About Accents:
An ERP Study on Prosodic Processing of Different Native Varieties of the Same Language

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Abstract

This study explores the possibility that individuals can simultaneously exhibit native proficiency in a language while displaying nonnative characteristics in a particular variety within that language. Several studies have found that between-variety phonemic differences influence phonological processing, and that between-variety prosodic differences influence prosodic processing. This aligns with the Different Processes Hypothesis, which states that the less familiar sounds are to a speaker, the more their cognitive approaches in processing these sounds differ from the approaches used when processing their own, familiar, phonemes. This ERP study explores the possibility that phonemic differences can influence prosodic processing, thereby applying this interface between phonemic differences and prosody to the Different Processes Hypothesis. American and British speakers of English were instructed to listen to Standard Southern British English speech that contained contrastive focus marking either on the verb or on the object. Half of the stimuli, which were obtained from Ganga *et al.* (2024), was preceded by a context sentence, whereas the other half was not. Below, an example of the stimuli is depicted.

Context sentences	Target sentences	
	Verb accentuation	Object accentuation
The dinosaur has a bucket and a suitcase. He was going to throw them and carry them. Then he changed his mind.	a. The dinosaur is only CARRYING the bucket.	b. The dinosaur is only carrying the BUCKET.
*No context	c. The dinosaur is only CARRYING the bucket.	d. The dinosaur is only carrying the BUCKET.

EEG activity was measured and analysed. The results showed that British and American speakers differed in how they processed Standard Southern British English contrastive focus marking. To elaborate, although context did not play a facilitatory role, the American group showed a negative expectancy peak when context was absent and pitch accent was present, while the British group exhibited an accent positivity when in the absence of context and the presence of accentuation. As expected, the phonemic differences between American and British English resulted in a different cognitive approach between the two groups to prosodic processing. It can be concluded that, therefore, the Different Processes Hypothesis can be extended to the interface between phonemic differences and prosody, meaning that speakers can adopt a nonnative-like approach to prosodic processing due to phonemic differences.

Keywords: prosodic processing, English, contrastive focus marking, *only*, ERP

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1. Introduction

This study explores the possibility that individuals can simultaneously exhibit native proficiency in a language while displaying nonnative characteristics in a particular variety within that language. While studies have shown that phonemic differences between native language varieties influence phonological processing (Brunellière *et al.*, 2009; Conrey, Potts & Niedzielski, 2005; Goslin, Duffy & Floccia, 2012), and prosodic differences influence prosodic processing (Arnhold *et al.*, 2020), this study will explore whether phonemic differences impact how one processes prosody.

Using an event-related potential (ERP) paradigm of electroencephalography (EEG), the current paper investigates the influence of phonemic differences between two native varieties of the same language on prosodic processing. To elaborate, phonemic differences in this paper refer to the segmental part of speech, meaning the way phonemes (i.e., smallest units of sounds) are pronounced. On the other hand, prosodic processing refers to the processing of prosody, the suprasegmental part of speech: the intonational patterns such as pitch accent, vowel lengthening, and pauses. The following sections will examine the role of prosody in spoken language and investigate if prosody and the interface between prosody and phonemic differences can be integrated into existing theories.

2. Theoretical background

2.1 Perceptual Distance Hypothesis

Much research has been conducted in order to establish how different varieties – may it be native or nonnative – are perceived. One theory, the Perceptual Distance Hypothesis, posits that the greater the linguistic divergence from the home variety, the longer the processing time required (Goslin, Duffy & Floccia, 2012). For instance, Clarke and Garrett (2004) investigated whether short periods of exposure to speech different from listeners' home varieties changed the listening behaviour. They conducted an experiment with native speakers of American English who listened to speech produced by native (American) or nonnative (Mexican) speakers of English. After each sentence was auditorily presented, a word, which was either identical to or slightly different from the last word of the preceding sentence, was visually presented and participants were instructed to answer as quickly as possible with a yes-button if it was identical or with a no-button if it was not. The response times and error rates were measured. The results showed that the group listening to the nonnative speech had a higher error rate than the group listening to the native speech. Moreover, the response times of the former group were also longer than those of the latter group, but a brief period of exposure to the nonnative variety gradually decreased the response times (Clarke & Garrett, 2004).

2.2 Different Processes Hypothesis

The above findings support the Perceptual Distance Hypothesis, since processing nonnative speech took longer than processing native speech (Clarke & Garrett, 2004). However, the reason behind this delay is not clear, and some researchers suggest that these delays do not stem from processing lags, but rather from distinct cognitive approaches to different varieties. This theory is called the Different Processes Hypothesis (Goslin, Duffy & Floccia, 2012). Specifically, it suggests that encountering unfamiliar sounds prompts a different processing mechanism than when exposed to familiar sounds. This finds support in observations of children's linguistic adaptation. Chambers (1992) demonstrates that children readily adjust their dialect to match a new native variety within their home country following relocation. However, they struggle to adapt to nonnative varieties upon international relocation, despite comparable exposure levels (Chambers, 2002).

The Different Processes Hypothesis thus suggests that listeners will adopt different strategies when processing sounds that are absent in their own spoken variety or that are unfamiliar to them, compared to sounds that are present or familiar. Conrey, Potts, and Niedzielski's (2005) study utilised stimuli with vowels such as in pin/pen, which are merged into one vowel in some American dialects of English, while the contrast between these vowels is remained in other American varieties of English. Speakers of American varieties with and without this vowel contrast listened to a sentence which always ended with a word with either the merger vowel (as in pin or pen) or the control vowel (as in pain or pine, which is stable in most – if not all – American varieties). Subsequently, a word appeared on screen which was identical to the last word of the sentence auditorily presented, or a minimal pair containing the vowel equivalent. The listeners were instructed to indicate whether or not this word was the word they had heard, while their EEG activity was measured. Behavioural results showed that on average, 59% of the incongruent pin/pen stimuli were interpreted as identical by the merged dialect group, whereas the same condition was falsely interpreted as identical 22% of the time by the unmerged dialect speakers (Conrey, Potts & Niedzielski, 2005). This shows that listeners who did not distinguish between the vowels in their own speech, had more difficulty distinguishing the vowels in perception. Moreover, ERP results showed that merged dialect speakers had a different response to the incongruent merger vowel stimuli than the unmerged dialect speakers. To elucidate, although there were no neurological differences between the groups regarding the control pain/pine stimuli, the merged dialect group exhibited a reduced late positive component (LPC) compared to the unmerged dialect group when presented with incongruent pin/pen stimuli. The LPC is associated with episodic memory and the processing of incongruencies; thus, a larger LPC response indicates that the discrepancy has been processed at a conscious level, drawing on stored auditory templates. In contrast, a reduced LPC suggests that the speakers are unable to consciously distinguish between the sounds (Conrey, Potts & Niedzielski, 2005). This finding supports the Different Processes Hypothesis as it demonstrates that phonemic differences between native varieties of the same language can reveal distinct processing mechanisms for these phonemes.

Sounds that are not used in the speech of the listener are not always processed differently; familiarity due to long-term exposure can affect one's processing. To elaborate, Goslin, Duffy and Floccia (2012) found that although Standard Southern British English (SSBE) speakers differed from Glaswegian English speakers while processing Glaswegian English, Glaswegian speakers of English did not differ from SSBE speakers when processing SSBE speech, likely due to the high exposure to SSBE in the United Kingdom. Brunellière *et al.* (2009) also demonstrated that exposure, rather than only the listener's spoken variety, plays a pivotal role within the Different Processes Hypothesis. This study utilised EEG to investigate how merger vowels are processed by speakers of different varieties of the same language. Particularly, they examined how Swiss French speakers who are regularly exposed to other varieties of French, process vowel contrasts in their own variety. In Swiss French, both the vowel contrasts of /e/ and /ɛ/ and of /ø/ and /y/ are stable. However, in Northern and Southern French, the /ø/–/y/ contrast remains stable while the /e/–/ɛ/ contrast is disappearing or already absent. Despite this linguistic difference, Swiss French speakers exhibited distinct neural responses to the vowel contrasts. While they showed a discernible P200 ERP component for the /ø/–/y/ contrast, indicating that they perceived the vowels as belonging to separate phonemic categories, they did not display the same response for the /e/–/ɛ/ contrast, suggesting that these vowels were perceived as belonging to the same phonemic category. This finding highlights the influence of long-term exposure on language processing. Swiss French speakers demonstrated a perceptual pattern more aligned with varieties other than their own, despite maintaining their own linguistic distinctions.

2.3 Prosody and the Different Processes Hypothesis

The current study focused on prosodic processing, rather than phonological processing, by speakers of different varieties of the same language. The presence of prosody in speech is crucial, as it provides immediate cues that aid in sentence comprehension, influencing the incremental construction of syntactic representations in real-time. Additionally, prosody plays a crucial role in integrating semantic and pragmatic aspects of communication, offering valuable insights into how language is structured and understood (Speer & Blodgett, 2006). By studying prosodic processing, researchers can uncover the fundamental role of prosody in language comprehension and its impact on cognitive mechanisms involved in processing spoken language.

Prosodic cues can disambiguate meaning, convey emphasis, and guide the interpretation of spoken language, often preceding syntactic or vocabularic information (Speer & Blodgett, 2006). This was illuminated in an eye-tracking study by Chen, Den Os and De Ruiter (2007), where British English speakers demonstrated their ability to anticipate upcoming words based on prosodic cues. Participants were presented with visual stimuli including objects (like candy and a candle, together with the example in Table 1) alongside geometrical shapes, while hearing instructions in Standard Southern British English such as shown in Table 1 below. When the information status was given, the object in instruction 1 was identical to the object in instruction 2 (i.e., *candle*), but when it was new, instruction 1 was not (i.e., *candy*).

Table 1
Experimental stimuli in Chen, Den Os and De Ruiter (2007; examples from Arnhold *et al.*, 2020, p. 803)

	Information status: Given	Information status: New
Instruction 1	Put the candle above the diamond.	Put the candy above the diamond.
Instruction 2	Now put the candle below the triangle.	Now put the candle below the triangle.

The target word (e.g., *candle*) and the competitor (e.g., *candy*) were always identical until the final syllable. The critical manipulation lay in the prosodic marking of the target word (*candle*) in the second instruction, which could be accompanied by a rising pitch accent, a falling pitch accent, or no accentuation at all. Eye movements were tracked before the disambiguation point, revealing the participants' predictive abilities. The results indicated that a falling pitch accent was associated with newness, whereas a rising pitch accent or unaccentuated words signalled givenness. This underscores how prosodic patterns, akin to segmental phonology, influence word processing.

Extending this inquiry, the above study was replicated with Canadian listeners of English (Arnhold *et al.*, 2020), which found a different approach to prosodic processing compared to British listeners of English. Specifically, the Canadian native speakers of English associated falling pitch accents with newness and no accentuation with givenness, similarly to the British English speakers. However, no significant relation between the rising pitch accent and information status was found, which was similar to the behaviour of Dutch listeners of English, who did not use any mapping between prosody and information status and rather utilised segmental information when identifying the words (Chen & Lai, 2011). This indicates that "Canadian speakers, while of course native speakers of English, are in that sense nonnative speakers of the British variety" (p. 805).

Notably, in another experiment in Arnhold *et al.* (2020), Canadian listeners were presented with stimuli recorded by a Canadian speaker of English who imitated the prosody of the British English speaker who recorded the stimuli in the eye-tracking study. Thus, the stimuli were made similar to British English in the form-meaning mapping between pitch accent and information status, while being Canadian on the phonemic level. To elaborate, the Canadian listeners were familiar to the phonemes in the stimuli, being identical to their own language variety, but unfamiliar to the form-meaning mapping, which was similar to the British variety of English. This experiment showed discrepancies in perceived appropriateness, which suggests that the Canadian and British varieties of English have distinct prosodic norms (Arnhold *et al.*, 2020). A follow-up study by Kim and Arnhold (2024) moreover showed that Canadian prosody differs from General American prosody, and also from previously established prosodic norms in British English. In essence, these findings underscore that when listeners encounter an unfamiliar variety of their native language, which employs prosody differently to signal information status, this prosodic information is processed differently compared to native speakers of that specific variety.

In summary, previous studies stress that a native listener will process phonemes that are unfamiliar to them differently from phonemes that are familiar (Brunellière *et al.*, 2009; Conrey, Potts & Niedzielski, 2005; Goslin, Duffy & Floccia, 2012). Likewise, native listeners process a rather unfamiliar use of prosodic patterns differently from familiar ones (Arnhold *et al.*, 2020). It therefore seems that the Different Processes Hypothesis can be extended to the realm of prosodic processing. However, the intersection of these disparities and processing strategies, particularly whether phonemic differences exert any influence on prosodic processing, is uncharted territory. While Arnhold *et al.* (2020) has shown that speakers can behave nonnative-like in their own native language, it was clear that this was due to the prosodic differences between the two scrutinised varieties (Kim & Arnhold, 2024). The current study aimed to understand whether phonemic differences may influence prosodic processing, by investigating two native varieties of English that use identical prosodic patterns in the observed pitch accent but are different phonemically, as described in the next section.

2.4 Comparison between American and British English

Phonemic differences between Standard Southern British English (SSBE) and General American English (GAE) include variations in rhoticity, the vowel distinction in words like "bath" ([bɑːθ] in SSBE and [bæθ] in GAE), the pronunciation of the "lot" vowel ([ɒ] in SSBE and [ɑː] in GAE), the insertion of a [j] sound by SSBE speakers in words like "student" or "new", and the pronunciation of the middle consonant in "letter" as [t] by SSBE speakers or [t̬] by GAE speakers (Darragh, 2000). Regarding prosody, Darragh (2000) highlights differences in word stress for words like "ballet" or "perfume", the production or elision of the penultimate unstressed syllable in words like "secretary" or "necessary", and the generally slower speech rate of Americans compared to Britons.

A study comparing British and North American English, conducted by Couper-Kuhlen (2020), focuses on prosodic structures in other-repetitions. These are repetitions produced by the interlocutor rather than the initial speaker, including repair initiations seeking clarification or specification and displays of surprise, disbelief, or challenge. Couper-Kuhlen (2020) found that while the North American group used more rising contours than the British group, both varieties predominantly use the same pitch contours for many actions. Specifically, in other-repetitions where interlocutors aim to repair the conversation, both the British English and North American English speakers either used a level or fall from high pitch accent, while North American English speakers additionally used a rise from low pitch accent. Other-repetitions that were beyond repair showed either a high rise-fall or a fall from high pitch accent in both groups, and the North American group additionally used a rise from low pitch accent here, as well. Lastly, other-repetition actions seeking to register information were given a fall from low pitch accent in both groups. To summarise, while North American English speakers use a rise from low while British speakers do not, according to the results of Couper-Kuhlen's (2020) study, North American speakers should be familiar with the British pitch contours as these contours are all used by North American speakers as well. A confound of this study is, however, that Canadian speakers are included in this study, while Kim and

Arnhold (2024) showed that Canadian and General American speakers adopt different pitch contours.

Similarities between British and American prosodic structures in narrow and contrastive focus have also been identified. Narrow focus typically emphasises a word in a syntactic constitute, which is contrary to broad focus, which covers a scope larger than a word (Gussenhoven, 2008). Contrastive focus can be either narrow or broad in scope. Contrastive narrow focus emphasises a constituent that rejects any alternative proposed by the speaker or the interlocutor (Gussenhoven, 2008). For instance, the sentence *I only ate the PIZZA* (where capital letters represent prosodic emphasis) denotes that the pizza was eaten, but simultaneously that something else was not. On the other hand, *I only ATE the pizza* denotes that the pizza was eaten, but nothing else was done to it. While there are several terms for this type of focus, such as corrective or counterassertive focus (Gussenhoven, 2008), the current study will use the common term contrastive focus marking (hereafter CFM). Several studies have shown that while duration is prolonged when something receives narrow focus, a higher pitch is a more prominent sign of narrow focus in both American and British English (Breen *et al.*, 2010; Rognoni, 2014; Sityaev & House, 2003; Speer & Ito, 2011; Visceglia, Su & Tseng, 2012). Moreover, both varieties frequently use the pitch accents L+H* and H*[1] followed by a low phrasal accent (or a fall with or without a rise leading to the high tone, transcribed as H*L in the British IViE notation) when contrastive or narrow focus is present (Sityaev & House, 2003; Speer & Ito, 2011).

Hence, while SSBE and GAE exhibit notable phonemic differences, their use of pitch accents in marking narrow and contrastive focus are similar. This sets the current paper apart from Arnhold *et al*. (2020), where the observed groups use different prosodic contours (Kim & Arnhold, 2024); thus, Arnhold *et al.*'s (2020) results were found due to prosodic differences between the groups. The similarity between American and British English in terms of prosodic contours allows for the current paper to investigate whether phonemic differences influence the processing of prosodic structures.

2.5 EEG and contrastive focus marking

In order to establish whether American and British speakers of English exhibit different approaches in processing SSBE speech, the brain-imagining technique electroencephalography (EEG) was used in the current study. EEG is a method whereby the

[1] ToBi annotation is used here, as both papers utilised ToBi annotation. The H stands for *high* while the L means *low*. The asterisk represents the placement of stress.

electrical brain activity is measured at the scalp and recorded over time, by means of a headcap with connected electrodes (Van Hell, 2023). It has a millisecond resolution and thus is an excellent technique to provide a temporal analysis of the brain activity. An event-related potential (ERP) is a typical response of the brain that is related to a particular event, such as the onset of a critical word in a linguistic stimulus, and can be measured using EEG.

