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SECOND LANGUAGE PROCESSING OF ASPECTUAL VIOLATIONS IN ENGLISH: A PILOT STUDY

Abstract

Grammatical aspect informs us about the internal temporal contours of a situation. In other words, aspect provides information as to how the verbal action is to be regarded, whether it is complete, continuous, or iterative. Bosnian grammaticalizes the binary system characteristic of Slavic languages that entails that verbs are marked for the perfective or the imperfective aspect. English, on the other hand, grammaticalizes the perfect and the progressive, which do not entirely correspond to the perfective/imperfective aspectual opposition. Grammatical aspect is an obligatory category in Bosnian, whilst in English, verbs need not be morphologically marked for aspect. Expectedly, studies report different processing patterns in sentences with aspectual violations in these two languages. It has been shown that native speakers of English do not show electrophysiological responses to violations of aspect, while native speakers of Bosnian show a clear sensitivity to aspectual violations immediately at the verb. Even though they detect aspectual violations already at the point of the verb in Bosnian, their L1, in this study we investigate whether university students of English process aspectual violations in English, their L2. More precisely, we conducted a self-paced reading study to explore whether Bosnian university students of English detect aspectual violations at the position of the verb or in adjacent positions during incremental sentence processing. Our results are in line with the previous findings on L1 processing of English aspect – English aspectual violations are not detected online during sentence comprehension in L2 processing. However, there is an important difference. Unlike native speakers of English, Bosnian university students of English do not

detect aspectual violations even after the sentence has been processed. Such results provide evidence for the Shallow Structure Hypothesis in L2 processing. We, therefore, compare our findings with other studies on grammatical aspect, contrast L1 and L2 processing, and discuss English and Bosnian grammatical aspect.

Keywords: *grammatical aspect, aspectual violations, English, Bosnian, self-paced reading, L1 processing, L2 processing*

1. INTRODUCTION

It has been reported that native speakers of English do not show electrophysiological responses to violations of aspect (Flecken et al., 2015), while native speakers of Bosnian show a clear sensitivity to aspectual violations in their language (Čordalija, 2021; Čordalija et al., 2023). Even though they detect aspectual violations already at the point of the verb in Bosnian, their native language (L1), in this study we investigate whether university students of English process aspectual violations in English, their second language (L2). More precisely, the paper describes a pilot experimental study that investigated whether Bosnian L2 learners of English process aspectual violations at the verb or in adjacent positions. We first address time and aspect in general which is then followed by sections that touch on grammatical aspect and its realization in Bosnian and English. We also discuss the findings of the previous experimental studies on processing of aspect. Most importantly, we describe the current study, its design, results, and contribution to existing experimental research on grammatical aspect.

1.1. Referring to time: Tense and aspect

In language, information about time is conveyed primarily by tense and aspect. Tense and aspect, however, are concerned with time in very different ways. Tense is a deictic category that relates the time of a situation to the moment of speech (Dahl, 1985). More precisely, tense views the situation externally by locating events and states on the time axis (Comrie, 1976). Aspect, on the contrary, is a non-deictic category that expresses the internal temporal contours of the situation (Dahl, 1985; Comrie, 1976). In other

words, aspect provides information as to how the verbal action is laid out along the time axis, whether it is completed or in progress or if the event is a single or a repeated one (Dowty, 1979; Quirk, 1973; Riđanović, 2012).

Studies on aspect note the complex interrelation between grammar and lexicon. According to Dahl (1985), aspectual meanings can be expressed by morphological means in some languages, but it is also true for all languages that verbal lexemes differ in their aspectual potential, which does not exclusively entail morphological realization of that potential. In other words, grammatical aspect refers to aspectual meanings conveyed by verb morphology (e.g., *is running* – the progressive meaning signaled by *be* and the *-ing* suffix), whereas aspectual meanings that may be expressed by the verb and its arguments without any morphological endings constitute lexical aspect, aktionsart or inherent aspect (Smith, 1997; Comrie, 1976; Binnick, 1991) (e.g., *ran all day* – the progressive meaning conveyed by the constellation of the verb and the adverbial with no aspectual morphology whatsoever). Inevitably, lexical aspect and grammatical aspect interact. Nevertheless, the present study investigated processing of violations of grammatical aspect and we eliminated lexical aspect as a potential confounding variable. For that reason, the following sections focus on grammatical aspect.

