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The prosody of second position clitics and focus in Zagreb Croatian

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by

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To my family and teachers

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ABSTRACT OF THE THESIS

The prosody of second position clitics and focus in Zagreb Croatian

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The alternation in second position (2P) clitic placement between after the first syntactic constituent (1C) and after the first phonological word (1W) in Bosnian/Croatian/Serbian (BCS), has inspired proposals challenging standard accounts of the syntax-prosody interface, such as bidirectional syntax-phonology interaction (Zec and Inkelas 1990) and post-syntactic movement in PF (Halpern 1992, i.a.), as well as more standard proposals such as a split construction account of 1W placement.

This thesis focuses on the details of the alternation in 2P clitic placement itself. It is about the interaction of prosody, focus, and alternation in 2P clitic placement in Zagreb Croatian. It is the first study of 2P clitics in BCS to provide instrumental data on prosody and emphasize the role of pragmatics in clitic placement.

We suggest that 1W placement may inherently be associated with focus, according to native speaker intuitions and based on differences in tonal alignment in the prosodic realization of the two different clitic placements. We also suggest that some tonal alignment evidence may indicate that 2P clitics in Zagreb Croatian may be undergoing change in their prosodic status as enclitics.

Finally, we show that there is no evidence for a prosodic break right-aligned to the

edge of a sentence-initial narrowly focused element, before a 1W clitic string (Chapter 3). The absence of such a break implies that, under a naive direct syntax-prosody mapping, prosodic phrasing cannot provide evidence for split construction accounts of 2P clitic placement after the first phonological word.

CHAPTER 1

Introduction and background

The alternation in second position (2P) clitic placement between after the first syntactic constituent (1C) and after the first phonological word (1W) in Bosnian/Croatian/Serbian (BCS),[1] has become a textbook example for the interaction between syntax and phonology (Franks 2000) and an impetus for proposals challenging standard accounts of the syntax-prosody interface, such as bidirectional syntax-phonology interaction (Zec and Inkelas 1990) and post-syntactic movement in PF (Halpern 1992, i.a.), as well as more standard proposals such as a split construction account of 1W placement.

This thesis draws attention to the details of the alternation in 2P clitic placement itself. It is about the interaction of prosody, focus, and alternation in second position clitic placement in Zagreb Croatian. It is the first systematic instrumental study on the prosody of 2P clitics in BCS and the first study of 2P clitics in BCS to emphasize the role of pragmatics in clitic placement.

We suggest that the 1W placement may inherently be associated with focus, according to native speaker intuitions (Chapters 1 and 2) and based on differences in tonal alignment in the prosodic realization of the two different clitic placements (Chapter 2). We also suggest that some tonal alignment evidence may indicate that 2P clitics in Zagreb Croatian may be undergoing change in their prosodic status as enclitics (Chapter 2).

[1]This has also been commonly called Serbo-Croatian in the linguistic literature. According to Alexander (2006), the most widely used name for the language in the English-speaking world is currently the abbreviation BCS, and therefore, we use this term in this thesis.

Finally, contrary to to the predictions of Radanović-Kocić (1988, 1996), we show that there is no intonational or durational evidence for a prosodic break right-aligned to the edge of a sentence-initial narrowly focused element, before a 1W clitic string (Chapter 3). The absence of such a break implies that, under a direct syntax-prosody mapping, prosodic phrasing cannot provide direct evidence for split construction accounts of 2P clitic placement after the first phonological word.

To provide the background necessary for understanding the studies carried out, we review the following in this chapter: (1) the distribution of second position clitics in Bosnian/Croatian/Serbian (BCS) (Section 1.1), (2) previous accounts of second position clitic placement in BCS (Section 1.2), and (3) the interaction of focus and second position clitic placement, as well as the prosodic realization of focus in BCS (Section 1.3). In Section 1.4 we motivate and introduce the studies we performed.

1.1 The distribution of second position clitics in Bosnian/Croatian/Serbian

BCS is a free word order Slavic language with default SVO order. In (1), for a string of three words, all 3! permutations are possible.

(1) a. *Ivan pije pivo.*
Ivan drink.3.sg beer
'Ivan drinks beer.'

b. Ivan pivo pije.

c. Pije Ivan pivo.

d. Pije pivo Ivan.

e. Pivo Ivan pije.

f. Pivo pije Ivan.

In contrast, the distribution of enclitics in BCS is extremely restricted. BCS enclitics are special clitics, which have a restricted syntactic distribution in addition to the phonological constraints on placement (Zwicky 1977). Specifically, BCS enclitics are second position (2P) clitics which must come in the second position of the sentence, as in (2).[2] Only orderings of the string in (2) where the clitic **je** is in second position are acceptable.

(2) a. *Ivan **je** pio pivo.*
Ivan AUX.3sg drink.ppt beer
'Ivan drank beer.'

Moreover, multiple 2P clitics must be string-adjacent[3] and traditionally occur in a specific order,[4] with the question particle **li** followed by all auxiliary 2P clitics except **je**, then the pronominals, the reflexive clitic **se**, and finally **je** Franks and King (2000).[5]

(3) **li** < AUX except **je** < DAT < ACC < GEN < **se** (REFL) < **je**

While second position clitics occur in several Slavic languages, as well as in other languages such as Sanskrit, Ancient Greek, Hittite, and Pashto, Tagalog, Warlpiri, and Luiseño (Bošković 2001, Halpern 1995), BCS is one of the few languages and only modern Slavic language with 2P clitics that allows two, quite freely alternating placements for 2P clitics in subject-initial sentences, as shown in (4) (Browne 1974).[6]

[2]Here and throughout the text, we indicate second position clitics in bold font.