This study drew upon the work of Ganga *et al.* (2024), employing stimuli in SSBE containing the word *only*. When the focus particle *only* occurs in a sentence, it conveys that a contrastive element will appear, and this element is emphasised by means of CFM (Ganga *et al.*, 2024). Ganga *et al.*'s (2024) original investigation centred on native English speakers and advanced Dutch learners of English, as the two languages exhibit distinct preferences in the word order of sentences with *only* containing CFM. To expand, Dutch has a more flexible word order than English and typically places CFM adjacent to *only*, meaning that the Dutch equivalent of *only* is positioned preceding the accentuated word. While this structure is also possible in English, it is less commonly used. The researchers sought to ascertain whether this structural discrepancy influenced prosodic processing. An example of the stimuli is provided in Table 2.

Table 2
Experimental stimuli in Ganga *et al.* (2024, p. 7).

Context sentences	Target sentences	
	Verb accentuation	Object accentuation
The dinosaur has a bucket and a suitcase. He was going to throw them and carry them. Then he changed his mind.	a. The dinosaur is only CARRYING the bucket.	b. The dinosaur is only carrying the BUCKET.
*No context	c. The dinosaur is only CARRYING the bucket.	d. The dinosaur is only carrying the BUCKET.

The prosodic structures in the recordings were not manipulated to maintain authenticity but they were acoustically analysed in order to establish whether pitch accent was accompanied with a larger pitch range, a higher pitch maximum, a lower pitch minimum and a longer duration; this was found to be true.

Several ERP components were measured in Ganga *et al.*’s (2024) study, all of which were also investigated in the current study. Firstly, the *negative* and *positive expectancy peaks* occur 100-200ms post-onset, which both indicate that the listener has anticipated the prosodic focus of the critical stimulus, but due to different reasons. To elaborate, focus particles such as the word *only* signal an upcoming contrast, which essentially means that listeners expect the word adjacent to a focus particle to contain pitch accent. When this word is indeed accentuated, this expectancy results in quick processing of the accentuated word, observed by a positive expectancy peak 100-200ms post-onset (Dimitrova *et al.*, 2012). When, contrary to the initial expectation, a subsequent word receives pitch accent, the accentuated word is processed with a negative-going peak. This is the result of expectancy due to previous linguistic cues in the sentence, such as a preceding word lacking prosodic focus that alerts the listeners that prosodic focus is still coming (Dimitrova *et al.*, 2012). In Ganga *et al.* (2024), the time window 100-200ms post-onset was analysed related to the verb as well as the object. Here, Ganga *et al.* (2024) expected to see that the British English group would show a positive expectancy peak when the related verb received CFM, while a negative expectancy peak was expected in those cases where the related object received CFM. As the verb was adjacent to the focus particle *only*, the researchers argued that CFM would initially be expected on the verb. As for the negative expectancy peak, the listeners would expect CFM on the object when the verb had not received it yet (Dimitrova *et al.*, 2012; Ganga *et al.*, 2024).

Another ERP component that was measured in Ganga *et al*. (2024) was the accent positivity, which typically occurs 200-390ms post-onset of the critical word. This time window was analysed relating to the verb and to the object. For the British English group, Ganga *et al.* (2024) expected this time window after the verb and object to show an accent positivity whenever the related word received CFM, and no positivity when the related word received no CFM, which would represent their attention to CFM. The ERP component accent positivity reflects that the CFM was noticed well, and processed accordingly (Ganga *et al.*, 2024).

Lastly, the P600 is a positive-going wave related to syntactic reanalysis, and occurs in the posterior region of the brain approximately 600ms post-onset of the critical stimulus (Van Hell, 2023). It often occurs after syntactic violations (Gouvea *et al.*, 2010; Molinaro, Barber & Carreiras, 2011; Roll, Horne & Lindgren, 2009), but also after prosodic incongruities (Mietz *et al.*, 2008; Roll, Horne & Lindgren, 2009; Steinhauer, Alter & Friederici, 1999), garden-path sentences (Gouvea *et al.*, 2010), and complex but grammatical sentences (Kaan *et al.*, 2000). In order to establish whether a P600 was exhibited by any of the groups, a late time window (500-900ms post-onset) was measured relating to the object. Notably, the analysis did not encompass a late time window for verbs, given its co-occurrence with object production. In the latest time window, it was expected that the L2 group would have to reevaluate the sentence only when the object received CFM, which would result in a P600, since CFM nonadjacent to *only* is less common in their L1 Dutch and this would cause them to deem the prosodic structure as incongruent.

Moreover, Ganga *et al.* (2024) expected that context would facilitate the L2 group in the processing and recognition of the CFM, leading to more native-like responses in all time windows when context was present, but to no expectancy peaks, no accent positivity, and a higher P600 when context was absent.

The findings showed that as for verb processing, context was used in a different way by Dutch listeners than by English listeners, while the time windows related to the object showed no such difference between groups in terms of the influence of context. Moreover, while main effects of accentuation were found, further analyses revealed that none of the time windows resulted in significant variation between the L1 group and the L2 group (Ganga *et al.*, 2024). A possible explanation for the lack of variation between the groups could be that the English group consisted of many different varieties, including people from the United States, United Kingdom, and Canada (Ganga *et al.*, 2024). As was shown by Kim and Arnhold (2024), Canadian speakers adopt a different prosodic pattern for CFM compared to, for example, General American and SSBE, which impacts prosodic processing. These speakers might therefore have behaved similarly to the L2 group, moving the overall results of the L1 group more closely to the L2 group. Moreover, as the current study might uncover, the ERP results from speakers with varieties different from British might have been influenced by the phonemic differences between those varieties. The present study used the same experiment and measured the same time windows, expecting to observe a nonnative-like behaviour in the American group, similar to the Dutch group in Ganga *et al*. (2020).

3. The present study

The current study obtained the experiment, stimuli, and part of the collected data from Ganga *et al.* (2024). The stimuli were recorded by an SSBE speaker, and British and American native speakers of English were tested.

3.1 Research question

This study aimed to address the following research question:
How do phonemic differences between American varieties of English and Standard Southern British English influence online processing of the mapping between accentuation and contrastive focus in sentences containing the word only*?*

3.2 Hypotheses

As mentioned in section 2, the Different Processes Hypothesis posits that a different phonological processing mechanism is employed when listeners process unfamiliar phonemes compared to familiar phonemes. The current study investigated whether unfamiliar phonemes influence the processing of a familiar use of prosodic patterns. If differences between the two groups emerged, this would support the Different Processes Hypothesis and this would mean that this hypothesis could be extended to prosodic processing.

Arnhold *et al.* (2020) has shown that the variety one speaks impacts language processing. While Arnhold *et al.*'s (2020) participants were familiar to the phonemes but unfamiliar to the prosody of their stimuli, the listeners in the current study were presented with stimuli that contained familiar prosody, but unfamiliar phonemes. If differences in prosodic processing emerged between the two variety groups, this would show that the unfamiliar phonemes influenced prosodic processing. The hypothesis of this study was that native speakers of American English and native speakers of British English process SSBE CFM differently, in line with the Different Processes Hypothesis. This study focused on two variables to test this hypothesis: placement of pitch accent and the absence or presence of a context sentence.

In terms of accentuation, it was predicted that American and British speakers of English respond differently to CFM in SSBE. Based on Ganga *et al.* (2024), it was expected that in the British group's early time window (100-200ms) relating to the verb, an early positive expectancy peak would be observed when pitch accent on the verb was present, while the British group's early time window (100-200ms) relating to the object would exhibit a negative expectancy peak when the object was accentuated. This is because the positive expectancy peak after an accentuated verb reflects quick processing as a result of expectancy due to the focus particle *only* that signals an adjacent contrast, while the negative expectancy peak subsequent to an accentuated object reflects expectancy as well, but due to preceding linguistic cues (i.e., the fact that the verb is unaccentuated implies that the object has to be accentuated). The American group would not show these responses or would show weaker responses due to the interference of phonemes that are less familiar to them. As for the middle time window (200-390ms) relating to a verb or object, the British group would show an accent positivity when pitch accent was present, while the American group would not. In the late time window (500-900ms), the American group would exhibit a P600 but the British group would not.

Furthermore, it was predicted that context would play a facilitating role for the American group, but not for the British group. Specifically, the American group was expected to show a response to CFM more similar to the British group only when context was provided, but not when context was absent. In other words, in the presence of context, the American group would exhibit a more native-like approach to language processing, while they would display a nonnative-like approach without context.

4. Method

4.1 Participants

While each group would ideally have consisted of monolingual speakers of the same area, these criteria were impossible to set due to the limited number of target participants available for this study, which was conducted in the Netherlands. Therefore, L1 English speakers who were raised with at least one parent with a variety from the United States or from the British Isles were accepted to participate in this study, regardless of any other languages spoken or in which country they were raised. As Goslin, Duffy, and Floccia (2012) showed, Glaswegian speakers of English did not differ from SSBE speakers when processing SSBE speech, while there was a difference between the two groups when processing Glaswegian English. This study shows that a country's standard variety causes speakers to behave native-like, likely due to the high exposure to these standard varieties. It was therefore assumed that these differences in participant backgrounds would not muddle the results within groups.

The database of the Institute for Language Sciences (ILS) at Utrecht University, the Netherlands, as well as the researcher's own network and social media were utilised for participant recruitment. The inclusion criteria were that participants were native speakers of

American (i.e., USA) or British (i.e., British Isles) English, they did not have dyslexia, they were between 18 and 58 years old, and they did not have any hearing issues or tinnitus. Moreover, participants were right-handed, did not have epilepsy, and had never had brain surgery. Participants with dreadlocks or thick afro-structured hair, or participants who were bald, had to be excluded since EEG does not work properly with these hairstyles.

4.1.1 Native speakers of American English

For the native speakers of American English (hereafter American group), 20 participants in total were tested. However, one participant had to be excluded from analyses on account of being Canadian (n = 1). The remaining participants in the American group (n = 18, eight female and two non-binary/third gender) comprised self-reported speakers of General American (n = 9), West Coast American (n = 1), Mid-Atlantic American (n = 1), and Northern Californian (n = 1) English. Most of the American participants were between 18 and 28 years old (n = 14), while some were between 29 and 38 years old (n = 3) or between the age of 39 and 48 (n = 1). Four participants indicated that they were raised bilingually, alongside Dutch (n = 1), Irish (n = 1), Romanian (n = 1), and Korean (n = 1). Three participants indicated they had lived in another native English-speaking country; in the UK for nine months (n = 1), in Canada for 4.5 years (n = 1) and in England for four months (n = 1). For those tested in 2019 by Ganga *et al.* (2024), the spoken varieties, whether they were monolingual or bilingual, and whether they had lived in another native English-speaking country were unknown (n = 6).

4.1.2 Native speakers of British English

The group containing native speakers of British English (henceforth the British group; n = 18, nine female and one non-binary/third gender) consisted of self-reported speakers of SSBE (n = 4), Geordie (n = 1), Derbyshire (n = 1), Birmingham (n = 1), London area (n = 1) and Irish[2] (n = 2) English. The ages varied from 18 to 28 years old (n = 12) to 29 until 38 years old (n = 6). One British participant was raised multilingually with Italian and Norwegian, while two were raised bilingually with French (n = 1) and Dutch (n = 1). An Irish participant lived in England for five years (n = 1), while another participant lived in Canada for five months (n = 1). Again, the information about the regional variety, bilingualism, and past residency were unknown for those who were tested by Ganga *et al.* (2024; n = 8).

[2] Geographical and historical factors played a role in determining who to include and exclude in this study. For the British group, it was decided to include native speakers of English from the British Isles (thus including Ireland).

4.1.3 Experimenter

The experimenters that provided explanations to the participants and that conducted the experiments during the present study as well as Ganga *et al.*'s study, were female Dutch learners of English. Thus, the participants were not exposed to a native variety of English while preparing for the experiment or during breaks. Analysis showed that experimenter did not significantly influence the ERP results in any of the five time windows.

4.2 Stimuli

4.2.1 Experimental stimuli

This study obtained stimuli from Ganga *et al.* (2024; see their online repository for the complete list of stimuli), who in turn obtained and slightly edited the stimuli originally made by Ge, Chen and Yip (2021). Sixty pairs, all including the word *only* and differing in placement of pitch accent, were naturally produced and recorded by a native male Standard Southern British speaker of English. This resulted in 120 items that all included a context sentence and either accentuated the verb or the object. Ganga *et al.* (2024) added context as a condition, producing another 120 stimuli, which resulted in the 2x2 Latin Square design that is repeated below in Table 3.

Table 3
Experimental stimuli in Ganga *et al.* (2024, p. 7).

Context sentences	Target sentences	
	Verb accentuation	Object accentuation
The dinosaur has a bucket and a suitcase. He was going to throw them and carry them. Then he changed his mind.	a. The dinosaur is only CARRYING the bucket.	b. The dinosaur is only carrying the BUCKET.
*No context	c. The dinosaur is only CARRYING the bucket.	d. The dinosaur is only carrying the BUCKET.

Note: Capitalised words represent the placement of contrastive focus marking.

4.2.2 Fillers

The fillers in this study were also originally created by Ge, Chen and Yip (2021) and produced by the same speaker. These fillers differed from the experimental items in that they did not include the word *only*. In Table 4, an overview of these fillers and the number of filler types are provided, where the words in bold represent the contrasts with experiment stimuli, and capitals refer to accentuated words. Specifically, the target sentences in *4a-b* contain an extra clause that negates the alternative situation, while the context sentence, only present in

4a, contains three objects and one verb rather than two of each. The other filler types, shown in *4c-d*, contained an additional context sentence, while the target sentence was either prosodically congruent (*4c*) or incongruent (*4d*) to the context sentence. Ganga *et al.* (2024) conducted an informal questionnaire which showed that the purpose of the study was unclear to the participants. Such an informal questionnaire was repeated in the current study, which confirmed these findings; none of the participants had understood the purpose of the study by the end of the experiment.

Table 4
Filler materials obtained from Ganga *et al.* (2024, p. 8).

Filler type	Context sentences	Target sentences
Confirmation of action		
A (n = 26)	The dog has **a broom**, a paper, and a tomato. He was going to wash the tomato. Then he changed his mind.	The dog is GETTING the tomato, **not washing the tomato**.
B (n = 52)	*No context*	The dog is GETTING the tomato, **not washing the tomato**.
Prosodic (in)congruity		
C (n = 20)	The fox has a banana and a pear. She was going to peel the banana. Then she changed her mind. **I wonder what the fox is peeling**.	The fox is peeling the **BANANA**.
D (n = 20)	The fox has a banana and a pear. She was going to peel the banana. Then she changed her mind. **I wonder what the fox is peeling**.	The fox is **PEELING** the banana.

Note: Words in bold represent the contrasts with experimental stimuli, and capitals refer to accentuated words.

4.2.3 Semantic relatedness task

The participants were instructed to do a forced-choice semantic relatedness task, which followed a random selection of 25% of the stimuli. A word appeared on screen and the participants were asked to indicate whether or not this word was related to the last sentence they heard, by pressing on the corresponding YES-NO buttons. This task served as a distraction from the aim of the study as well as a measurement of alertness.

4.3 Materials and design

The computer screen used in this study was a 21.5 inch LCD screen with a resolution of 1920x1080 and a refresh rate of 69Hz. The participant was seated at approximately one metre away from the computer screen and no chinrest or other constraints were utilised. Both a keyboard and a mouse were present while the participant completed the survey, and before the start of the EEG experiment, the mouse was removed. The participants were then instructed to sit still and look at the fixation cross on screen without blinking when this cross was visible. The speakers that were used to auditorily present the stimuli were two Tangent evo e4 Two-way speakers. A Logitech c920 Webcam was used to monitor the participants from the experimenter room.

A BioSemi ActiveTwo system with ActiView software was used to record EEG activity. Headcaps with 64 channels in 10/20 system from BioSemi and a DC amplifier were used. Bundled electrodes with a sintered Ag-AgCl pin-like tip, without pre-amplifiers, were connected to the headcap. There were 64 scalp electrodes, as well as the common mode sense (CMS) and the driven right leg (DRL), which were used as on-line reference and ground electrode, respectively. Moreover, separate, flat electrodes were attached to the left and right mastoids (EXG1 and EXG2 respectively) by means of a double-sided sticker, which were later used as off-line references. The left and right outer canthi (EXG3, EXG4) and above and below the left eye (EXG5, EXG6) were also provided with such flat electrodes, which detected eye movements such as blinking. The conductive medium that was used was a water-based gel. The impedance levels that were deemed acceptable for data collections were more or less below 20mV. The sampling rate was 2048Hz and the local power line frequency was 50Hz.

Besides the EEG experiments, the participants also completed a questionnaire eliciting background information to possibly account for individual differences. An overview of the questions asked is depicted in appendix 9.1.

4.4 Procedure

A mixed design was employed in this study, where the between-subject aspect referred to the fact that the differences in ERP results between the American and British group when listening to SSBE CFM were scrutinised. The within-subject factors involved the different conditions of the stimuli (i.e., whether the verb or the object received CFM and whether or not a context sentence was present).