1.2. Grammatical aspect

As a Slavic language, Bosnian expresses the aspectual opposition between two verbal forms, the perfective (e.g., *napisati* – ‘to have written’) and the imperfective (e.g., *pisati* – ‘to be writing’), while English aspect is based on the difference between the perfect (e.g., *has/had run*) and the progressive (e.g., *was running*). To draw a cross-linguistic parallel, we describe grammatical aspect in both Bosnian and English.

1.2.1. Bosnian

In Bosnian, grammatical aspect is an indispensable verbal category marked on finite and non-finite verb forms. The perfective form can be derived from the imperfective (perfectivization), and vice versa (imperfectivization)

(Jahić et al., 2000). Most typically, verbs are inherently imperfective and derive their perfective counterparts by prefixation (*pisati* – *napisati* ‘to be writing’ – ‘to have written’). The perfective aspectual partner can also be derived by vowel change (*bacati* – *baciti* ‘to be throwing’ – ‘to have thrown’). Means of aspectual grammaticalization aside, there are three broad aspectual meanings in Bosnian: punctual (action occurs at a single point in time, momentary), durative (action ongoing), iterative (action repetitive/habitual) (Riđanović, 2012). Perfective aspect expresses the punctual meaning as in (1), while imperfective aspect conveys the durative as in (2) and iterative meanings as in (3).

(1) Učenici su napisali esej.
Students AUX wrote_{PFV} essay
‘Students wrote an essay.’

(2) Učenici sada pišu esej.
Students now write_{IPFV} essay
‘Students are now writing an essay.’

(3) Učenici često pišu eseje.
Students often write_{IPFV} essays
‘Students often write essays.’

In summary, the imperfective form is underspecified in Bosnian so that it expresses more than one meaning so that the intended meaning is disambiguated by the sentential context. The perfective form, on the other hand, is specific, conveying the meaning of completion, which logically entails that perfective aspect cannot be used in the present tense to refer to an ongoing incomplete action (Riđanović, 2012).

1.2.2. English

An important characteristic of the English aspectual system is that grammatical aspect does not have to be expressed on the verb at all. In that case, the only type of aspectual information is the one contained in the

semantics of the simple form and its arguments (i.e., lexical aspect). When grammaticalized, English aspect is expressed periphrastically in an auxiliary + participle construction (the perfect – *to have/had run*; the progressive – *to be running*) (Quirk et al. 1985).

The perfect aspect expresses the relation between two time points: the time of the state resulting from a prior situation and the time of that prior situation (Comrie, 1976). More precisely, when perfect aspect is combined with present tense, it typically refers to a situation set in some indefinite period that leads to the present. This situation can relate to a state of affairs that extends to the present as in (4) or it may be an event or set of events that is viewed as possibly recurring as in (5) (Nelson & Greenbaum, 2013).

(4) I *have lived* here since last summer.

(5) I *have phoned* him every day since he fell ill.

On the other hand, when the perfect aspect is combined with past tense, a reference is made to a situation that happened earlier than another situation set in the past as shown in (6) (Nelson & Greenbaum, 2013).

(6) We *had heard* a lot about her before we ever met her.

Even though the meaning of punctuality is generally expressed by simple, aspectually unmarked forms in English (e.g., *I phoned him yesterday*), the perfect aspect also expresses a punctual meaning as in (7).

(7) I *had phoned* him before I called the police.

The progressive aspect indicates a durative event that is ongoing in relation to the reference time (Carnie, 2013). Whether combined with present or past tense, the progressive aspect describes an event or a state of affairs in progress or continuing as illustrated by the example in (8) (Biber et al., 2002).

(8) I *was sitting* in my office smoking James's cigarettes.

Even though the aspectual meaning of habituality is normally expressed by simple, aspectually unmarked forms (e.g., *He always writes with a special pen*), the English progressive is not incompatible with habituality. Such

habituality is conveyed by the progressive form and typically combined with a high-frequency adverbial to add the tone of disapproval and annoyance as in (9) (Quirk et al., 1973).

- (9) He's always *writing* with a special pen – just because he likes to be different.

Already at this point, it becomes clear that Bosnian and English aspectual systems differ substantially concerning the grammaticalization means as well as the semantics of aspectual partners. The next section addresses this difference in detail.

1.2.3. A comparison: Bosnian vs. English

As stated above, Bosnian and English both express grammatical aspect, but they vary considerably regarding both the formal expression and the semantic features of aspectual subcategories. Bosnian grammaticalizes the perfective and the imperfective while English grammaticalizes the perfect and the progressive. While aspect in Bosnian is generally synthetic (stems or aspectual affixes carry the perfective or imperfective meaning), English aspect is expressed analytically (the combination of the auxiliary and the main verb). In English, aspect is not obligatorily expressed on the verb. On the contrary, in Bosnian, the infinitival form of the verb is already marked for aspect. Inevitably, this formal difference leads to different semantics of aspectual systems in these two languages.

