той тайно замина с влака много надалеч."

"Разговарях с момчетата, когато се ядосаха заради оценките, които получиха."

A.2 Direct ungrammatical

"Чух момичетата на терасата, как обсъждали останалите деца от класа."

"Видях как Иван и другите идвали на срещата, която планирахме."

"Срещнах се с Хари, който бързал да отиде на кино."

"Погалих котето, но то ме охапало по ръката и избяга."

"Участвах в състезание и ми връчили медал за първо място."

"Сетих се, че когато съм ходил в ресторанта, ми хареса."

"Сънувах как един фермер ни закарал до замък на принцесата."

"Видях младите жени, които се спряли, защото голям камион премина."

"Гледах вчера пиеса, в която паднал голям смях заради актьорите."

"Дойдох на време и съм видял как си счупи ръката."

A.3 Indirect grammatical

"Твърдеше, че колегите нищо не правили, докато само той работил."

"Според информацията, която тя била получила, те са пристигнали вчера."

"Разбрах, че сестра ми е завършила двегодишното си магистърско образование."

"Чух от колега, че е пътувал цяла година из Европа."

"Казаха, че дядо ми е тръгнал на поход из планината."

"Прецених, че храната им е харесала, поради напълно облизаните чинии."

"Казаха ми, че купона е бил забавен и много щур."

"Научих от приятел, че е бил на приключение в джунглата."

"Говори се, че са го подложили на бой с камшик."

"Разказаха ми, че драконът е излизал от пещерата само привечер."

A.4 Indirect ungrammatical

"Каза ми, че моето коте избяга от кошницата вчера сутринта."

"Според съседа вчера, докато си гледаше новините, са ограбили магазина."

"Разбрах от приятел, че ресторанта предлага вкусни салати и десерти."

"Научих от радиото, че са приложиха спешни мерки заради земетресенията."

"Изглежда, че тези задачи бяха давани само на ръководителя ни."

"Чух от присъстващите, че постановката беше добра и много емоционална."

"Казаха по новините, че концертът беше отменен заради лошото време."

"Има слухове, че филмът беше получил отлични отзиви и рейтинг."

"Според интернет този университет се изкачваше в класациите по успех."

"Чух, че магазин за техника предлага големи отстъпки и промоции."

A.5 Filler grammatical

"Правя това, защото става въпрос за националната сигурност на държавата."

"Мисля, че си губен, защото прекарваш много време в бара."

"Скучно ми е всяка сутрин да си пия кафето сама."

"Пия маргарита и слушам как мексиканският оркестър пее любовна серенада."

"Вчера поръчах си нови очила, за да мога да чета."

"Запалих свещ в банята, за да релаксирам сама във ваната."

"Играха, докато не стана време да си лягат по леглата."

"Прегледах старите снимки, които ме върнаха към минали щастливи моменти."

"Изкачихме се на върха на планината, за да видим изгрева."

"Открихме загубения ключ и най- после успяхме да отворим вратата."

A.6 Filler ungrammatical

"Вечерта слънцето потъва в оранжеви нюанси, озарявайки хоризонт със светлина."

"Черен малък котарак стои оплашени и свит в тъмна алея."

"След тежки ден, тя се зарадва, че може да почине."

"Лекарят се грижи за своите пациенти с удадени и прецизност."

"С усмивка тя зарежда с позитивни енергия хората около нея."

"В новия кафене всеки четвъртък се събират група стари приятели."

"Обичайната сутрин се превръща в приключение заради натрупания убелен снегът."

"С лекота тя завладяват вниманието на всички, с които говори."

"Тя приготвиха вечеря със зеленчуци и екзотични подправки за всички."

"Посади холандските лалетата в градината, които дъщеря ѝ ѝ подари."

B Appendix

List of questionnaire questions: What is your name?

What is your age?

What is your nationality?

What is your country of residence at the moment?

How long have you lived there (current country of residence)?

What is your mother tongue?

What other languages do you feel confident in? (if none put 0)

On a scale from 1 to 10 how would you rate your level of Bulgarian?

At what age did you start learning Bulgarian? (if you are a native put 0)