The experiment was conducted by means of the software Presentation (v.20.0, Neurobehavioral Systems, 2019). The order of the presentation of the stimuli was pseudo-randomised by Ganga *et al.* (2024), which meant that there were no adjacent stimuli with the same subject. Moreover, stimuli within the same condition, the same positioning of focus marking (i.e., on the verb or on the object), or with similarity in terms of inclusion or exclusion of context sentences were presented maximally three times in succession. Six lists were created with these requirements. Subsequently, in order to avoid any effects of fatigue, each list was reversed, starting with the last stimulus of each list. This resulted in 12 lists, which were assigned to the participants one by one in order to assign it more or less evenly. Lists 1, 2, 3, 4, 9, and 11 were presented to two British speakers while the remaining lists were presented once to the British group. To the American group, lists 1, 2, 3, 4, 5, 7, and 9 were presented twice while the remaining lists were presented once. An analysis was conducted to see if the list participants were presented with significantly influenced the ERP results, which showed that this was not the case in any of the time windows. Each list consisted of seven blocks, while each block took approximately 11 minutes. An inter-block interval of two minutes was incorporated as a forced break so that the participants were able to move and blink. Moreover, additional volitional breaks were incorporated within each block. This meant that in total, the experiment took approximately 90 minutes. During the auditory presentation of a stimulus, a fixation cross was shown, and the participants were instructed to refrain from blinking as much as possible while this cross was visible. Each stimulus had a different duration, as they were all different and some had context sentences while others did not. An inter-stimulus interval was included that lasted 2000ms. During this interval, three dashes were shown, which indicated that the participants were allowed to blink. In 94 randomly selected stimuli (i.e., 25%), a word appeared on the screen after the sentence had finished. The participants were instructed to determine whether or not the word shown was related to the preceding sentence, which they were able to indicate by either pressing the left shift button (meaning *yes*) or on the right shift button (meaning *no*) of the keyboard. These buttons were marked with a green and red sticker, so that the participants would not confuse these buttons with their respective meaning. The response window for the semantic relatedness task was as long as they needed until they pressed one of the buttons.

4.5 Analysis

4.5.1 Differences between pre-existing data and current data

The data of the British and American participants that had already been tested by Ganga *et al.* (2024) were incorporated in this analysis. To ensure the comparability of the results, both studies were conducted in the same laboratory, utilising identical stimuli, technical devices, and procedures, in accordance with the current paper's preregistration (Verrijt, 2024). Analysis indicated no significant influence of experimenter on the ERP results. However, the present study additionally collected exploratory data on the participants' regional accents, musicality (e.g., frequency of musical activity per week), and previous residency in other English-speaking countries (including the duration and specific locations). This additional information was not collected by Ganga *et al.* (2024).

4.5.2 Outcome EEG

Three event-related potentials, in five time windows, were measured:

- The early expectancy response, 100-200ms after the onset of the verb and object;
- The accent positivity, 200-390ms after the onset of the verb and object;
- And the sentence P600, which was measured 500-900ms after the onset of the last word of the sentence, which was the object in each sentence.

Ganga *et al.* (2024) averaged the electrodes into nine different regions of the brain, but since adding a variable with a high number of levels reduces power, the present study calculated the means of only those electrodes that were relevant to the particular ERPs. Ganga *et al.* (2024) have shown that for the early expectancy response (100-200ms post-onset), the left and midline anterior regions were relevant. The accent positivity was found in the anterior regions on the left sites as well as the midline (Lee, Perdomo & Kaan, 2020; Ganga *et al.*, 2024) while the P600 was detected for syntactic integration difficulties, long wh-dependencies, and garden-path sentences in the posterior regions (Kaan *et al.*, 2000; Gouvea *et al.*, 2010; Ganga *et al.*, 2024). Table 5 shows an overview of the time windows that were analysed and the electrodes that were averaged for these time windows. Note that all outer channels were excluded from analyses in order to prevent noisy data.

Table 5
Time windows and their relevant regions and electrodes.

Name	Time window	Relevant region(s)	Relevant electrodes
Early response	100-200ms	Left & midline sites of anterior region	AFz, AF3, AF7, Fz, F1, F3, F5, F7
Accent positivity	200-390ms	Left & midline sites of anterior region	AFz, AF3, AF7, Fz, F1, F3, F5, F7
P600	500-900ms	Posterior	Pz, P1, P2, P3, P4, P5, P6, POz, PO3, PO4, PO7, PO8, Oz, O1, O2

4.5.3 Outcome semantic relatedness task

As mentioned, a semantic relatedness task was conducted relating to 25% of the stimuli. This was done in order to distract the participants from the purpose of the study but also to test their alertness. Analysis showed that no participants performed below the accepted error rate of 20%, meaning that none of the data had to be removed due to lack of alertness.

4.5.4 Preprocessing steps

The ActiView software recorded the EEG data. The preprocessing steps were done in BrainVision Analyzer (v2.2.0, 2019) and in the order in which they are described below. After the experiment, the recorded channels were exported into a bdf file. The left and right mastoids (EXG1 and EXG2), were averaged and all channels were re-referenced to this average. In order to easily detect blinks and other eye movements, the channel hEOG was created by averaging the electrodes on the left (EXG3) and right (EXG4) canthus. Likewise, the channel vEOG was created by calculating the average of the electrodes above (EXG5) and below (EXG6) the left eye. Subsequently, a Butterworth zero phase filter was applied with a cutoff range of 0.1-35 Hz and order 2. While Ganga *et al.* (2024) did not apply a notch filter, this study decided to apply a notch filter at 50Hz to filter out the local power line frequency. Next, the data was resampled to 500Hz to decrease the file size and computational time. Epochs were created ranging from 100ms before to 1000ms after the onset of each verb and each object, in all four conditions. This resulted into eight different epochs. Afterwards, a baseline correction was applied of -100 to 0ms. Subsequently, trials that contained blinks or other excessive eye movements were marked by applying an automatic artifact inspection to all channels with the hEOG and vEOG as reference channels. Then, another automatic artifact inspection was applied to all channels using independent channel mode. For these inspections, the maximally allowed voltage step was 50uV while the minimally allowed amplitude was -75uV compared to a maximally allowed amplitude of 75uV. The lowest allowed activity in intervals was 0.5 uV and the interval length is 100ms. Bad channels were marked accordingly. After these steps, Matlab (v9.6.0, 2019) files were created. In Matlab, the bad channels were removed and the remaining channels were assigned to the relevant regions of interest as mentioned in Table 5 and averaged. Output files containing the average responses to each region of interest and time window were created that could be further analysed in RStudio (Posit team, 2023).

4.5.5 Contrasts

Contrasts were set for the variables American (-1 = British, 1 = American), AccentOnVerb (-1 = pitch accent on object, 1 = pitch accent on verb; used in the models concerning the verb), AccentOnObject (-1 = pitch accent on verb, 1 = pitch accent on object; used in the models concerning the object), and Context (-1 = context absent, 1 = context present).

4.5.6 Analytic steps

The data were analysed using mixed-effect modelling in RStudio (Posit team, 2023), by means of the lmer4 package (Bates *et al.*, 2015). For each time window, average *ERP* was the dependent variable. This variable included only the relevant channels, meaning that the electrodes in the left and midline anterior regions were included in the early and middle time window analyses while the posterior region was analysed in the late time window. Models were built step-wise, commencing with solely a random factor of *Participant*. Subsequently, a random factor of *Item* was added, followed by the fixed factors *American* and *AccentOnVerb/AccentOnObject*. Afterwards, the interaction of *American by AccentOnVerb/AccentOnObject* was added, followed by the fixed factor *Context*. Next, the interactions were added in the order *Context* by *AccentOnVerb/AccentOnObject*, *Context by American* and *American* x *AccentOnVerb/AccentOnObject* x *Context*. After each addition, new models were systematically compared with the previous model to determine whether they were improved, utilising an analysis of variance (ANOVA). Statistical significance was established when the *p*-value was <.05. For a full overview of the statistical analyses and how the models were built, see appendix 9.2.

5. Results

5.1 Semantic relatedness task

The participants' answers to the semantic relatedness task were analysed to establish alertness. If participants answered over 20% of the questions incorrectly, they were excluded from further analysis. Unfortunately, the logfiles of two participants from the American group, whose data were elicited by Ganga *et al.* (2024), were missing. This meant that for these participants, it was not possible to establish the percentage of correct answers. The results of these participants were still analysed due to the otherwise small number of participants in the American group. Amongst the participants whose logfiles were available, no one had exceeded the limit of incorrect answers. The lowest accuracy for the American group was 80.9%, while the highest accuracy was 94.7% (n = 17, M = 90%, SD = 4.03, 95 confidence interval (CI) [88, 92]). For the British group, this ranged from 83% to 92.6% (n = 18, M = 89%, SD = 3.68%, 95% CI [87, 91]).

5.2 ERP results

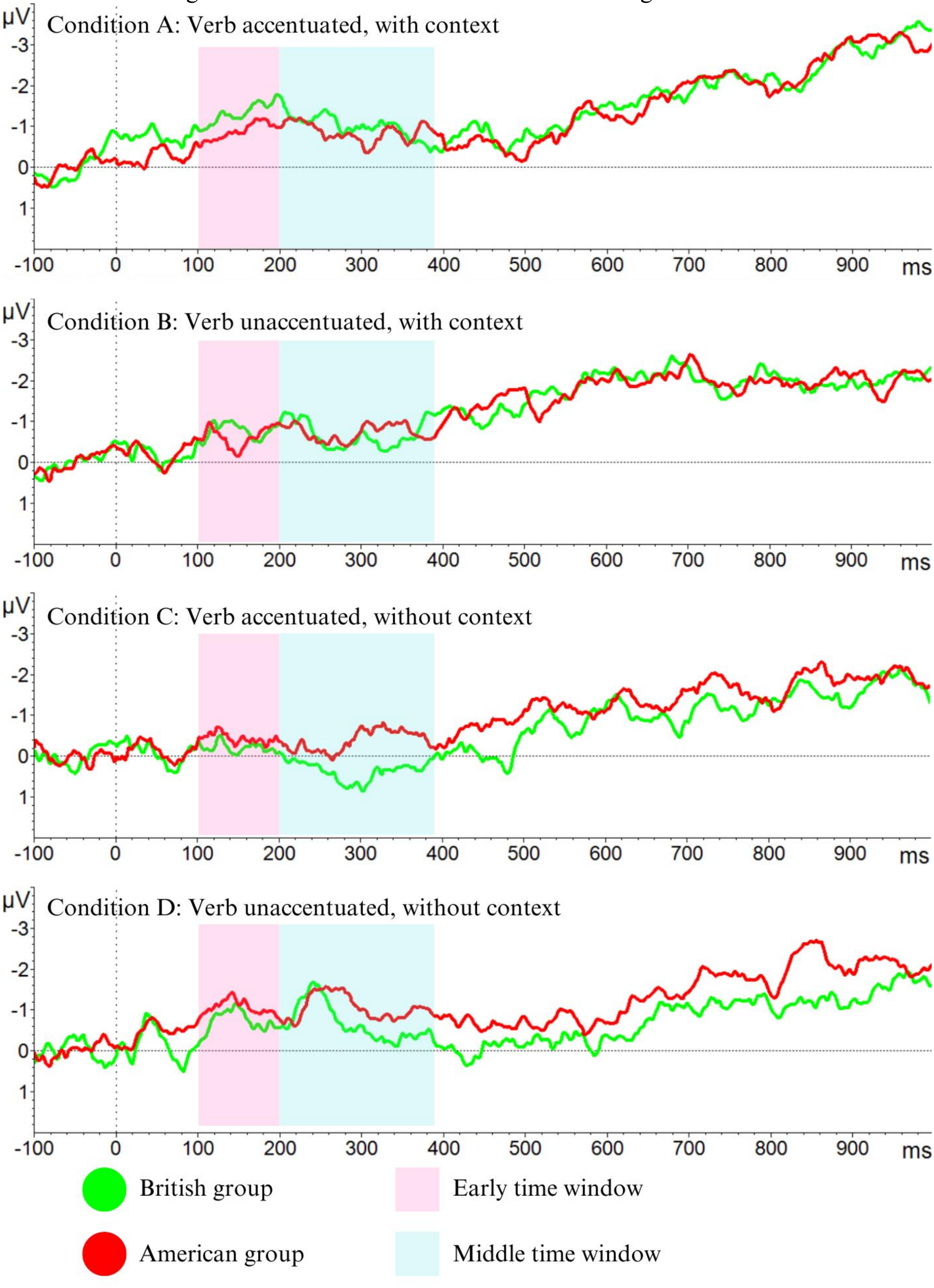
In appendix 9.4, the significant factors included in the best-fit models for each time window is illustrated, along with the estimated means, the standard error, df, t, and p-value. As it shows, no interaction improved any model. This is contrary to Ganga *et al.*'s (2020) findings. The current study adapted Ganga *et al.*'s original analysis so that Region of Interest (ROI) was not included as an independent variable. The reason for this was that the variable *ROI* consisted of nine different levels, and this made the analysis more noisy and the interpretation of the results more complex. Thus, this study chose to select the most relevant regions as based on previous studies (Ganga *et al.*, 2024; Gouvea *et al.*, 2010; Kaan *et al.*, 2000; Lee, Perdomo & Kaan, 2020), and only include these regions as the dependent variable. However, this did not come without risk; Ganga *et al.* (2020) found some widely distributed ERP responses and selecting only a part of this area could diminish the amplitude of the results. Moreover, EEG has a poor spatial resolution (Van Hell, 2023). This means that EEG is extremely sensitive to a wrong identification of active brain regions; activity in one scalp region might actually be recorded in a different scalp region. Since the current findings contradicted those of Ganga *et al.*, an additional analysis was done, precisely copying Ganga *et al.*'s analysis as according to their Complementary Materials and appendix 9.3. This meant that in the second analysis, ROI was included as an independent variable, with nine different regions: left anterior (LA), centre anterior (CA), right anterior (RA), left central (LC), centre central (CC), right central (RC), left posterior (LP), centre posterior (CP), and right posterior (RP). In appendix 9.5, the best-fit models along with the estimated means, standard error, *df*, *t*, and *p*-value are shown. Below, a more elaborate discussion of both analyses is provided along with visual aids. In appendices 1 and 2, a more elaborate overview of each step whilst building the model is shown for the main and alternative analyses.

5.2.1 Verb

Two time windows related to the verb were analysed: the early window (100-200ms post-onset) and the middle window (200-390ms post-onset). In Figure 1, the ERP measured in the left and midline anterior regions of the brain is depicted for each condition, with green representing the British group and red representing the American group. In Table 6 below, topographic maps of all scalp regions are shown for both time windows, separately for the American and British groups.

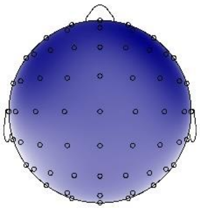
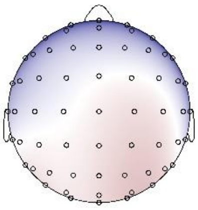
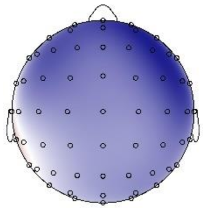
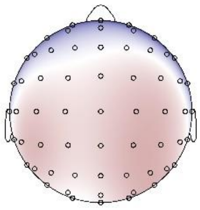
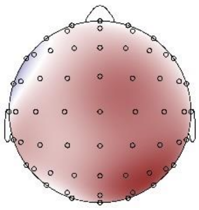
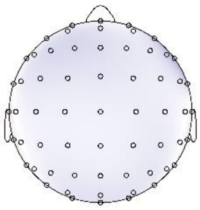
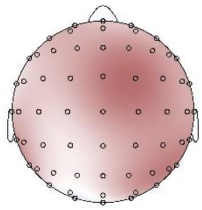
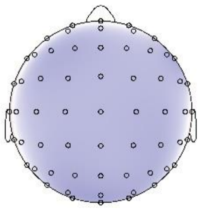
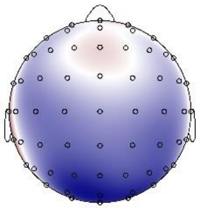
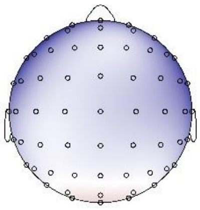
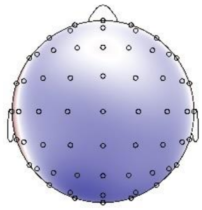
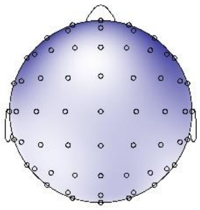
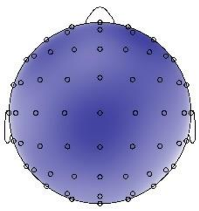
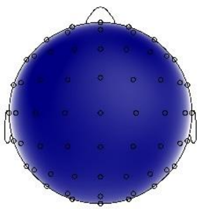
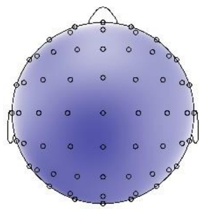
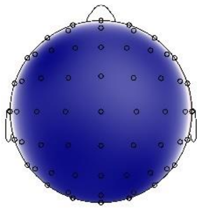
Figure 1

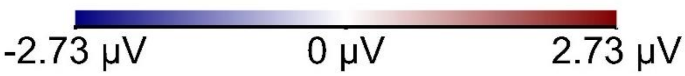
ERP results relating to the verb in the left and midline anterior regions.



Note: Green = British, red = American. The section marked in pink is the early time window (100-200ms post-onset), while the blue section is the middle time window (200-390ms post-onset).

Table 6
Topographic maps for conditions A, B, C, and D, of all scalp regions for the verb's early time window (100-200ms) and the middle time window (200-390ms), for the British group and the American group separately.