Bosnian perfective aspect expresses the totality of the situation without reference to its internal temporal constituency. In other words, the situation is presented as a single unanalyzable whole, with the beginning, middle, and end rolled into one (Comrie, 1976). In English, such holistic view of the situation is provided by the perfect aspect or by simple, aspectually unmarked forms in combination with verbs' arguments.

Furthermore, Bosnian imperfective aspect does not convey a holistic view of the situation but conceives it as consisting of stages and expressing duration or repetition. In English, such durative and progressive meaning

is expressed by progressive forms or by simple, aspectually unmarked forms. Finally, while the aspectual meaning of habituality is expressed by imperfective aspect in Bosnian, in English it is expressed by simple forms but also by the progressive aspect.

What this means is that English shows considerable flexibility in its aspectual system – one aspectual form may express more than one meaning, and one and the same meaning may be expressed by different aspectual forms and even aspectually unmarked forms. In other words, in English, neither aspectual opposition shows one-to-one correspondence between the form and the function. In Bosnian, the imperfective aspectual partner to a certain extent shows such flexibility, but the perfective aspect does not due to its straightforward distribution and one-to-one correspondence between the form and the function (Zeller & Clasmeier, 2020 for Russian; Ćordalija et al., 2023 for Bosnian/Croatian/Serbian, BCS, as referred to as in the original paper). Such important formal differences between these two aspectual systems raise the following question: Are different aspectual systems processed differently in the brain?

1.3. L1 processing of English and Bosnian aspect

One of the first studies that explored brain processing of aspect agreement in English was an event-related potentials (ERP) study by Flecken et al. (2015). This study investigated processing of aspect violations that arise due to the mismatch of aspectual information on the verb phrase with the previous temporal context (**Every day, Sophie is swimming in the pool; *Right now, Sophie swims in the pool*). By using electroencephalogram (EEG), they analyzed electrophysiological responses of the brain to aspectual violations when compared to the brain's activity during processing of sentences without aspectual violations. For aspectually incongruous sentences, the study did not find any effect that could be associated with temporal processing. Flecken and colleagues argued that the absence of a clear effect for aspectual violations suggested that aspectually incongruous sentences in English might not trigger reintegration and reanalysis processes

or additional processing costs. In other words, English native speakers did not process aspectual violations at the point where they were integrated in the sentence. Flecken et al., however, report that in the grammaticality judgment task that was performed after the sentence had been processed, English native speakers detected aspectual violations and rated them as significantly less acceptable than grammatical sentences.

Čordalija, Bastiaanse, and Popov (2023) performed an ERP study on aspectual violations in Bosnian/Croatian/Serbian (BCS). In this study, the incompatible perfective verb form was introduced into the real-present time frame in ungrammatical sentences, as in (10).

- (10) Asistenti *trenutno pročitaju članak o umjetnoj inteligenciji.
Assistants currently read_{PRS.PFV} article about artificial intelligence
'Assistants currently read an article about artificial intelligence.'

Čordalija et al. (2023) found that aspectual violations in BCS triggered an immediate and robust ERP effect normally associated with (morpho) syntactic processing (the P600). In another study that used the self-paced reading method, Čordalija (2021) showed that aspectual violations in BCS trigger longer reading times already at the verb compared to grammatical sentences. Subsequent grammaticality judgment questions also showed that aspectual violations are clearly marked as ungrammatical in BCS.

Čordalija et al. (2023) explain that in BCS, the distribution of aspectual oppositions is simple and clear. Generally, perfective and imperfective verb forms cannot be used in the same context. Perfective forms, moreover, cannot be used in the present time at all. Consequently, BCS aspectual violations are detected as soon as the violation becomes clear. On the contrary, English has a flexible aspectual system where different verb forms express similar aspectual meanings and one aspectual form can express primary and secondary meaning (e.g., *They were dancing* – progressive aspect, durative meaning; *They are always losing their keys* – progressive aspect, habitual meaning). Čordalija et al. (2023) propose that in the case of English, instead of processing aspectual violations at the verb, the parser may acti-

vate the less frequent but still plausible secondary aspectual meaning of the verb that is initially compatible with the time frame of the sentence. By the end of the sentence, the contextually inappropriate secondary meaning is discarded, and the violation becomes clear, which is why aspectual violations were labeled as ungrammatical after the sentence has been processed in a grammaticality judgment task, but not before. In other words, English aspectual violations are not detected online, at the spot, during automatic sentence processing, but only when the intended meaning becomes clear, after the sentence, in a subsequent grammaticality judgment task when they are asked to make a conscious and controlled decision about the grammaticality of the sentence. By contrast, BCS aspectual violations are processed at the verb during sentence comprehension, and they are detected again as ungrammatical in a grammaticality judgment task after the sentence has been processed. Essentially different aspectual systems entail different processing patterns.