	British			
	100-200ms		**200-390ms**	
	Verb accentuated	Verb unaccentuated	Verb accentuated	Verb unaccentuated
With context	 A	 B	 A	 B
Without context	 C	 D	 C	 D
	American			
	100-200ms		**200-390ms**	
	Verb accentuated	Verb unaccentuated	Verb accentuated	Verb unaccentuated
With context	 A	 B	 A	 B
Without context	 C	 D	 C	 D



5.2.1.1 Early time window (100-200ms)

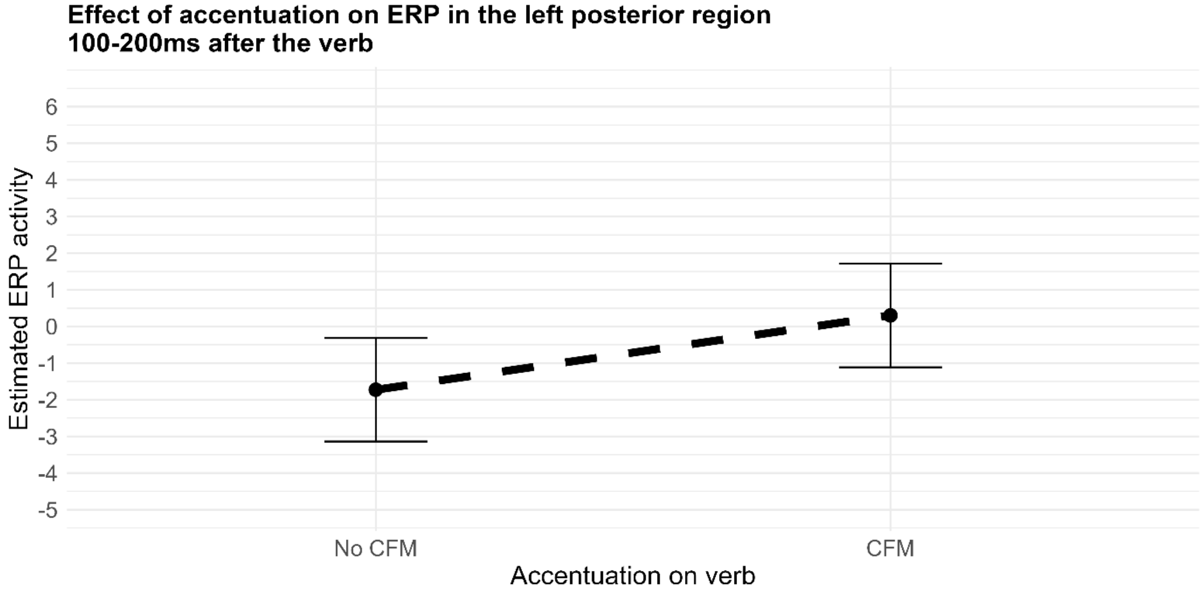
The results of the main analysis showed that the best-fit model included only random intercepts of Participant and Item. No significant main effects or interactions were included.

However, the alternative analysis with ROI as an additional independent variable included the random intercepts of Participant and Item as well as a 4-way interaction of AccentOnVerb x ROI x American x Context. Main effects of AccentOnVerb and ROI (as can be seen in the topographic maps in Table 6) were determined, as well as significant interactions of AccentOnVerb x Left posterior x Context, AccentOnVerb x Right posterior x Context, and American x AccentOnVerb x Left posterior x Context (see appendix 9.5 for coefficients).

To further investigate the 4-way interaction, the 3-way interaction AccentOnVerb x American x Context was tested in only the left posterior (LP) region. This was done because the independent variable ROI contained nine levels, making the 4-way interaction rather complex to interpret. This further investigation showed that the interaction was lost, but a main effect of AccentOnVerb was still found (B = 1.01, SE = 0.45, t = 2.25, p = 0.025). Figure 2 below depicts this main effect.

The results show that an early positive expectancy peak was present for both groups when the verb was accentuated. This observation was expected in the British group, and only expected at most in a reduced form in the American group, but has been observed in both groups with similar amplitudes.

Figure 2



Note: CFM stands for contrastive focus marking.

5.2.1.2 Middle time window (200-390ms)

The best-fit model of the main analysis, with only the left and midline anterior brain regions, included the random intercept Participant and the fixed factors Context and American. Both factors were found to be significant (see appendix 9.4 above for the coefficients). Figures 3 and 4 show the effect of Context and American within this time window. No interactions were included in the model. It was expected that the British group would show an accent positivity when the verb was accentuated, and that context would play a facilitatory role for the American group. Based on this analysis, it seems that the expectation is not borne out; a more nuanced result is missing due to the lack of significant interactions. Therefore, the alternative analysis including all nine brain regions was needed for clarification.

Figure 3

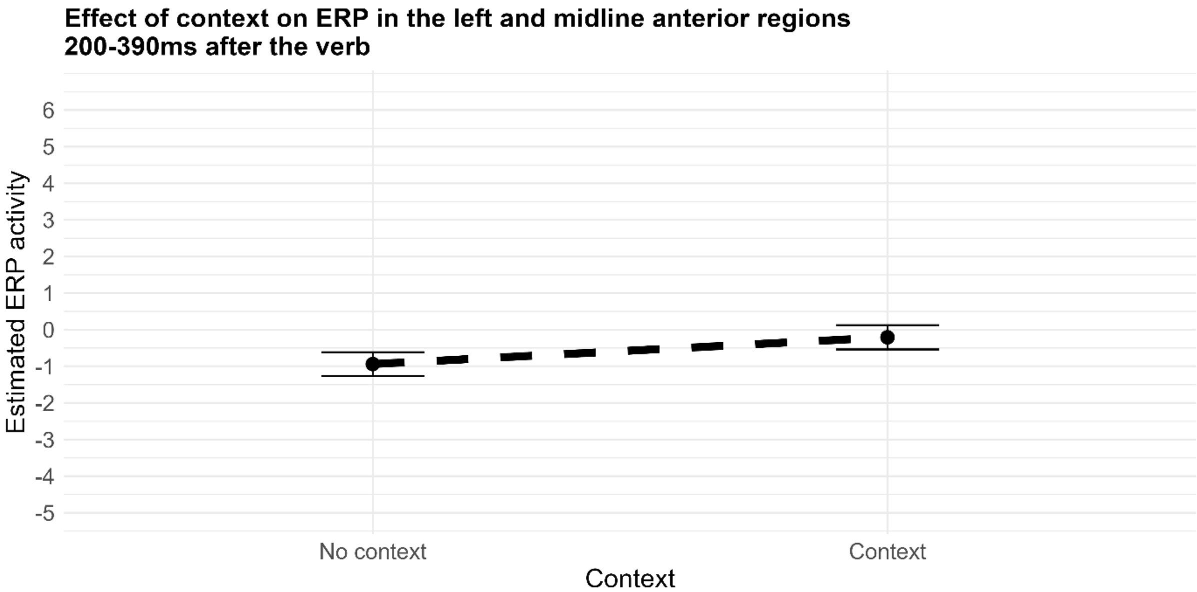
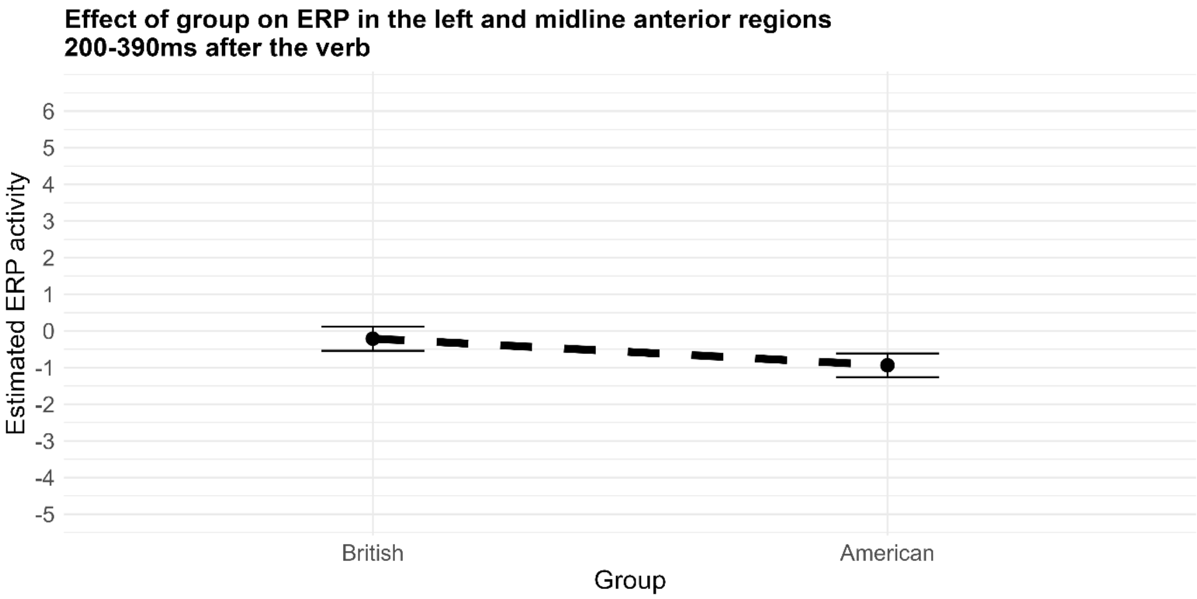


Figure 4

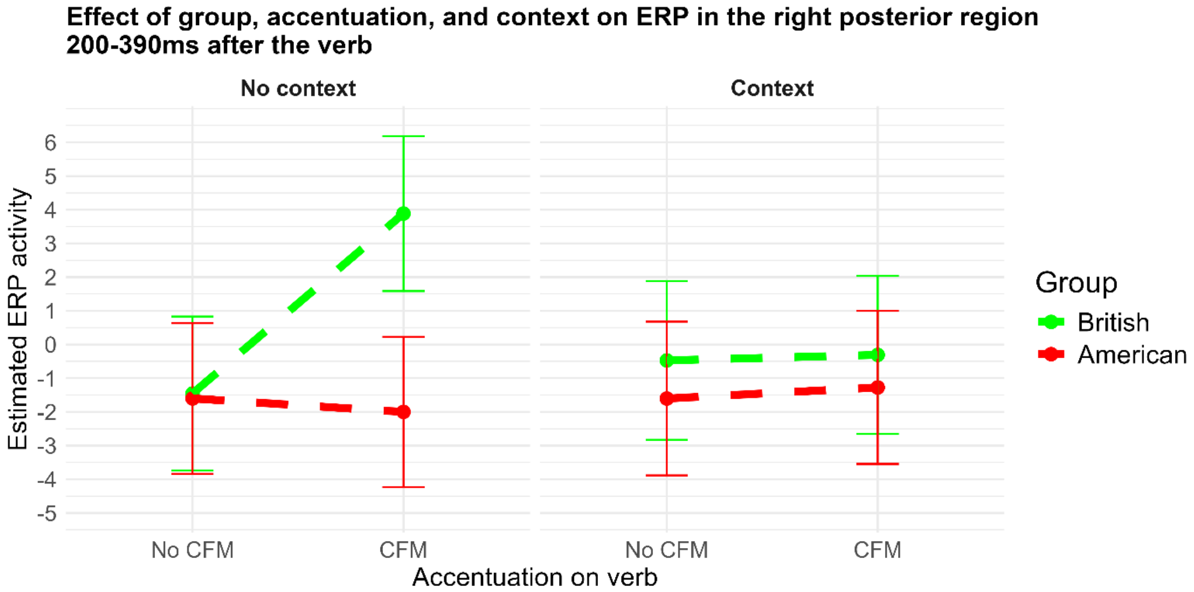


The alternative analysis found a best-fit model including random intercepts of Participant and Item, and the 4-way interaction AccentOnVerb x ROI x American x Context. A main effect of AccentOnVerb was found, as well as significant interactions of American x Context x Left posterior, Context x Left posterior x AccentOnVerb, Context x Right posterior x AccentOnVerb, and American x Context x Right posterior x AccentOnVerb (see appendix 9.5 for coefficients).

To further test the complex 4-way interaction, an analysis in only the right posterior (RP) region was conducted. A main effect of AccentOnVerb was found ($B = 0.68$, $SE = 0.34$, $t = 1.98$, $p = 0.049$) as well as interactions of American by AccentOnVerb ($B = -0.70$, $SE = 0.31$, $t = -2.27$, $p = 0.023$) and American x Context x AccentOnVerb ($B = 0.74$, $SE = 0.31$, $t = 2.40$, $p = 0.016$). The latter 3-way interaction is shown in Figure 5 below. Subsequently, the 2-way interaction Context by AccentOnVerb was tested in the RP region separately for the American speakers and the British speakers. This analysis resulted in no significant effects for the American group, suggesting that the American group was insensitive to CFM and unaffected by context. As for the British group, a main effect of AccentOnVerb was established ($B = 1.35$, $SE = 0.60$, $t = 2.26$, $p = 0.025$), as well as an interaction of Context by AccentOnVerb ($B = -1.21$, $SE = 0.60$, $t = -2.02$, $p = 0.044$). The latter interaction was further analysed by conducting a simple main effect analysis of AccentOnVerb in both context conditions, in the RP region for the British group. This resulted in a loss of significant effects when context was present, but a main effect of accentuation when context was absent ($B = 2.64$, $SE = 1.10$, $t = 2.40$, $p = 0.017$).

As predicted, the British group was more sensitive to CFM, exhibiting increased positivity in response to the presence of CFM. This increase in ERP amplitude occurred only when context was absent, suggesting that the context sentence confused the British group. It was expected that the British group would not be affected by context, as they would not need it; however, it was not anticipated that they would perform worse with context. Additionally, it was predicted that the American group would benefit from the presence of a context sentence, but this was not observed; the American group appeared insensitive to pitch accent despite context.

Figure 5



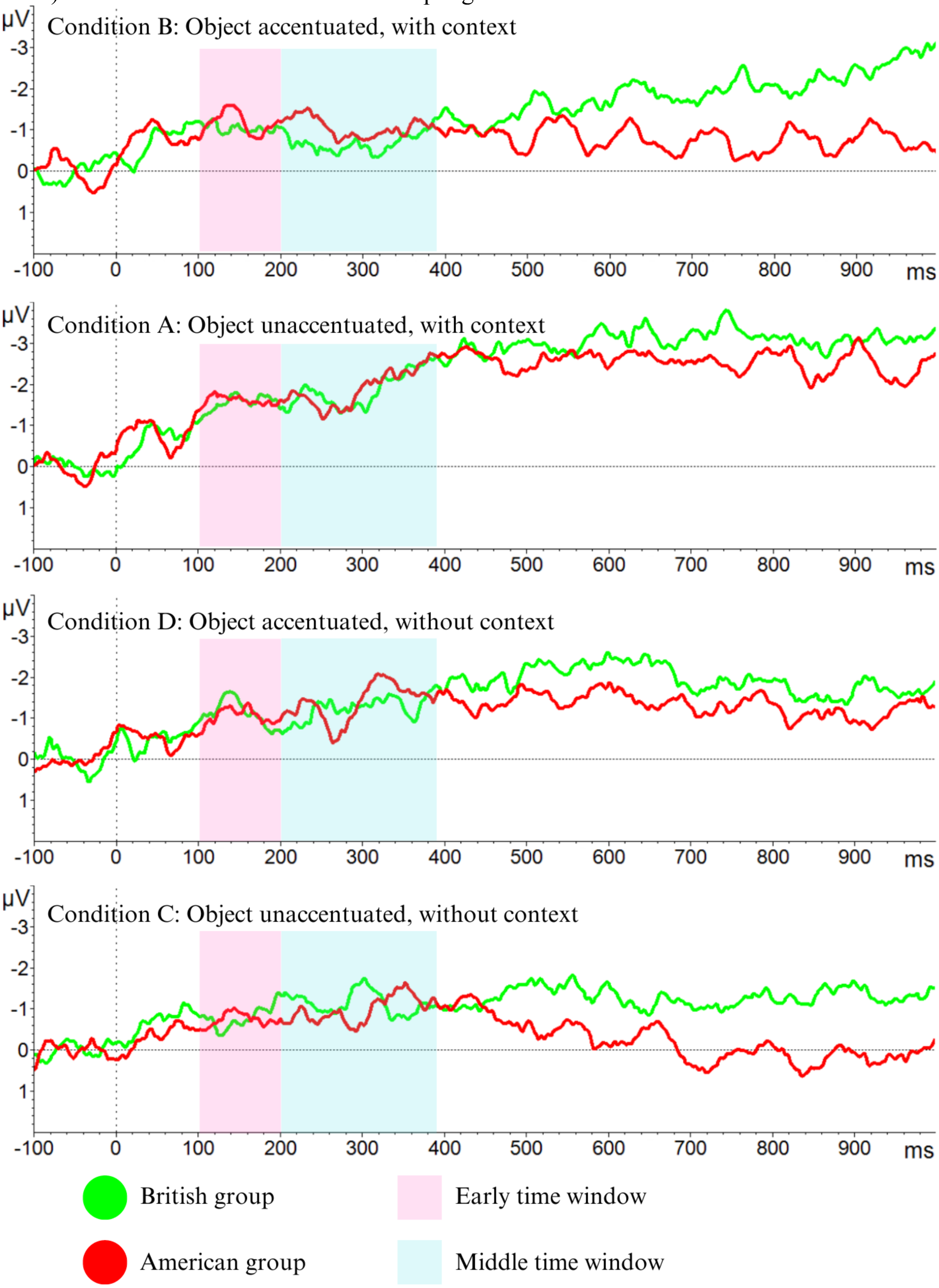
Note: The left figure is the no-context condition, and the right figure is the context condition. CFM stands for contrastive focus marking. Green = British and red = American.

5.2.2 Object

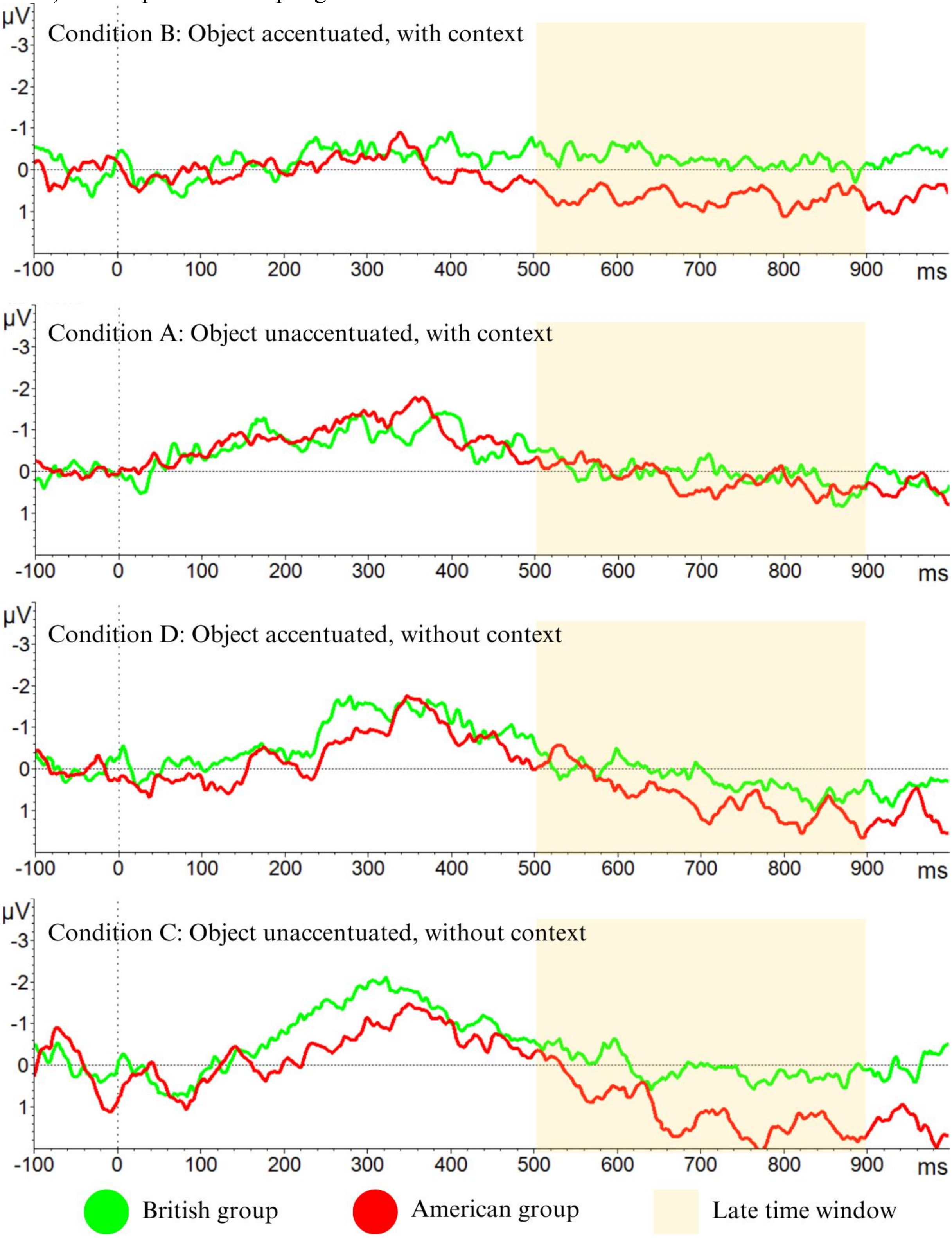
An early time window (100-200ms), middle time window (200-390ms), and late time window (500-900ms) were analysed relating the object. The relevant brain region in the main analysis for the early and the middle time window was left and midline anterior, while the relevant brain region for the late time window was posterior. In Figures 6a and 6b respectively, the ERP results of the left and midline anterior regions and the posterior region are depicted for the British group (green) and the American group (red). Below that, Table 7 depicts the topographic maps for the time windows related to the object, separately for the American and British groups and for each condition.

Figure 6
ERP results relating to the object

a) In the left and midline anterior scalp regions



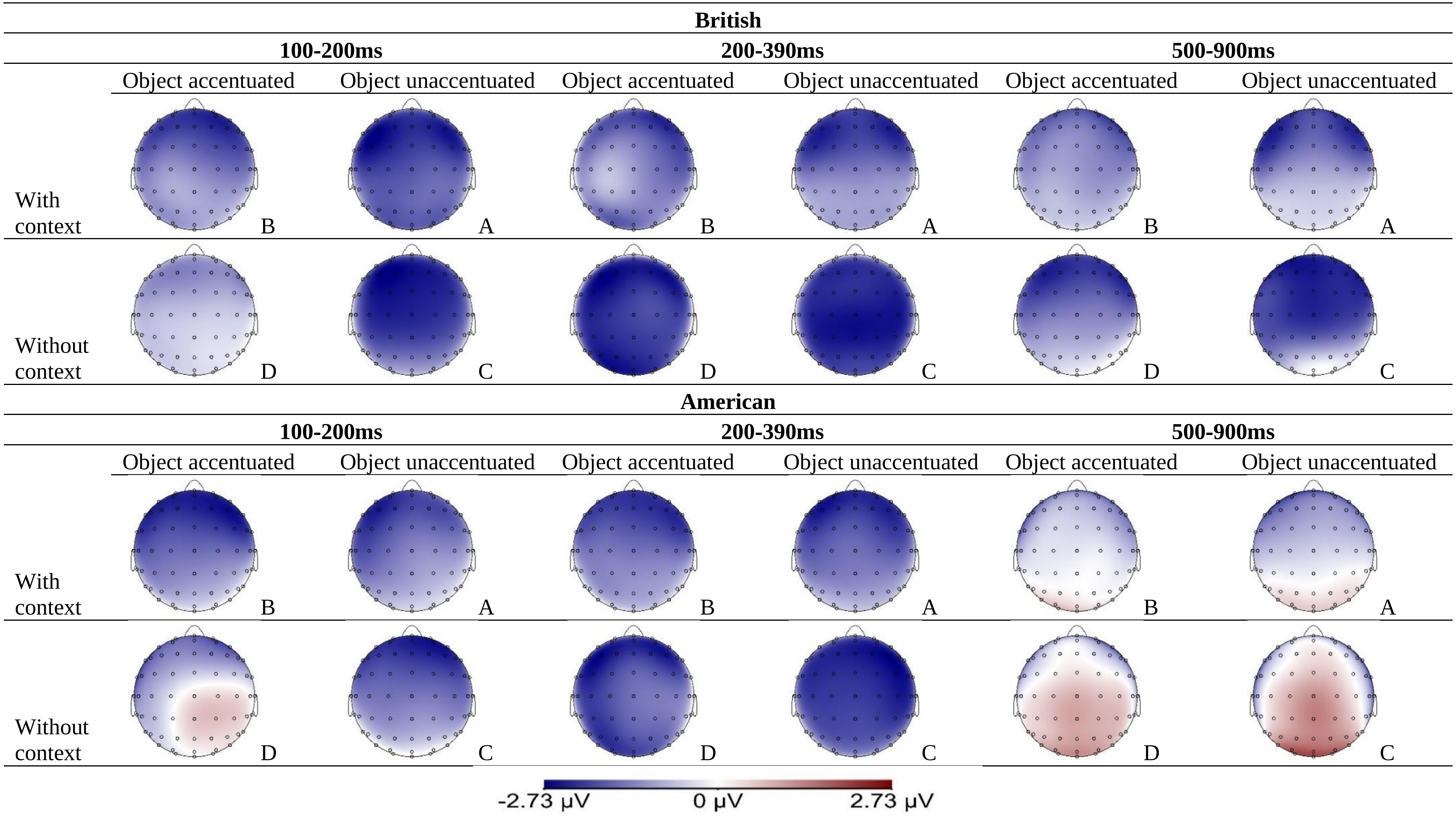
b) In the posterior scalp regions



Note: The marked sections represent the relevant regions: the early time window (pink), the middle time window (blue), and the late time window (yellow). Green = British, red = American.

Table 7

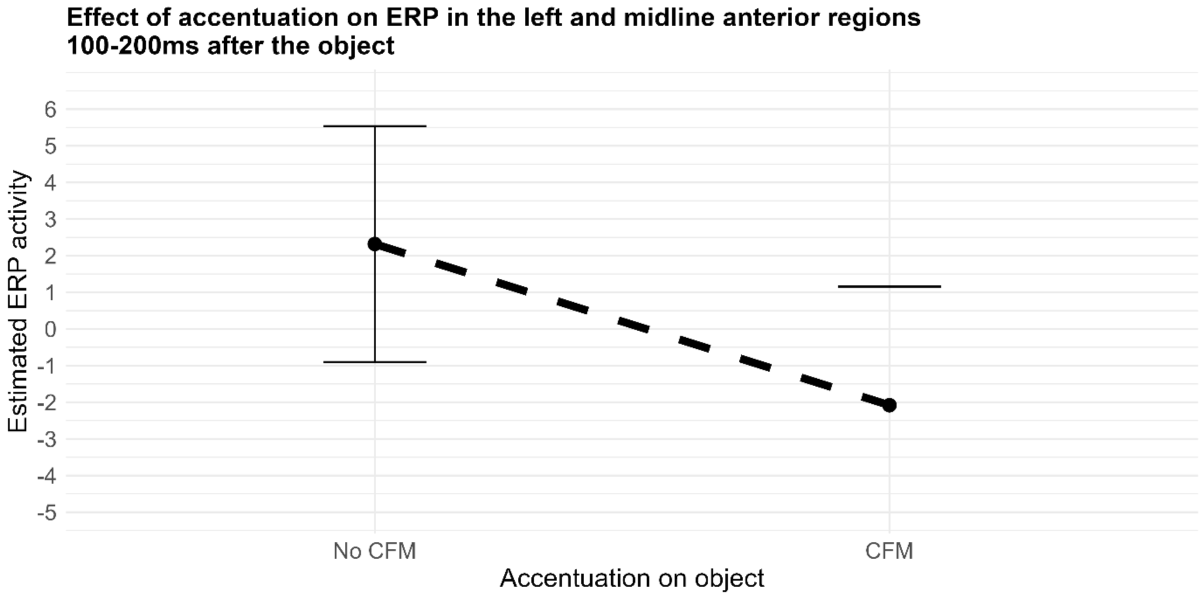
Topographic maps for conditions A, B, C, and D, averaged over all channels for the object's early time window (100-200ms), the middle time window (200-390ms), and the late time window (500-900ms) for the British group and the American group separately.



5.2.2.1 Early time window (100-200ms)

Firstly, only the ERP results in the left and midline anterior regions were analysed. The best-fit model included Participant and Item as random intercepts and AccentOnObject as fixed factor. Appendix 9.4 shows the coefficients and Figure 7 below depicts the significant effect of AccentOnObject. This result shows that both groups had a negative expectancy peak when the object was accentuated, while this finding was only expected for the British group, and only a reduced form was expected for the American group.

Figure 7



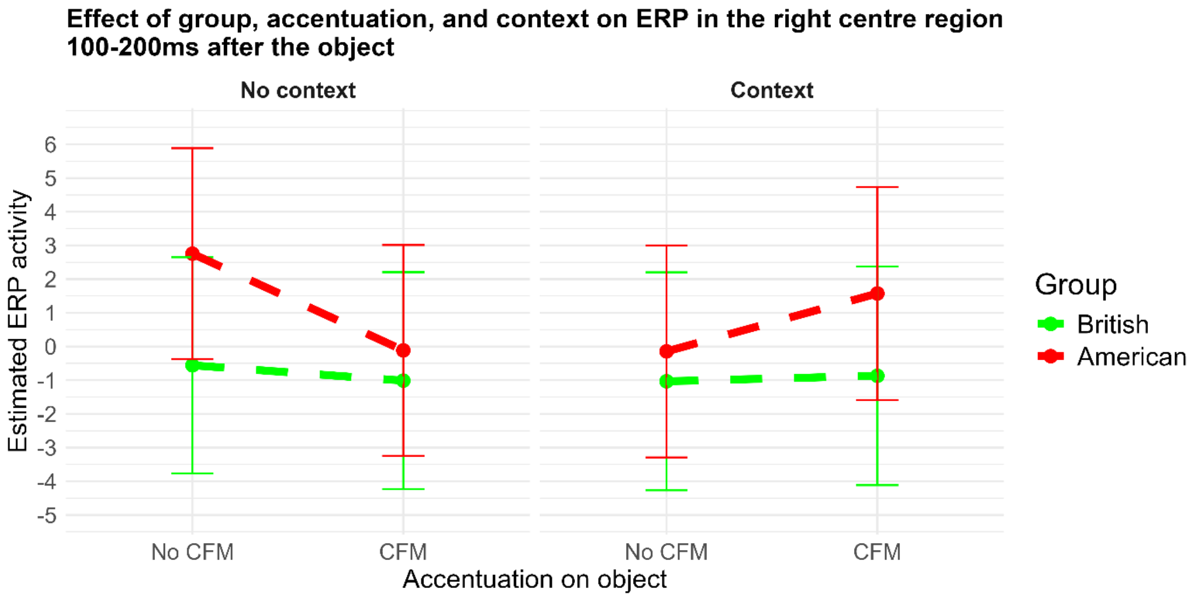
Note: CFM stands for contrastive focus marking.

The alternative analysis resulted in a best-fit model with Participant and Item as random intercepts and the 4-way interaction of AccentOnObject x ROI x American x Context. There were no significant main effects, but the interactions of American by Left posterior, Left anterior by Context, American x Left posterior x Context, Centre posterior x AccentOnObject x Context, Left anterior x AccentOnObject x Context, Left posterior x AccentOnObject x Context, Right posterior x AccentOnObject x Context, and American x Right central x AccentOnObject x Context were found to be significant (see appendix 9.5 for the coefficients).

The 4-way interaction was further analysed in only the right central (RC) region. A 3-way interaction of American x AccentOnObject x Context was found ($B = -0.50$, $SE = 0.19$, $t = 2.66$, $p = 0.008$), depicted in Figure 8. This interaction was further analysed by testing the 2-way interaction of AccentOnObject by Context in both language varieties separately. This analysis showed that whereas the significant results were lost in the British group, the interaction was significant ($B = 1.09$, $SE = 0.55$, $t = 1.99$, $p = 0.048$) in the American group. A further simple main effect analysis revealed that, for both context conditions, no main effect of accentuation was found for the American group.

As expected, the British group was insensitive to context. However, it was anticipated that the British group would only show a negative-going response when CFM was present; instead, the group exhibited a negative expectancy peak in each condition. The American group showed sensitivity to the context conditions, but this did not play a facilitatory role, since the presence of context led to a positive peak rather than a negative peak in the CFM condition. They were also sensitive to pitch accent. Both findings are against the expectations.

Figure 8



Note: CFM stands for contrastive focus marking. Green = British, red = American

5.2.2.2 Middle time window (200-390ms)

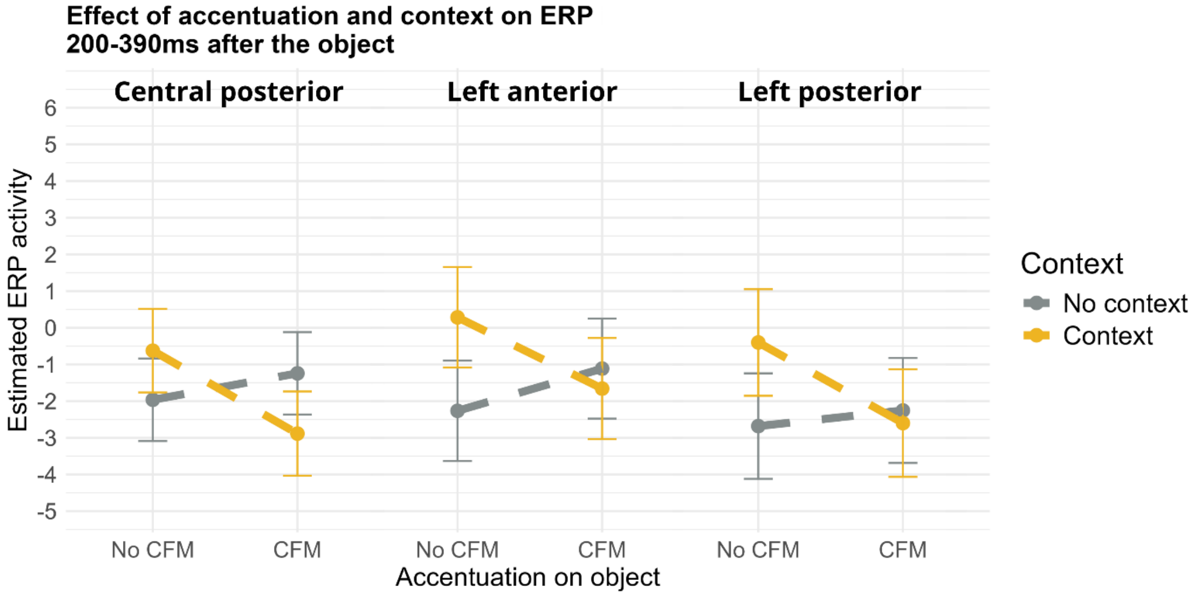
The main analysis with only the left anterior region led to a best-fit model with only a random intercept of Participant, but no other factors. However, in the alternative analysis where all regions were included, the best-fit model comprised random intercepts Participant and Item, and interactions of American x ROI x Context and AccentOnObject x ROI x Context. There were significant interactions of American by Left anterior, American x Left posterior x Context, Centre posterior x Context x AccentOnObject, Left anterior x Context x AccentOnObject, Left posterior x Context x AccentOnObject, and Right central x Context x AccentOnObject (see appendix 9.5 for the coefficients).