However, there have been no experimental studies on L2 processing of English aspect by native speakers of Bosnian that do instantly react to violations of aspect in their L1. As the current study taps into this question, it is important to first address some of the most prominent theories of L2 processing in general.

1.4. L2 processing

The Bottleneck Hypothesis (Slabakova, 2008) assumes that not all components of grammar are acquired in the same way and that there are components that are more difficult to acquire than others in a second language. More precisely, this hypothesis argues that morphology is the bottleneck in L2 acquisition because it combines a variety of semantic, syntactic, and phonological features that affect the meaning of the whole sentence. On the other hand, Slabakova claims that learning L2 syntax or semantics is not an acquisitional challenge at all.

Tsimpili and Sorace (2006) formulated the Interface Hypothesis, which states that all phenomena that are processed in the internal components of

grammar (e.g., phonology, syntax, semantics) or at the interface between internal components (e.g., syntax-semantics) can be fully acquired in L2 acquisition. They predict more troublesome and incomplete acquisition of properties that are processed at the syntax-discourse level, which includes an external component of language (e.g., pragmatics, discourse), even among advanced speakers.

Clahsen and Felser (2006) conducted a study investigating the domains of morphology and syntax where they compared L1 and L2 populations. They found important differences between adult L1 and L2 processing. The study showed that adult L2 learners rely on lexical and semantic information during sentence processing more than native speakers do, and unlike native speakers, L2 speakers show reduced reliance on syntactic information during sentence processing. Consequently, they formulated the Shallow Structure Hypothesis, which argues that the syntactic representations of L2 speakers during sentence processing are less detailed and shallower than those of L1 speakers.

To investigate whether such theories can accommodate L2 processing of grammatical aspect, we designed an experiment where Bosnian university students of English were exposed to violations of a habitual time frame by a progressive verb form in English. The next sections describe the details of this experimental study.

1.5. The present study

We performed a self-paced reading experiment to answer the following research question: *Do university students of English with Bosnian as their L1 process English aspectual violations?* Violations were created by introducing a progressive verb form into a habitual temporal frame. The temporal frame was set by a topicalized time adverbial (e.g., *every day*). The context implying a habitual situation is incongruous with the semantics of the progressive verb, signaling a non-habitual event unfolding at the moment of speaking. The regions of interest were the position of the auxiliary and the main verb in the progressive construction, as well as the following

two words. The violation was disambiguated on the main verb. However, we observed the immediately preceding position, as it represents the first part of the progressive construction announcing the progressive verb. We also observed positions following the main verb in case of a spill-over effect – the effect of ungrammaticality affecting the processing of surrounding words.

Self-paced reading is a computerized method of recording a reading time for a certain segment of the sentence that is presented as an experimental stimulus. In the linear non-cumulative presentation of stimuli that this study used, participants are first presented with a series of dashes that represent words of a sentence. By pressing a button, participants reveal one word at a time while the previous word disappears. Each button press is recorded and provides an insight into how fast participants process each word. Longer reaction times at a particular position in a sentence are thought to reflect processing difficulties that arise when the parser encounters ungrammaticality or a violation of an expectation (Marinis, 2010). In the context of the present study this means the following: if Bosnian university students of English process English aspectual violations, longer reading times are expected in the regions of interest in ungrammatical sentences than in grammatical sentences.

Bosnian speakers process aspectual violations in their L1 as soon as the violation is introduced – on the verb (Čordalija, 2021; Čordalija et al., 2023). As shown by Flecken and colleagues (2015) in an ERP study, English native speakers did not show a clear effect of aspectual violations in English during real-time sentence processing. However, offline grammaticality questions showed that English native speakers rejected sentences with aspectual violations.

In the context of our study, several factors must be considered. The present study comprised aspectual violations that were essentially violations of semantics. Morphologically, the progressive verb was well-formed. It is its progressive semantics that was not compatible with the habitual semantics of the sentence. Semantic information is claimed to be acquired and

processed with relative ease. Nevertheless, studies have shown that grammatical aspect violations are processed as (morpho)syntactic and not as semantic violations (Čordalija et al., 2023; Zeller & Clasmeier, 2020; Zhang and Zhang, 2008). Still, the Interface Hypothesis (Tsimplici & Sorace, 2006) and the Bottleneck Hypothesis (Slabakova, 2008), would predict a similar linguistic performance by Bosnian L2 speakers of English, university students more precisely, and L1 speakers of English as grammatical aspect is processed by the syntactic component of grammar and not by the interface between components. On the contrary, the Shallow Structure Hypothesis (Clahsen & Felser, 2006) suggests that L1 and L2 processing of syntactic phenomena differ significantly with L2 processing entailing more superficial syntactic representations.

2. METHOD

2.1. Participants

Participants in our study were 17 undergraduate students at the Department of English Language and Literature, University of Sarajevo. Participants were L1 speakers of Bosnian with English as their L2. The exclusion criteria entailed that participants must be matched on previous knowledge of English. We achieved this by testing a group that was exposed to the same courses in English linguistics from the beginning of their studies – second-year students. Furthermore, to eliminate the threat of potential confounding variables even within such a homogenous group, we administered a test on previous knowledge of English, more specifically on the use of English structures and forms. Only participants with accuracy of 80% and above were included in the study. Four participants were excluded based on this criterion. Participation in the study was on a voluntary basis. At the beginning of the experiment, participants were informed of the duration of the experiment and the procedure. They were told that they could withdraw from the experiment at any time. All the data obtained from participants were anonymized by being assigned a code.

2.2. Materials and design

Experimental sentences were designed as a violation paradigm. Grammatical and ungrammatical sentences formed minimal pairs in the regions of interest: the auxiliary, the main verb, and the prepositional phrase functioning as a place adverbial. Twelve intransitive predicates were used to create two different sentences, yielding a set of 24 different sentences that each occurred with and without an aspectual violation. Consider the predicate *eat in the restaurant* in the following sentences:

- (11) *Every day/right now, lawyers are eating in the restaurant while reading about a new case.
- (12) At the moment/*every week, doctors are eating in the restaurant after a night shift.

Predicates (the verb + adverbial) were taken from the study by Flecken et al. (2015). All predicates were atelic, as the Aspect Hypothesis predicts that the progressive aspect is more compatible with ongoing atelic situations. All the predicates were also atelic in Bosnian, our participants' L1, as Slabakova (1999) showed that telicity in L1 may affect aspect processing in L2.

Frequencies for verbs were taken from the British National Corpus, and all verbs had a frequency less than two standard deviations from the mean. Prepositions and the NP complements in adverbial PPs were also matched on frequency so that prepositions and nouns with a frequency of two standard deviations above or below the mean were discarded and replaced. This required that two nouns from the study by Flecken et al. be replaced. Sentences have the following structure: topicalized time adverbial + subject noun (occupation noun in plural) + auxiliary be + main verb + adverbial 1 + adverbial 2.

- (13) Right now/*every week, lifeguards are swimming
[TOPICALIZED ADVERBIAL] [SUBJECT] [BE] [VERB]
in the pool to stay in shape.
[ADVERBIAL 1] [ADVERBIAL 2]

The main verb was always kept constant. The ungrammaticality was introduced/eliminated by manipulating the adverbial. In grammatical sentences, adverbials *right now* and *at the moment* were used as they are congruent with the progressive aspect. In ungrammatical sentences, we used *every day* and *every week* because they are incongruent with the progressive aspect. The first postverbal adverbial was also kept constant in sentences that use the same verb. We observed reading times on the auxiliary, on the main verb and on the adverbial to check for a delayed effect of ungrammaticality. Therefore, it was important to keep the first adverbial constant too. The second adverbial was introduced so to postpone the end of the sentence and possible wrap-up effects affecting reading times on the first adverbial.

Experimental sentences comprised 24 items in a violation paradigm. To avoid priming effects resulting from one and the same participant being exposed to both the grammatical and ungrammatical forms of a sentence, experimental sentences were distributed across two presentation lists by using Latin Square design. We also created 48 fillers that were added to each list. Fillers involved violations of tense and person/number concord. Tense violations were also designed as a violation paradigm, as the following examples show.

- (14) Last week/*tomorrow pilots waited at the desk since all rooms were booked when they arrived.
- (15) *Next week/yesterday reporters waited at the desk only to be taken to the conference room a few minutes later.