This time-window did not show any evidence for differences that were variety-related, since no significant interaction was found that included American, Context, and

AccentOnObject together. In order to establish how the presence of context influenced the processing of accentuation for both groups, further analyses were conducted that included the 2-way interaction of AccentOnObject by Context within the significant regions centre posterior (CP), left anterior (LA), LP, and RC. The results showed that this interaction was significant in the regions CP ($B = -0.74$, $SE = 0.26$, $t = -2.90$, $p = 0.004$), LP ($B = -0.65$, $SE = 0.31$, $t = -2.10$, $p = 0.037$), and LA ($B = -0.77$, $SE = 0.31$, $t = -2.51$, $p = 0.013$). The RC region did not include any main effects or interactions. The significant interactions are shown in Figure 9. Further investigation, involving a simple main effect analysis of AccentOnObject in each context condition, showed that no significance was found in each brain region in cases where context was absent. However, in the presence of context, there was a main effect of AccentOnObject in the CP ($B = -1.13$, $SE = 0.40$, $t = -2.80$, $p = 0.006$), LA ($B = -0.98$, $SE = 0.48$, $t = -2.02$, $p = 0.046$), and LP ($B = -1.07$, $SE = 0.52$, $t = -2.05$, $p = 0.043$) regions.

For the British group, it was anticipated that they would be unaffected by the context but would show a more positive peak (an accent positivity) when pitch accent was present. It was furthermore expected that the American group would be facilitated by context, behaving more native-like when context was present. No significant difference between the two variety groups was found. Figure 9 surprisingly reveals that context did not facilitate CFM processing during this time window. When a context sentence was included, the ERP results were more negative in the CFM condition, with no significant difference between the groups. In the absence of context, there is no significant main effect of accentuation.

Figure 9



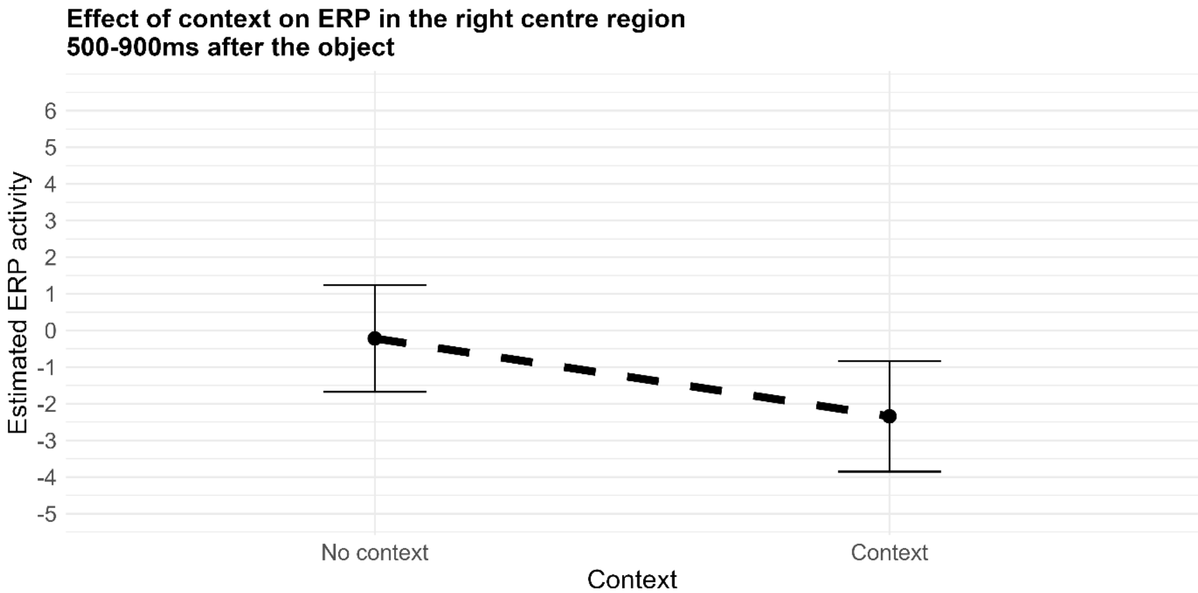
Note: The right figure depicts ERP results measured in the central posterior region, while the middle figure shows those in the left anterior region, and the left figure illustrates findings from the left posterior scalp region. CFM stands for contrastive focus marking. Grey = no context, yellow = context.

5.2.2.3 Late time window (500-900ms)

The main analysis of the late time window related to the verb resulted in a best-fit model with only Participant as random intercept and no fixed factors. After analysing the data including nine regions, the best-fit model consisted of the random intercepts Participant and Item and the interactions of American by Context and of ROI x AccentOnObject x Context. Significant interactions were found of American by Context, Context by Right central, and Context x Right central x AccentOnObject (see appendix 9.5 for the coefficients). The latter interaction was further investigated with only RC as the region of interest. This analysis resulted in a loss of the interaction but a main effect of Context (B = -1.07, SE = 0.48, t = -2.24, p = 0.026), which is shown in Figure 10.

Figure 10, focusing on the RC region, shows a distinct P600 when context is absent, but no P600 when context is present. This outcome matches expectations, although it was anticipated only for the American group.

Figure 10



6. Discussion

6.1 Summary analysis

This study aimed to establish whether phonemic differences can affect prosodic processing. Specifically, native speakers of American and British English participated in an EEG study while listening to Standard Southern British English (SSBE) speech containing contrastive focus marking (CFM). It was expected that both groups had different cognitive approaches, in line with the Different Processes Hypothesis. Several analyses were conducted. Firstly, this study tried to remove noise from the data and complex interactions as compared to Ganga *et al.*'s (2024) analysis which included all nine brain regions, so the main analysis did not contain those nine brain regions as the independent factor. Rather, the dependent factor, ERP, contained only the most relevant regions of the brain. This meant that for the two early time windows and the two middle time windows, only the left and midline anterior regions of the brain were included, while the posterior region was most relevant to the late time window. However, this analysis did not result in any significant interactions, which was highly contradictory to Ganga *et al.*'s (2024) findings. Moreover, while, based on previous research (Ganga *et al.*, 2024; Gouvea *et al.*, 2010; Kaan *et al.*, 2000; Lee, Perdomo & Kaan, 2020), the most significant brain regions were chosen in the present study's main analysis, Ganga *et al.* found broadly distributed ERP results rather than only in a more specific part of the brain. Moreover, EEG has a poor spatial accuracy, so observed activity might not be recorded in the correct scalp region. Therefore, an alternative analysis was necessary, which was identical to Ganga *et al.*'s analysis. To elucidate, the dependent variable ERP included all brain regions and an independent variable Region of Interest (ROI) was included, which included nine different brain regions (either left, centre, or right, and either anterior, central, or posterior). Further analysis comprised a simple main effect analysis containing only the ROI which was included in a significant interaction, in order to have a less complex interaction. Below, the results of the alternative analysis will be discussed, as this analysis provides a more nuanced view on the results due to the significant interactions. Based on this, the research question will be answered in section 7.

6.2 Early expectancy peak

In the early time window related to the verb, it was predicted that the British group would exhibit a positive expectancy peak, and that the American group would show a native-like positive expectancy peak when context was present, facilitated by the context. The results indicated that both groups exhibited a positive expectancy peak, with no significant differences between the groups or the context conditions. This suggests that both groups anticipated pitch accent on the verb, aligning with findings from Dutch (Dimitrova et al., 2012), where the Dutch equivalent of the focus particle *only* led listeners to expect adjacent pitch accent. Although American English speakers are not native SSBE speakers, it stands to reason that they would expect pitch accent due to the focus particle *only*, since it is part of their native language; thus, this was predicted. However, it was also predicted that they would show a reduced positive expectancy peak due to their lower sensitivity to pitch accent in a, to them, nonnative variety. The fact that they exhibited a full positive expectancy peak, comparable to the British group, indicates that they were sensitive to pitch accent. These findings suggest that the hypothesis that phonemic differences influence prosodic processing is not supported.

For the early time window relating to the object, it was expected to observe a negative expectancy peak for the British group when CFM was present, regardless of context. Additionally, the American group was expected to exhibit a reduced form of the negative expectancy peak, with context facilitating a more native-like response. The American group showed to be sensitive to context, but context did not play a facilitating role. To elaborate, the ERP amplitude was more positive with CFM when context was present, while the opposite was expected. In the no-context condition, the American group exhibited a negative expectancy peak when CFM was present. These findings suggest that context did not facilitate; on the contrary, context seemed to confuse listeners. The British group exhibited a negative expectancy peak in every condition, irrespective of CFM presence. This was contrary to predictions, as it was anticipated that the British group would show a negative expectancy peak only when CFM was present. It seems that the British group expected pitch accent in every condition. Even though context did not play a facilitating role, the observed differences between the two groups support the hypothesis that phonemic variations influence prosodic processing.

6.3 Accent positivity

Results from the middle time window relating to the verb show that, as expected, the American group did not exhibit an accent positivity when context was absent and CFM was present, while the British group did. This supports the hypothesis that phonemic differences affect the processing of prosodic structures that are similar between two varieties. However, the American group did not improve in the presence of context, while it was expected that they would. Moreover, the British group was predicted to remain unaffected by context, but their accent positivity disappeared in the presence of context. This unexpected influence of context was also observed in the middle time window after the object, which shows that ERP results for both groups become more negative in the presence of context when CFM was provided compared to when CFM was absent. A possible explanation for this finding is the nature of the context sentences. The context sentences provided participants with two options for the object (*a bucket* and *a suitcase*) and two options for the verb (*throw* and *carry*): *The dinosaur has a bucket and a suitcase. He was going to throw them and carry them.* Even though only one of these options received CFM in the target sentence, both the object and the verb were contrastive. In other words, the target sentence always negated one verb option and one object option, regardless of pitch accent placement. Thus, perhaps a more rational target sentence in response to the context sentences would be one with broad focus, accentuating both the verb and the object: *The dinosaur is only CARRYING the BUCKET.* Therefore, the nature of the context sentences might have been a confound in this study, obstructing the question whether context can be facilitating.

6.4 P600

The late time window related to the object did not provide evidence for variety-related differences. Whereas the other time windows showed a negative effect of context, this time window shows that both groups exhibited a P600 when context was absent, but no P600 when context was present. This suggests that context facilitated the processing of the target sentence, which aligns with the prediction. The reason why context appears to facilitate in this instance, yet not in earlier time windows, remains uncertain. As discussed in section 6.3, it is possible that the nature of the context sentences contributes to these ambiguous results, highlighting the need for further research to clarify this issue.

7. Conclusion

This EEG study used the ERP paradigm to test American and British native speakers of English when listening to Standard Southern British English speech containing contrastive focus marking (CFM).

The research question *How do phonemic differences between American varieties of English and Standard Southern British English influence online processing of the mapping between accentuation and contrastive focus in sentences containing the word* only*?* can be answered as follows: phonemic differences cause for a different approach to prosodic processing. Due to this, it can be concluded that the Different Processes Hypothesis can be extended to the interface between phonemic differences and prosody, as phonemic differences not only influence phonological processing, but also prosodic processing.

While it is clear that the two groups exhibited different approaches in the early time window related to the object and the middle time window related to the verb, it is not clear what role context plays in prosodic processing. To elaborate, the British group was less sensitive to pitch accent when context was present in the middle time window related to the verb, when they exhibited an accent positivity only in the absence of context, suggesting that context confused the group. Moreover, the American group was not facilitated by context in the early time window related to the object, since they exhibited a negative expectancy peak in the absence but not in the presence of context. Both groups were also obstructed by context in the middle time window related to the object, since no accent positivity was exhibited in the presence of context. However, both groups exhibited a P600 in the absence of context, while they did not when context was present. The latter finding suggests that context facilitated speakers in that they did not have to reevaluate the sentence. The context sentences may have been overly complex, offering two options each for the verb and the object. Additionally, the sentences involved anthropomorphised descriptions of animals, which could have been semantically confusing.

A potential confound of this study arises from Brunellière's (2009) findings, which showed that Swiss French speakers demonstrated native-like processing of Standard French. This suggests that extensive exposure to native varieties beyond one's own, even across national borders, can impact phonological processing. If this effect also applies to prosodic processing, the American group's possible familiarity with SSBE may have affected their responses.

Additionally, the alternative analysis that was added to this study due to the poor spatial resolution of EEG resulted in more significant effects, although some of the effects observed were measured in regions that were not adjacent to the initially most relevant determined scalp regions. This is likely due to the fact that the ERP components measured in this study can occur widely-distributed across all scalp regions, as in Ganga *et al.* (2024).

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9. Appendices

9.1 Questionnaire

Information gathered from participants in survey.

Question number	Question, as asked in survey	Answer options
1	How old are you?	18 to 28 years old 29 to 38 years old 39 to 48 years old 49 to 58 years old
2	Besides English, were you raised with another language (i.e., bilingual/multilingual)? If yes, please state which language(s).	No, English is my only native language. Yes, namely...
3	What (regional) accent of English do you speak? For example, Liverpool English, New York English, General American, Standard Southern British, etc.	Open question
4	What is your gender?	Male Female Non-binary / third gender Prefer not to say
5	On average, how many days per week do you make music (i.e., sing/rap/dance or play any musical instrument)?	0 days 1 day 2 days 3 days 4 days 5 days 6 days 7 days
6	Have you ever lived in a country different from the one in which you grew up, where English is a native language?	No Yes
	If answered “yes” to the *Residence* question:	
7	In which English-speaking country, different from the one in which you grew up, did you live?	Open question
8	For how long did you live there?	Open question

9.2 Main analysis

In the main analysis, the dependent variable "ERP" consisted of only those channels that in previous research (Dimitrova *et al.*, 2012; Ganga *et al.*, 2024) were found to be most relevant to the respective time windows. In the tables below, the order in which the predictors were added whilst building the model to establish the best-fit model is shown as well as the coefficients and the action that was taken.

9.2.1 Steps taken in the main analysis for the early time window (100-200ms) after the verb

Model nr.	**-2LL**	***df***	***p*-value**	**Model comparison**	**Predictor added**	**Action**
0	72296	6252	-	-	Dependent variable "ERP" and random factor "Participant"	-
1	72292	6251	0.047	Better	Random intercept "Item"	Keep
2	72290	6250	0.096	Not better	Fixed factor "American"	Keep for interaction
3	72286	6249	0.055	Not better	Fixed factor "AccentOnVerb"	Keep for interaction
4	72285	6248	0.362	Not better	Interaction between "American" and "AccentOnVerb"	Remove
5	72286	6248	0.986	Not better	Fixed factor "Context"	Keep for interaction
6	72286	6247	0.726	Not better	Interaction between "Context" and "AccentOnVerb"	Remove
7	72286	6247	0.516	Not better	Interaction between "Context" and "American"	Keep for 3-way interaction
8	72283	6244	0.446	Not better	Interaction between "Context", "AccentOnVerb" and "American"	Remove

9.2.2 Steps taken in the main analysis for the middle time window (200-390ms) after the verb

Model nr.	**-2LL**	***df***	***p*-value**	**Model comparison**	**Predictor added**	**Action**
0	45716	6252	-	-	Dependent variable "ERP" and random factor "Participant"	-
1	45716	6251	0.804	Not better	Random intercept "Item"	Remove
2	45706	6251	0.002	Better	Fixed factor "American"	Keep
3	45703	6250	0.062	Not better	Fixed factor "AccentOnVerb"	Keep for interaction
4	45701	6249	0.125	Not better	Interaction between "American" and "AccentOnVerb"	Remove
5	45693	6249	0.002	Better	Fixed factor "Context"	Keep
6	45692	6248	0.277	Not better	Interaction between "Context" and "AccentOnVerb"	Remove
7	45692	6248	0.166	Not better	Interaction between "Context" and "American"	Keep for 3-way interaction
8	45687	6245	0.204	Not better	Interaction between "Context", "AccentOnVerb" and "American"	Remove

9.2.3 Steps taken in the main analysis for the early time window (100-200ms) after the object

Model nr.	**-2LL**	***df***	***p*-value**	**Model comparison**	**Predictor added**	**Action**
0	73749	6371	-	-	Dependent variable "ERP" and random factor "Participant"	-
1	73744	6370	0.032	Better	Random intercept "Item"	Keep
2	73744	6369	0.083	Not better	Fixed factor "American"	Keep for interaction
3	73740	6368	0.042	Better	Fixed factor "AccentOnObject"	Keep
4	73740	6367	0.714	Not better	Interaction between "American" and "AccentOnObject"	Remove
5	73740	6367	0.815	Not better	Fixed factor "Context"	Keep for interaction
6	73739	6366	0.329	Not better	Interaction between "Context" and "AccentOnObject"	Remove
7	73739	6366	0.594	Not better	Interaction between "Context" and "American"	Keep for 3-way interaction
8	73738	6363	0.760	Not better	Interaction between "Context", "AccentOnObject" and "American"	Remove

9.2.4 Steps taken in the main analysis for the middle time window (200-390ms) after the object

Model nr.	**-2LL**	***df***	***p*-value**	**Model comparison**	**Predictor added**	**Action**
0	46497	6371	-	-	Dependent variable "ERP" and random factor "Participant"	-
1	46497	6370	0.456	Not better	Random intercept "Item"	Remove
2	46496	6370	0.302	Not better	Fixed factor "American"	Keep for interaction
3	46493	6369	0.076	Not better	Fixed factor "AccentOnObject"	Keep for interaction
4	46491	6368	0.138	Not better	Interaction between "American" and "AccentOnObject"	Remove
5	46490	6368	0.105	Not better	Fixed factor "Context"	Keep for interaction
6	46489	6367	0.357	Not better	Interaction between "Context" and "AccentOnObject"	Remove
7	46486	6367	0.052	Not better	Interaction between "Context" and "American"	Keep for 3-way interaction
8	46483	6364	0.374	Not better	Interaction between "Context", "AccentOnObject" and "American"	Remove

9.2.5 Steps taken in the main analysis for the late time window (500-900ms) after the object

Model nr.	**-2LL**	***df***	***p*-value**	**Model comparison**	**Predictor added**	**Action**
0	48963	6371	-	-	Dependent variable "ERP" and random factor "Participant"	-
1	48962	6370	0.198	Not better	Random intercept "Item"	Remove
2	48961	6370	0.174	Not better	Fixed factor "American"	Keep for interaction
3	48960	6369	0.29	Not better	Fixed factor "AccentOnObject"	Keep for interaction
4	48957	6368	0.062	Not better	Interaction between "American" and "AccentOnObject"	Remove
5	48960	6368	0.494	Not better	Fixed factor "Context"	Keep for interaction
6	48960	6367	0.575	Not better	Interaction between "Context" and "AccentOnObject"	Remove
7	48959	6367	0.427	Not better	Interaction between "Context" and "American"	Keep for 3-way interaction
8	48955	6364	0.233	Not better	Interaction between "Context", "AccentOnObject" and "American"	Remove

9.3 Alternative analysis

An alternative analysis was done since the lack of significant results as opposed to Ganga *et al.*'s (2024) findings suggested that the removal of Region of Interest (ROI) as dependent variable was unwise. This time, Ganga *et al.*'s approach to the analysis was replicated, so ROI was used as an independent variable which comprised nine different neural regions. Below, the tables illustrate in what order the models were built and what actions were taken.