Sentences with tense violations had a very similar structure to experimental sentences. The time adverbial was topicalized and followed by the subject noun (occupation noun in plural). The verb was always inflected for the simple past tense. Two adverbials followed the verb as in the experimental sentences. The ungrammaticality was introduced/eliminated by manipulating the adverbial. In grammatical sentences, adverbials *yesterday* and *last week* were used as they are congruent with the simple past tense. In ungrammatical sentences, we used *tomorrow* and *next week* as they are

incongruent with past time reference of the verb. The verb and the first postverbal adverbial were kept constant to create sentences similar to experimental ones that would serve as distractors.

The other set of filler sentences involved violations of the person-number agreement. These sentences were introduced to alter the sentence structure, thereby preventing the participants from developing expectations that all sentences have a fixed structure: adverbial, subject, verb, adverbial 1, and adverbial 2, which was the structure of experimental sentences and type I filler sentences. Type II filler sentences started with a proper name as the subject of the sentence, the grammatical or ungrammatical form of the verb, object, and an adverbial or two adverbials in sentences with intransitive verbs.

(16) *Benjamin look a lot like his mother.

(17) Paul cuts old branches once a month.

The test on pre-knowledge of English comprised multiple choice tasks, fill-in tasks, and grammaticality judgment tasks concerning verbal categories (tense, aspect, mood, voice, and finiteness), the difference between stative and dynamic verbs, and subject-verb agreement. The test included 85 sentences.

2.3. Procedure

The experiment consisted of one experimental session and was performed online via Pen Controller for Internet Based Experiments (PC Ibex; Zehr & Schwarz, 2018) on participants' laptops or computers in their own setting. The experiment started with the consent form, instructions, and five practice examples. Experimental sentences and fillers were segmented into words and shown in a linear, non-cumulative presentation. A series of dashes was first presented on the screen, corresponding to individual words in the sentence that the participant revealed by pressing the space button on the keyboard. In each trial, after the presentation of the last word in the sentence, the sentence disappeared and a grammaticality question followed. Experimental sentences and fillers were pseudo-randomized

so that experimental sentences never immediately followed one another. Reading times for each word were automatically recorded and stored on the PC Ibex platform.

2.4. *Data analysis*

To analyze whether aspect violations are processed at the verb or in adjacent positions, participants' reading times in the regions of interest were used as a dependent variable. More specifically, we compared reading times in the regions of interest in grammatical and ungrammatical sentences.

Regions of interest were the following: the auxiliary of the progressive construction, the main verb of the progressive construction, the preposition of the adverbial PP, the article of the NP complement in the adverbial PP, and the noun complement of the adverbial PP. The critical region was the position of the main verb of the progressive construction, as that is the position where the violation becomes clear. However, we also observed the preceding position, as it is also part of the progressive construction, and the three following positions to check for a delayed effect of ungrammaticality. For the offline grammaticality judgment task at the end of the sentence, the accuracy rate was calculated as the percentage of correct responses. For statistical analysis, we used R (R Core Team, 2021) and the lme4 package (Bates et al., 2015) to perform a linear mixed effects analysis of the relationship between grammaticality and participants' reading times in the regions of interest. The sole fixed effect was grammaticality, that is, the presence or absence of the aspectual violation. Random effects were intercepts for subjects and items. *P*-values were obtained by likelihood ratio tests of the full model with the fixed effect against the reduced model without the fixed effect in question.

3. RESULTS

We present the results of the online self-paced reading task first and then the results of the offline grammaticality judgment task.

3.1. Online data

The output of the linear mixed effects model for aspectual violations in the regions of interest is given in Table 1.

Table 1. *Relationship between the fixed effect and reading time in ms at the position of the auxiliary, the main verb, the preposition, the article, and the noun*

Fixed effect	Sentence position				
	auxiliary	main verb	preposition	article	noun
No violation	473	541.8	426.7	390.8	437.8
Violation	-9.2	-52.8	+20.09	+25.9	-8.6

The linear mixed effects analysis of the reading times revealed that the presence of the aspectual violation in experimental sentences was not a significant factor in sentence processing, and it did not affect reading times in any of the regions of interest in comparison with grammatical experimental sentences without aspectual violations ($p=0.7$; $p=0.2$; $p=0.35$; $p=0.4$; $p=0.79$).

3.2. Offline data

The accuracy analysis of grammaticality judgments that were part of the SPR experiment showed the following results. In the violation paradigm, grammatical sentences were judged correctly in 99% of trials whereas ungrammatical sentences were judged correctly in 20% overall participants' responses. The offline results are summarized in Table 2. Such results imply that, at the end of the experimental sentence, aspectual violations were largely judged incorrectly as being grammatical.

Table 2. *The accuracy rate in the grammaticality judgment task*

Grammaticality	Accuracy [%]
	Aspect
Grammatical sentences	99
Ungrammatical sentences	20

4. DISCUSSION

This experimental study investigated L2 processing of grammatical aspect. Our research question concerned whether university students of English with Bosnian as L1 process aspectual violations in English. The self-paced reading data show that this is not the case, neither at the main verb, where the violation becomes clear, nor at other positions of interest that we checked for early or late effects of ungrammaticality (the position of the auxiliary verb, preposition, article, and noun). In other words, during sentence processing, there was no difference in L2 linguistic performance between sentences with aspectual violations and sentences without aspectual violations in English. Bosnian speakers do, however, detect aspectual violations in their L1 immediately at the point of the violation (Čordalija, 2021; Čordalija et al., 2023). Nevertheless, these results are in line with the study conducted by Flecken et al. (2015), which reports no effect of English aspect violations in L1 processing. Initially, this confirms our prediction that L1 and L2 processing of grammatical aspect is comparable as aspect is processed by the internal syntactic component of grammar.

However, the grammaticality judgment data shows that grammatical sentences (i.e., sentences without aspectual violations) were evaluated as correct in 99% of the cases, whereas ungrammatical sentences (i.e., sentences containing aspectual violations) were recognized and evaluated as unacceptable in only 22% of cases. This suggests the high tolerance for ungrammatical sentences such as *Every day, students are dancing in the club to unwind after exhausting lectures*. At this point, L1 and L2 processing of aspect prove to take different paths.

L1 speakers of English rejected ungrammatical aspectual sentences, whereas Bosnian university students of English predominantly rated them as acceptable. Therefore, Bosnian university students of English did not detect aspectual violations in either the self-paced reading task or the grammaticality judgment task. To speculate why that is the case, we must address the L1 processing of English aspect again.

Čordalija et al. (2023) argued that Bosnian aspectual violations are detected immediately due to a clear form-function correspondence in Bosnian aspectual system and no overlap in aspectual forms and meanings that they express. On the contrary, in the English aspectual system, one aspectual meaning can be conveyed by different forms, and one form can convey different aspectual meanings. For example, the punctual meaning can be conveyed by the present perfect, past perfect, or simple past form. Similarly, the habitual meaning is normally conveyed by simple forms, but sometimes progressive forms can be used in habitual contexts too (e.g., *He is always bringing his brother*). Flecken et al. (2015) and Čordalija et al. (2023) suggest that in L1 processing of English aspectual violations, participants did not detect aspectual violations during sentence processing due to the fact that the forms used to create violations have a secondary aspectual meaning that is compatible with the time frame of the sentence. Instead, the parser activated this secondary habitual meaning of the progressive as well as the primary one and deactivated the habitual interpretation at some point before the end of the sentence as it was not contextually appropriate. Consequently, in the subsequent grammaticality judgment task, the primary meaning of the duration of the progressive form was not compatible with the habitual time frame, which is why L1 speakers rated sentences with aspectual violations as ungrammatical.

Our study suggests that L2 processing of aspect does not involve the same mechanisms as L1 processing. Even though it is tempting to claim that Bosnian L2 speakers activated the primary and secondary meanings of the progressive as L1 speakers, there is no evidence that the secondary, contextually inappropriate meaning is ever discarded, as reading times on words following the incongruous aspectual form are not significantly longer than in grammatical sentences. Furthermore, in the grammaticality judgment question, participants did not reject sentences with aspectual violations as ungrammatical but predominantly accepted them as grammatical.

Such a processing pattern is strikingly different from L1 processing and does not provide evidence for predictions of the Interface Hypothesis

(Tsimpli & Sorace, 2006) and the Bottleneck Hypothesis (Slabakova, 2008). Although aspect is processed by the syntactic component of grammar and should be fully acquired and parallel to L1 processing, the presented experimental results suggest L2 processing of grammatical aspect is qualitatively different from L1 processing.

On the other hand, the Shallow Structure Hypothesis by Clahsen and Felser (2006) argues that L2 learners generally do not build deep syntactic representations of sentences with structural details as native speakers do. We may claim then that it is because it is processed by the syntactic component of grammar that L2 processing of English aspect is not comparable to L1 processing, as syntactic representations in L2 processing are shallow and do not contain fine structural details.