9.3.1 Steps taken in the alternative analysis for the early time window (100-200ms) after the verb

Model nr.	**-2LL**	***df***	***p*-value**	**Model comparison**	**Predictor added**	**Action**
0	497500	56869	-	-	Dependent variable "ERP" and random factor "Participant"	-
1	497266	56868	<.001	Better	Random factor "Item"	Keep
2	497265	56867	0.361	Not better	Fixed factor "Context"	Keep for interaction
3	497248	56866	<.001	Better	Fixed factor "AccentOnVerb"	Keep
4	497248	56865	0.459	Not better	Interaction between "Context" and "AccentOnVerb"	Remove
5	497233	56858	0.046	Better	Fixed factor "ROI"	Keep
6	497223	56850	0.275	Not better	Interaction between "Context" and "ROI"	Remove
7	497224	56850	0.395	Not better	Interaction between "AccentOnVerb" and "ROI"	Keep for 3-way interaction
8	497201	56833	0.131	Not better	Interaction between "Context", "Accent", and "ROI"	Remove
9	497232	56857	0.33	Not better	Fixed factor "American"	Keep for interaction
10	497230	56856	0.168	Not better	Interaction between "Context" and "American"	Remove
11	497225	56856	0.013	Better	Interaction between "AccentOnVerb" and "American"	Keep
12	497221	56853	0.24	Better	Interaction between "Context", "Accent", and "American"	Remove
13	497214	56848	0.159	Not better	Interaction between "ROI" and "American"	Keep for 3-way interaction
14	497195	56831	0.344	Not better	Interaction between "Context", "ROI", and "American"	Remove
15	497201	56832	0.432	Not better	Interaction between "AccentOnVerb, "ROI", and "American"	Keep for 4-way interaction
16	497150	56797	0.041	Better	Interaction between "Context", Accent", "ROI", and "American"	Keep

9.3.2 Steps taken in the alternative analysis for the middle time window (200-390ms) after the verb

Model nr.	**-2LL**	***df***	***p*-value**	**Model comparison**	**Predictor added**	**Action**
0	515125	56869	-	-	Dependent variable "ERP" and random factor "Participant"	-
1	515042	56868	<.001	Better	Random factor "Item"	Keep
2	515041	56867	0.463	Not better	Fixed factor "Context"	Keep for interaction
3	515021	56866	<.001	Better	Fixed factor "AccentOnVerb"	Keep
4	515019	56865	0.115	Not better	Interaction between "Context" and "AccentOnVerb"	Remove
5	515009	56858	0.153	Not better	Fixed factor "ROI"	Keep for interaction
6	514997	56850	0.13	Not better	Interaction between "Context" and "ROI"	Remove
7	515002	56850	0.499	Not better	Interaction between "AccentOnVerb" and "ROI"	Keep for 3-way interaction
8	514972	56833	0.031	Better	Interaction between "Context", "Accent", and "ROI"	Keep
9	514970	56857	0.132	Not better	Fixed factor "American"	Keep for interaction
10	514966	56856	0.045	Better	Interaction between "Context" and "American"	Keep
11	514951	56855	<.001	Better	Interaction between "AccentOnVerb" and "American"	Keep
12	514949	56853	0.175	Not better	Interaction between "Context", "Accent", and "American"	Remove
13	514938	56847	0.111	Not better	Interaction between "ROI" and "American"	Remove
14	514926	56831	0.074	Not better	Interaction between "Context", "ROI", and "American"	Remove
15	514928	56831	0.114	Not better	Interaction between "AccentOnVerb, "ROI", and "American"	Remove
16	514899	56797	0.018	Better	Interaction between "Context", Accent", "ROI", and "American"	Keep

9.3.3 Steps taken in the alternative analysis for the early time window (100-200ms) after the object

Model nr.	**-2LL**	***df***	***p*-value**	**Model comparison**	**Predictor added**	**Action**
0	464100	57826	-	-	Dependent variable "ERP" and random factor "Participant"	-
1	463518	57825	<.001	Better	Random factor "Item"	Keep
2	463517	57824	0.477	Not better	Fixed factor "Context"	Keep for interaction
3	463517	57823	0.959	Not better	Fixed factor "AccentOnObject"	Keep for interaction
4	463516	57822	0.171	Not better	Interaction between "Context" and "AccentOnObject"	Remove
5	463509	57815	0.358	Not better	Fixed factor "ROI"	Keep for interaction
6	463500	57807	0.342	Not better	Interaction between "Context" and "ROI"	Remove
7	463500	57807	0.404	Not better	Interaction between "AccentOnObject" and "ROI"	Keep for 3-way interaction
8	463437	57790	<.001	Better	Interaction between "Context", "Accent", and "ROI"	Keep
9	463437	57789	0.471	Not better	Fixed factor "American"	Keep for interaction
10	463436	57788	0.337	Not better	Interaction between "Context" and "American"	Remove
11	463435	57788	0.146	Not better	Interaction between "AccentOnObject" and "American"	Keep for 3-way interaction
12	463433	57786	0.454	Not better	Interaction between "Context", "Accent", and "American"	Remove
13	463415	57781	0.005	Better	Interaction between "ROI" and "American"	Keep
14	463396	57772	0.026	Better	Interaction between "Context", "ROI", and "American"	Keep
15	463384	57763	0.242	Not better	Interaction between "AccentOnObject, "ROI", and "American"	Remove
16	463360	57754	0.008	Better	Interaction between "Context", Accent", "ROI", and "American"	Keep

9.3.4 Steps taken in the alternative analysis for the middle time window (200-390ms) after the object

Model nr.	**-2LL**	***df***	***p*-value**	**Model comparison**	**Predictor added**	**Action**
0	465480	57826	-	-	Dependent variable "ERP" and random factor "Participant"	-
1	464977	57825	<.001	Better	Random factor "Item"	Keep
2	464976	57824	0.33	Not better	Fixed factor "Context"	Keep for interaction
3	464975	57823	0.265	Not better	Fixed factor "AccentOnObject"	Keep for interaction
4	464969	57822	0.019	Better	Interaction between "Context" and "AccentOnObject"	Keep
5	464964	57814	0.707	Not better	Fixed factor "ROI"	Keep for interaction
6	464949	57806	0.075	Not better	Interaction between "Context" and "ROI"	Remove
7	464954	57806	0.322	Not better	Interaction between "AccentOnObject" and "ROI"	Keep for 3-way interaction
8	464898	57790	<.001	Better	Interaction between "Context", "Accent", and "ROI"	Keep
9	464898	57789	0.709	Not better	Fixed factor "American"	Keep for interaction
10	464892	57788	0.023	Better	Interaction between "Context" and "American"	Keep
11	464892	57787	0.438	Not better	Interaction between "AccentOnObject" and "American"	Remove
12	464891	57786	0.657	Not better	Interaction between "Context", "Accent", and "American"	Remove
13	464877	57780	0.049	Better	Interaction between "ROI" and "American"	Keep
14	464857	57772	0.011	Better	Interaction between "Context", "ROI", and "American"	Keep
15	464845	57763	0.189	Not better	Interaction between "AccentOnObject, "ROI", and "American"	Remove
16	464836	57754	0.291	Not better	Interaction between "Context", Accent", "ROI", and "American"	Remove

9.3.5 Steps taken in the alternative analysis for the late time window (500-900ms) after the object

Model nr.	-2LL	*df*	*p*-value	Model comparison	Predictor added	Action
0	504238	57826	-	-	Dependent variable "ERP" and random factor "Participant"	-
1	504037	57825	<.001	Better	Random factor "Item"	Keep
2	504030	57824	0.006	Better	Fixed factor "Context"	Keep
3	504023	57823	0.008	Better	Fixed factor "AccentOnObject"	Keep
4	504022	57822	0.379	Not better	Interaction between "Context" and "AccentOnObject"	Remove
5	504016	57815	0.54	Not better	Fixed factor "ROI"	Keep for interaction
6	503991	57807	0.002	Better	Interaction between "Context" and "ROI"	Keep
7	503974	57799	0.03	Better	Interaction between "AccentOnObject" and "ROI"	Keep
8	503941	57790	<.001	Better	Interaction between "Context", "Accent", and "ROI"	Keep
9	503941	57789	0.63	Not better	Fixed factor "American"	Keep for interaction
10	503934	57788	0.011	Better	Interaction between "Context" and "American"	Keep
11	503934	57787	0.851	Not better	Interaction between "AccentOnObject" and "American"	Remove
12	503931	57786	0.14	Not better	Interaction between "Context", "Accent", and "American"	Remove
13	503922	57780	0.123	Not better	Interaction between "ROI" and "American"	Remove
14	503913	57772	0.149	Not better	Interaction between "Context", "ROI", and "American"	Remove
15	503916	57771	0.342	Not better	Interaction between "AccentOnObject, "ROI", and "American"	Remove
16	503899	57754	0.38	Not better	Interaction between "Context", Accent", "ROI", and "American"	Remove

9.4 Coefficients best models main analysis

Critical word	**Time window**	**Random intercepts**	**Included factors**	**Estimated means**	**Standard error**	***df***	***t***	***p***
Verb	100-200ms	Participant Item number	Intercept	min1.53	1	237	min1.42	0.16
	200-390ms	Participant	Intercept	min0.57	0	6255	min4.85	<.001*
			American	min0.36	0	6255	min3.08	0.002*
			Context	0.37	0	6255	min3.10	0.002*
Object	100-200ms	Participant	Intercept	0.12	1	41	0.09	0.924
		Item number	AccentOnObject	min2.20	1	231	min2.05	0.042*
	200-390ms	Participant	Intercept	min0.64	0	33	min4.62	<.001*
	500-900ms	Participant	Intercept	0.49	0	32	2.36	0.025*

9.5 Coefficients best models alternative analysis

9.5.1 Coefficients for the best model of the early time window (100-200ms) after the verb

Included factors	**Estimated means**	**Standard error**	***df***	***t***	***p***
(Intercept)	-0.68	0.29	530	-2.39	.017*
American	-0.08	0.26	430	-0.29	.772
AccentOnVerb	0.63	0.26	3111	2.39	.017*
Centre central	0.34	0.34	55035	1.00	.318
Centre posterior	0.52	0.34	56829	1.52	.129
Left anterior	-0.07	0.34	56602	-0.22	.828
Left central	-0.06	0.34	54983	-0.17	.863
Left posterior	0.04	0.34	56828	0.10	.918
Right anterior	0.33	0.34	56604	0.98	.327
Right central	-0.37	0.34	54987	-1.08	.279
Right posterior	0.72	0.34	56829	2.13	.033*
Context	0.10	0.26	3111	0.39	.694
American:AccentOnVerb	0.03	0.24	56724	0.14	.891
American:Centre central	-0.43	0.34	56739	-1.27	.205
American:Centre posterior	-0.32	0.34	56722	-0.93	.351
American:Left anterior	-0.11	0.34	56607	-0.33	.743
American:Left central	-0.01	0.34	56734	-0.03	.976
American:Left posterior	0.52	0.34	56723	1.52	.129
American:Right anterior	-0.13	0.34	56605	-0.39	.693
American:Right central	0.25	0.34	56739	0.75	.454
American:Right posterior	-0.23	0.34	56718	-0.66	.506
AccentOnVerb:Centre central	-0.06	0.34	55039	-0.18	.856
AccentOnVerb:Centre posterior	0.00	0.34	56822	-0.01	.995
AccentOnVerb:Left anterior	-0.34	0.34	56602	-1.00	.317
AccentOnVerb:Left central	-0.20	0.34	54988	-0.57	.568
AccentOnVerb:Left posterior	0.41	0.34	56822	1.21	.225
AccentOnVerb:Right anterior	-0.26	0.34	56605	-0.76	.445

AccentOnVerb:Right central	-0.23	0.34	54988	-0.68	.496
AccentOnVerb:Right posterior	0.18	0.34	56823	0.53	.597
American:Context	-0.01	0.24	56727	-0.03	.976
AccentOnVerb:Context	0.16	0.26	3110	0.59	.555
Centre central:Context	-0.40	0.34	55030	-1.18	.240
Centre posterior:Context	-0.32	0.34	56815	-0.95	.340
Left anterior:Context	-0.37	0.34	56602	-1.08	.278
Left central:Context	-0.55	0.34	54977	-1.60	.110
Left posterior:Context	0.15	0.34	56818	0.43	.670
Right anterior:Context	-0.26	0.34	56604	-0.77	.440
Right central:Context	0.15	0.34	54978	0.43	.668
Right posterior:Context	-0.52	0.34	56817	-1.53	.127
American:AccentOnVerb:Centre central	-0.21	0.34	56744	-0.61	.542
American:AccentOnVerb:Centre posterior	-0.31	0.34	56719	-0.91	.363
American:AccentOnVerb:Left anterior	-0.22	0.34	56607	-0.66	.508
American:AccentOnVerb:Left central	-0.18	0.34	56739	-0.54	.589
American:AccentOnVerb:Left posterior	-0.15	0.34	56721	-0.43	.668
American:AccentOnVerb:Right anterior	-0.02	0.34	56606	-0.06	.952
American:AccentOnVerb:Right central	-0.53	0.34	56742	-1.56	.118
American:AccentOnVerb:Right posterior	-0.43	0.34	56716	-1.25	.210
American:AccentOnVerb:Context	-0.07	0.24	56713	-0.30	.763
American:Centre central:Context	-0.17	0.34	56732	-0.50	.614
American:Centre posterior:Context	0.42	0.34	56712	1.22	.222
American:Left anterior:Context	-0.08	0.34	56607	-0.24	.813
American:Left central:Context	0.27	0.34	56726	0.79	.427
American:Left posterior:Context	-0.08	0.34	56715	-0.23	.819
American:Right anterior:Context	0.07	0.34	56605	0.19	.846
American:Right central:Context	0.23	0.34	56729	0.68	.498

American:Right posterior:Context	0.44	0.34	56709	1.31	.192
AccentOnVerb:Centre central:Context	0.04	0.34	55032	0.13	.897
AccentOnVerb:Centre posterior:Context	-0.46	0.34	56818	-1.34	.180
AccentOnVerb:Left anterior:Context	-0.27	0.34	56602	-0.79	.432
AccentOnVerb:Left central:Context	-0.05	0.34	54980	-0.13	.894
AccentOnVerb:Left posterior:Context	-0.77	0.34	56821	-2.27	.023*
AccentOnVerb:Right anterior:Context	0.01	0.34	56605	0.02	.982
AccentOnVerb:Right central:Context	-0.06	0.34	54982	-0.16	.869
AccentOnVerb:Right posterior:Context	-0.73	0.34	56820	-2.14	.032*
American:AccentOnVerb:Centre central:Context	0.23	0.34	56731	0.68	.499
American:AccentOnVerb:Centre posterior:Context	0.03	0.34	56716	0.09	.932
American:AccentOnVerb:Left anterior:Context	-0.01	0.34	56607	-0.04	.972
American:AccentOnVerb:Left central:Context	0.36	0.34	56725	1.06	.290
American:AccentOnVerb:Left posterior:Context	0.71	0.34	56720	2.08	.037*
American:AccentOnVerb:Right anterior:Context	-0.47	0.34	56606	-1.40	.162
American:AccentOnVerb:Right central:Context	0.21	0.34	56730	0.62	.538
American:AccentOnVerb:Right posterior:Context	0.54	0.34	56713	1.59	.112

* Significant *p*-values are indicated with an asterisk.

9.5.2 Coefficients for the best model of the middle time window (200-390ms) after the verb

Included factors	**Estimated means**	**Standard error**	***df***	***t***	***p***
(Intercept)	-1.78	0.53	61	-3.36	.001*
American	-0.58	0.52	58	-1.12	.268
Context	0.45	0.29	5606	1.52	.129
Centre central	0.03	0.40	52252	0.08	.937
Centre posterior	0.42	0.40	56835	1.05	.292
Left anterior	0.03	0.40	56605	0.07	.947
Left central	-0.35	0.40	52133	-0.88	.379

Left posterior	-0.11	0.40	56835	-0.27	.786
Right anterior	0.33	0.40	56607	0.83	.406
Right central	-0.42	0.40	52154	-1.05	.293
Right posterior	0.65	0.40	56834	1.64	.101
AccentOnVerb	0.59	0.29	5606	2.01	.044*
American:Context	0.34	0.28	56751	1.21	.225
American:Centre central	-0.35	0.40	56773	-0.88	.381
American:Centre posterior	-0.52	0.40	56750	-1.30	.194
American:Left anterior	-0.08	0.40	56613	-0.20	.841
American:Left central	-0.24	0.40	56767	-0.61	.539
American:Left posterior	0.57	0.40	56751	1.43	.152
American:Right anterior	-0.07	0.40	56608	-0.17	.868
American:Right central	0.29	0.40	56773	0.73	.468
American:Right posterior	-0.45	0.40	56746	-1.14	.256
Context:Centre central	-0.39	0.40	52263	-0.97	.332
Context:Centre posterior	-0.46	0.40	56831	-1.17	.243
Context:Left anterior	-0.64	0.40	56605	-1.62	.105
Context:Left central	-0.65	0.40	52151	-1.62	.105
Context:Left posterior	0.15	0.40	56831	0.37	.710
Context:Right anterior	-0.53	0.40	56607	-1.35	.177
Context:Right central	0.13	0.40	52152	0.33	.740
Context:Right posterior	-0.78	0.40	56831	-1.96	.050
American:AccentOnVerb	0.04	0.28	56751	0.14	.889
Context:AccentOnVerb	0.25	0.29	5605	0.84	.401
Centre central:AccentOnVerb	0.09	0.40	52249	0.23	.821
Centre posterior:AccentOnVerb	-0.08	0.40	56832	-0.20	.842
Left anterior:AccentOnVerb	-0.25	0.40	56605	-0.64	.522
Left central:AccentOnVerb	-0.08	0.40	52132	-0.20	.843
Left posterior:AccentOnVerb	0.61	0.40	56832	1.53	.126
Right anterior:AccentOnVerb	-0.26	0.40	56607	-0.66	.508

Right central:AccentOnVerb	-0.10	0.40	52135	-0.25	.806
Right posterior:AccentOnVerb	0.13	0.40	56832	0.33	.742
American:Context:Centre central	-0.40	0.40	56770	-1.00	.316
American:Context:Centre posterior	0.26	0.40	56746	0.66	.510
American:Context:Left anterior	-0.36	0.40	56613	-0.90	.367
American:Context:Left central	-0.07	0.40	56764	-0.18	.854
American:Context:Left posterior	-0.84	0.40	56748	-2.12	.034*
American:Context:Right anterior	-0.12	0.40	56608	-0.31	.753
American:Context:Right central	-0.01	0.40	56768	-0.03	.976
American:Context:Right posterior	0.21	0.40	56743	0.53	.594
American:Context:AccentOnVerb	-0.18	0.28	56749	-0.63	.528
American:Centre central:AccentOnVerb	-0.29	0.40	56773	-0.74	.461
American:Centre posterior:AccentOnVerb	-0.63	0.40	56748	-1.59	.111
American:Left anterior:AccentOnVerb	0.00	0.40	56613	0.00	.997
American:Left central:AccentOnVerb	-0.42	0.40	56767	-1.06	.288
American:Left posterior:AccentOnVerb	-0.66	0.40	56750	-1.66	.097
American:Right anterior:AccentOnVerb	-0.12	0.40	56608	-0.31	.754
American:Right central:AccentOnVerb	-0.74	0.40	56771	-1.85	.064
American:Right posterior:AccentOnVerb	-0.73	0.40	56745	-1.83	.067
Context:Centre central:AccentOnVerb	-0.27	0.40	52271	-0.68	.496
Context:Centre posterior:AccentOnVerb	-0.67	0.40	56833	-1.69	.091
Context:Left anterior:AccentOnVerb	-0.20	0.40	56605	-0.49	.621
Context:Left central:AccentOnVerb	-0.51	0.40	52153	-1.28	.201
Context:Left posterior:AccentOnVerb	-1.24	0.40	56833	-3.10	.002*
Context:Right anterior:AccentOnVerb	-0.19	0.40	56606	-0.47	.638
Context:Right central:AccentOnVerb	-0.25	0.40	52167	-0.61	.539

Context:Right posterior:AccentOnVerb	-0.79	0.40	56833	-1.98	.048*
American:Context:Centre central:AccentOnVerb	0.43	0.40	56770	1.08	.281
American:Context:Centre posterior:AccentOnVerb	0.25	0.40	56748	0.63	.529
American:Context:Left anterior:AccentOnVerb	0.03	0.40	56613	0.07	.944
American:Context:Left central:AccentOnVerb	0.35	0.40	56764	0.87	.383
American:Context:Left posterior:AccentOnVerb	0.70	0.40	56751	1.76	.078
American:Context:Right anterior:AccentOnVerb	-0.43	0.40	56608	-1.08	.282
American:Context:Right central:AccentOnVerb	0.55	0.40	56769	1.39	.165
American:Context:Right posterior:AccentOnVerb	0.85	0.40	56745	2.13	.033*

* Significant *p*-values are indicated with an asterisk.

9.5.3 Coefficients for the best model of the early time window (100-200ms) after the object

Included factors	**Estimated means**	**Standard error**	***df***	***t***	***p***
(Intercept)	-0.08	0.36	62	-0.22	.825
American	0.16	0.35	51	0.46	.651
Centre central	-0.21	0.24	57382	-0.87	.385
Centre posterior	-0.43	0.24	57701	-1.84	.065
Left anterior	-0.29	0.23	57558	-1.23	.217
Left central	-0.16	0.24	57368	-0.66	.509
Left posterior	-0.45	0.24	57699	-1.90	.058
Right anterior	-0.08	0.23	57557	-0.35	.725
Right central	0.06	0.24	57362	0.24	.812
Right posterior	-0.31	0.24	57699	-1.31	.191
AccentOnObject	0.09	0.20	1565	0.46	.647
Context	-0.30	0.20	1566	-1.51	.131
American:Centre central	0.01	0.23	57628	0.04	.970
American:Centre posterior	0.26	0.23	57620	1.11	.269
American:Left anterior	0.43	0.23	57557	1.83	.067

American:Left central	0.14	0.23	57631	0.59	.557
American:Left posterior	-0.49	0.23	57621	-2.10	.036*
American:Right anterior	-0.08	0.23	57556	-0.35	.728
American:Right central	0.37	0.23	57630	1.60	.110
American:Right posterior	-0.07	0.23	57618	-0.28	.778
American:AccentOnObject	0.08	0.16	57625	0.48	.632
Centre central:AccentOnObject	0.26	0.24	57385	1.10	.273
Centre posterior:AccentOnObject	-0.29	0.24	57701	-1.24	.213
Left anterior:AccentOnObject	-0.15	0.23	57558	-0.65	.513
Left central:AccentOnObject	0.03	0.24	57371	0.12	.903
Left posterior:AccentOnObject	-0.23	0.24	57698	-0.96	.338
Right anterior:AccentOnObject	-0.21	0.23	57557	-0.91	.361
Right central:AccentOnObject	-0.24	0.24	57364	-1.03	.302
Right posterior:AccentOnObject	-0.08	0.24	57699	-0.34	.730
American:Context	0.16	0.16	57628	0.97	.334
Centre central:Context	0.27	0.24	57387	1.13	.258
Centre posterior:Context	0.01	0.24	57697	0.03	.976
Left anterior:Context	0.50	0.23	57558	2.16	.031*
Left central:Context	0.27	0.24	57373	1.16	.247
Left posterior:Context	0.31	0.24	57694	1.31	.190
Right anterior:Context	0.36	0.23	57557	1.56	.118
Right central:Context	0.20	0.24	57366	0.85	.397
Right posterior:Context	-0.01	0.24	57695	-0.02	.982
AccentOnObject:Context	0.12	0.20	1565	0.62	.532
American:Centre central:AccentOnObject	0.23	0.23	57629	0.98	.326
American:Centre posterior:AccentOnObject	0.11	0.23	57622	0.47	.636
American:Left anterior:AccentOnObject	-0.25	0.23	57557	-1.06	.287
American:Left central:AccentOnObject	0.13	0.23	57632	0.54	.590
American:Left posterior:AccentOnObject	0.05	0.23	57623	0.23	.821
American:Right anterior:AccentOnObject	-0.24	0.23	57556	-1.03	.303
American:Right central:AccentOnObject	-0.15	0.23	57631	-0.65	.514
American:Right posterior:AccentOnObject	0.15	0.23	57620	0.65	.516
American:Centre central:Context	0.24	0.23	57630	1.03	.303

American:Centre posterior:Context	-0.10	0.23	57617	-0.44	.658
American:Left anterior:Context	-0.29	0.23	57557	-1.26	.208
American:Left central:Context	-0.38	0.23	57632	-1.63	.103
American:Left posterior:Context	-0.65	0.23	57618	-2.76	.006*
American:Right anterior:Context	-0.21	0.23	57556	-0.89	.372
American:Right central:Context	-0.28	0.23	57630	-1.21	.226
American:Right posterior:Context	-0.23	0.23	57614	-1.00	.317
American:AccentOnObject:Context	-0.18	0.16	57625	-1.07	.283
Centre central:AccentOnObject:Context	-0.07	0.24	57384	-0.32	.752
Centre posterior:AccentOnObject:Context	-0.87	0.24	57697	-3.68	<.001*
Left anterior:AccentOnObject:Context	-0.71	0.23	57558	-3.06	.002*
Left central:AccentOnObject:Context	0.02	0.24	57370	0.08	.935
Left posterior:AccentOnObject:Context	-0.68	0.24	57694	-2.88	.004*
Right anterior:AccentOnObject:Context	-0.22	0.23	57557	-0.96	.336
Right central:AccentOnObject:Context	0.43	0.24	57363	1.83	.067
Right posterior:AccentOnObject:Context	-0.59	0.24	57695	-2.51	.012*
American:Centre central:AccentOnObject:Context	-0.03	0.23	57627	-0.13	.900
American:Centre posterior:AccentOnObject:Context	0.26	0.23	57618	1.12	.262
American:Left anterior:AccentOnObject:Context	-0.23	0.23	57557	-1.00	.319
American:Left central:AccentOnObject:Context	0.24	0.23	57630	1.02	.308
American:Left posterior:AccentOnObject:Context	0.22	0.23	57619	0.95	.342
American:Right anterior:AccentOnObject:Context	-0.10	0.23	57556	-0.41	.680
American:Right central:AccentOnObject:Context	0.74	0.23	57628	3.18	.001*
American:Right posterior:AccentOnObject:Context	0.09	0.23	57615	0.36	.715

* Significant *p*-values are indicated with an asterisk.

9.5.4 Coefficients for the best model of the middle time window (200-390ms) after the object

Included factors	**Estimated means**	**Standard error**	***df***	***t***	***p***
(Intercept)	-1.69	0.37	63	-4.58	<.001*
American	-0.21	0.35	54	-0.59	.555
Centre central	0.04	0.24	57200	0.17	.863
Centre posterior	-0.10	0.24	57717	-0.43	.669
Left anterior	0.15	0.24	57563	0.63	.528
Left central	0.22	0.24	57181	0.91	.361
Left posterior	-0.24	0.24	57715	-0.99	.321
Right anterior	0.06	0.24	57562	0.24	.807
Right central	0.02	0.24	57173	0.08	.935
Right posterior	-0.11	0.24	57715	-0.46	.647
Context	0.12	0.20	1829	0.62	.532
AccentOnObject	-0.06	0.20	1824	-0.29	.771
American:Centre central	-0.02	0.24	57640	-0.10	.916
American:Centre posterior	0.28	0.24	57631	1.17	.243
American:Left anterior	0.48	0.24	57562	2.05	.041*
American:Left central	0.09	0.24	57644	0.40	.690
American:Left posterior	-0.25	0.24	57632	-1.04	.297
American:Right anterior	-0.07	0.24	57561	-0.31	.753
American:Right central	0.34	0.24	57642	1.43	.152
American:Right posterior	-0.08	0.24	57628	-0.33	.744
American:Context	-0.01	0.17	57639	-0.07	.943
Centre central:Context	0.03	0.24	57206	0.11	.911
Centre posterior:Context	-0.17	0.24	57713	-0.70	.484
Left anterior:Context	0.30	0.24	57563	1.29	.196
Left central:Context	0.06	0.24	57187	0.25	.800
Left posterior:Context	0.36	0.24	57710	1.53	.127
Right anterior:Context	-0.23	0.24	57562	-0.97	.332
Right central:Context	-0.09	0.24	57179	-0.36	.720
Right posterior:Context	-0.30	0.24	57711	-1.27	.206

Context:AccentOnObject	-0.16	0.20	1823	-0.82	.411
Centre central:AccentOnObject	0.30	0.24	57205	1.23	.218
Centre posterior:AccentOnObject	-0.29	0.24	57715	-1.24	.216
Left anterior:AccentOnObject	-0.14	0.24	57563	-0.61	.545
Left central:AccentOnObject	0.13	0.24	57187	0.54	.588
Left posterior:AccentOnObject	-0.31	0.24	57712	-1.29	.197
Right anterior:AccentOnObject	-0.21	0.24	57563	-0.89	.375
Right central:AccentOnObject	0.01	0.24	57177	0.03	.974
Right posterior:AccentOnObject	-0.19	0.24	57713	-0.80	.427
American:Centre central:Context	0.38	0.24	57641	1.60	.110
American:Centre posterior:Context	-0.10	0.24	57628	-0.42	.674
American:Left anterior:Context	-0.14	0.24	57562	-0.59	.558
American:Left central:Context	-0.08	0.24	57645	-0.33	.741
American:Left posterior:Context	-0.60	0.24	57629	-2.53	.011*
American:Right anterior:Context	-0.33	0.24	57561	-1.39	.165
American:Right central:Context	-0.20	0.24	57642	-0.83	.406
American:Right posterior:Context	0.01	0.24	57625	0.04	.971
Centre central:Context:AccentOnObject	0.18	0.24	57204	0.77	.443
Centre posterior:Context:AccentOnObject	-0.55	0.24	57711	-2.29	.022*
Left anterior:Context:AccentOnObject	-0.54	0.24	57563	-2.28	.023*
Left central:Context:AccentOnObject	0.20	0.24	57186	0.85	.397
Left posterior:Context:AccentOnObject	-0.47	0.24	57709	-1.96	.050*
Right anterior:Context:AccentOnObject	-0.24	0.24	57563	-1.01	.314
Right central:Context:AccentOnObject	0.63	0.24	57177	2.63	.009*
Right posterior:Context:AccentOnObject	-0.32	0.24	57709	-1.33	.185

* Significant *p*-values are indicated with an asterisk.

9.5.5 Coefficients for the best model of the late time window (500-900ms) after the object

Included factors	**Estimated means**	**Standard error**	***df***	***t***	***p***
(Intercept)	-1.68	0.56	50	-3.00	.004*
American	-0.25	0.50	33	-0.50	.621
Context	-0.20	0.26	3581	-0.80	.425
Centre central	-0.49	0.34	55596	-1.47	.142
Centre posterior	0.11	0.33	57770	0.34	.731
Left anterior	-0.19	0.33	57570	-0.57	.569
Left central	-0.16	0.34	55541	-0.48	.634
Left posterior	-0.08	0.33	57768	-0.23	.820
Right anterior	0.14	0.33	57569	0.42	.676
Right central	-0.09	0.34	55514	-0.28	.778
Right posterior	0.22	0.33	57767	0.66	.512
AccentOnObject	-0.36	0.26	3579	-1.39	.163
American:Context	-0.20	0.08	57788	-2.53	.011*
Centre central:AccentOnObject	0.56	0.34	55602	1.66	.098
Centre posterior:AccentOnObject	0.07	0.33	57769	0.21	.835
Left anterior:AccentOnObject	0.02	0.33	57570	0.07	.944
Left central:AccentOnObject	0.37	0.34	55548	1.10	.272
Left posterior:AccentOnObject	-0.26	0.33	57767	-0.79	.428
Right anterior:AccentOnObject	-0.10	0.33	57569	-0.31	.755
Right central:AccentOnObject	-0.62	0.34	55521	-1.84	.066
Right posterior:AccentOnObject	0.05	0.33	57768	0.16	.873
Context:Centre central	0.03	0.34	55612	0.10	.918
Context:Centre posterior	-0.22	0.33	57766	-0.66	.506
Context:Left anterior	0.23	0.33	57570	0.70	.482
Context:Left central	-0.11	0.34	55559	-0.34	.733
Context:Left posterior	0.51	0.33	57764	1.51	.130
Context:Right anterior	-0.32	0.33	57569	-0.98	.327

Context:Right central	-0.91	0.34	55532	-2.72	.007*
Context:Right posterior	-0.50	0.33	57764	-1.49	.135
Context:AccentOnObject	-0.24	0.26	3578	-0.93	.354
Context:Centre central:AccentOnObject	0.43	0.34	55606	1.29	.197
Context:Centre posterior:AccentOnObject	-0.23	0.33	57766	-0.70	.487
Context:Left anterior:AccentOnObject	-0.25	0.33	57570	-0.75	.454
Context:Left central:AccentOnObject	0.62	0.34	55552	1.86	.063
Context:Left posterior:AccentOnObject	-0.33	0.33	57764	-0.99	.321
Context:Right anterior:AccentOnObject	-0.13	0.33	57569	-0.39	.696
Context:Right central:AccentOnObject	1.10	0.34	55525	3.27	.001*
Context:Right posterior:AccentOnObject	-0.14	0.33	57764	-0.41	.682

* Significant *p*-values are indicated with an asterisk.