In other words, for L2 learners, it is easier to process semantic phenomena, whereas building syntactic representations implies a shallow structure without the structural details characteristic of L1 processing. For that reason, even at an advanced level, L2 processing patterns of sentences with aspectual violations and L2 processing patterns of sentences without aspectual violations are the same during real-time sentence comprehension and even after the sentence is processed.

5. CONCLUSION

The current study is part of a project that investigates grammatical aspect in English and Slavic languages. This pilot study confirmed the predictions of the Shallow Structure Hypothesis (Clahsen & Felser, 2008) and did not find evidence for the Interface Hypothesis (Tsimpli & Sorace, 2006) and the Bottleneck Hypothesis (Slabakova, 2008) as far as grammatical aspect processing is concerned. However, we are aware that the study would have greater statistical power with a larger sample. Therefore, the next study on L2 processing of English aspect by advanced Bosnian learners will include a larger and more diverse sample to attempt to replicate the findings of

the current pilot study. More specifically, we plan to test another group of advanced learners of English, students at the Department of English Language and Literature as well as students of a non-linguistic discipline to investigate the impact of metalinguistic knowledge of English linguistics in L2 processing. In another study, we test a group of advanced Polish L2 speakers of English to explore whether a different type of a Slavic language as L1 will lead to different L2 processing patterns of English grammatical aspect.

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PROCESIRANJE NEGRAMATIČNIH OBLIKA GLAGOLSKOG VIDA U ENGLISKOM KAO STRANOM JEZIKU: PILOT STUDIJA

Sažetak

Glagolski vid (gramatički aspekt) daje informaciju o unutrašnjoj vremenskoj strukturi neke situacije. Drugim riječima, glagolski vid nas informira o tome da li se glagolska radnja shvata kao svršena, nesvršena ili iterativna. Bosanski jezik morfološki realizira binarni sistem karakterističan za slavenske jezike, koji podrazumijeva da su glagoli obilježeni svršenim ili nesvršenim glagolskim vidom. U engleskom sistemu glagolskog vida gramatički je izražen kontrast između perfekta i progresiva, koji ne odgovaraju u potpunosti razlici između svršenog i nesvršenog vida. Glagolski vid je obavezna kategorija u bosanskom, dok u engleskom jeziku glagoli ne moraju biti morfološki obilježeni gramatičkim vidom. U skladu s ovim razlikama, studije su pokazale različite obrasce procesiranja u rečenicama sa negramatičnim oblicima glagolskog vida u ova dva jezika. Ističe se da izvorni govornici engleskog jezika ne pokazuju elektrofiziološki odgovor na negramatične oblike glagolskog vida, dok izvorni govornici bosanskog odmah prepoznaju negramatične oblike glagolskog vida i to već na glagolu. Iako prepoznaju negramatične oblike glagolskog vida u svom maternjem jeziku, u ovoj studiji smo istraživali da li izvorni govornici bosanskog, koji su ujedno napredni govornici engleskog, procesiraju negramatične oblike glagolskog vida u engleskom, svom prvom stranom jeziku. Dakle, proveli smo studiju koja koristi metodu čitanja slobodnim ritmom kako bismo istražili da li izvorni govornici bosanskog, s engleskim kao prvim stranim jezikom, prepoznaju negramatične oblike glagolskog vida na glagolu ili u susjednim pozicijama za vrijeme inkrementalnog rečeničnog procesiranja. Naši rezultati su u skladu s ranijim otkrićima o L1 procesiranju glagolskog vida u engleskom – negramatični oblici glagolskog vida u engleskom jeziku se ne prepoznaju kao negramatični tokom procesiranja rečenice ni u L2 procesiranju. Međutim, postoji bitna razlika u odnosu na bosanski. Za razliku od izvornih govornika engleskog jezika, L2 govornici nisu prepoznali negramatične oblike glagolskog vida ni nakon što je čitava rečenica procesirana. Ovakvi rezultati upućuju na tačnost hipoteze o površnoj sintaksičkoj strukturi u L2 procesiranju. U ovom radu poredimo naše rezultate s rezultatima drugih studija o temi glagolskog vida,

pravimo kontrast između L1 i L2 procesiranja te diskutujemo glagolski vid u engleskom i bosanskom jeziku.

Ključne riječi: *glagolski vid / gramatički aspekt, negramatični oblici glagolskog vida, engleski jezik, bosanski jezik, metoda čitanja slobodnim tempom, L1 procesiranje, L2 procesiranje*