[3]except in clitic climbing cases, such as with embedded infinitives (Bošković 2001, Ćavar 1999)

[4]Violations of this order may be found in spoken language or on the Internet (Rončević and Ćavar 2006).

[5]The clitics used in the experimental studies presented in this thesis were **me** (1sg.ACC) and **je** (AUX.3sg).

[6]Others include Luiseño, Ngiyambaa, and Warlpiri, but 2P clitics in these languages have been much less studied (Halpern 1995).

(4) a. after the first constituent (1C)

[Taj čovjek]$_{DP}$ ***je*** *pio pivo.*
That man AUX.3.sg drink.ppt beer
'That man drank beer.'

b. after the first (phonological) word (1W)

Taj ***je*** *čovjek pio pivo.*

The optionality between the two placements, either after the first constituent (1C) or after the first phonological word (1W), has inspired many accounts to reconcile both syntactic and phonological factors in 2P clitic placement.

On the one hand, data showing that 2P clitics cannot always be placed after the first phonological word indicate that phonology alone cannot determine 2P clitic placement. For instance, in the coordinate structure in (5), the 1W placement in (5a) is not possible for some speakers, although the accented preceding phonological host *sestra* is available. However, the 1C placement in (5b) is perfectly acceptable.

(5) a. 1W

%Sestra ***će*** *i njen muž doći u utorak.*
sister AUX.3.fut and her husband come in Tuesday
'My sister and her husband will come on Tuesday.'

(Halpern 1995: 74 (134), Progovac 1996: 418 (27))

b. 1C

[Sestra i njen muž]$_{DP}$ ***će*** *doći u utorak.*

On the other hand, evidence also suggests that syntax alone cannot determine 2P clitic placement. First, the 1W placement splits syntactic constituents: it splits a determiner or adjective from the noun in the DP. Second, intonational breaks can cause clitic placement to be delayed past second position, showing evidence that second position

can be defined in prosodic rather than syntactic constituency. In appositive constructions as in (6), the 2P clitics must come after the verb in (6a) rather than immediately after the intonational break as in (6b), although a typical second position placement is possible in (6c) for a non-appositive construction.

(6) Appositives delay clitic placement

a. *Ja, tvoja mama, obećala* ***sam*** ***ti*** *igračku.*
I your Mom promised AUX.1sg 2sg toy
'I, your Mom, promised you a toy.'

b. **Ja, tvoja mama,* ***sam ti*** *obećala igračku.*

c. *Ja* ***sam ti*** *obećala igračku.*

'I promised you a toy.'

(Radanović-Kocić 1996: 437 (18))

A standard definition of second position referencing prosodic phrasing in the literature is thus:

(7) SC clitics occur in the second position of their intonational phrase. (Bošković 2001: 65 (120))

Progovac (2000), (2005) proposes that in fact, clitic placement is sensitive only indirectly to intonation boundaries because of a direct mapping between syntactic clause boundaries and intonational boundaries. For instance, she explains that material set off with comma intonation also precedes the 'kernel clause', the highest extended projection of V, which forms an intonation unit.

1.2 Previous accounts for the second position clitic alternation in BCS

Because the 1C placement seems to be straightforwardly derivable syntactically compared to the 1W placement,[7] most attention has centered on accounting for the existence of the 1W placement. Some linguists have used the 1W placement to argue for deriving both clitic placements purely in phonology, cf. Section 1.2.1 (Radanović-Kocić 1988, 1996, Zec and Inkelas 1990, 1991, Zec 2005). Others have posited last resort movement 'prosodic inversion' in PF to account for the 1W placement, cf. Section 1.2.2 (Halpern 1992, 1995, Percus 1993, Schütze 1994) and still others have argued that the 1W placement can be derived with movement in syntax rather than PF, while not necessarily denying that the motivation for second position placement lies in prosodic phonology, cf. Section 1.2.3 (Wilder and Ćavar 1994, Progovac 1996, 2005, Franks 1998, Ćavar 1999, Bošković 2001, i.a.).

1.2.1 Prosodic accounts

Zec and Inkelas (1990, 1991), and Zec (2005) propose that BCS 2P clitics subcategorize prosodically for a leftward prosodic word, as shown below for the 2P clitic **je**:

(8) Zec and Inkelas 2P clitic subcategorization frame

$[[\quad]_{\omega}\quad \textbf{je}]_{\omega}$

This allows for clitic clusters to be built up recursively, as shown below:

[7] In fact, there have been different proposals for deriving 1C placement as well. A common account is that the subject DP fronts (or is base-generated) in front of the 2P clitic string (Halpern 1995: 20, Bošković 2001: 12, Progovac 2005: 137). Another is that the clitic string is lowered before PF and then morphologically merged in PF with its preceding host (Shokeir 2006).

(9) *[[[[Milovanova]$_{\omega}$* ***mu]***$_{\omega}$ ***ga]***$_{\omega}$ ***je]***$_{\omega}$ *mama bananu.*
Milovan's 3sg.DAT 3sg.ACC AUX.3sg mama banana-DAT
'Milovan's mother gave him a banana.'

Radanović-Kocić (1988, 1996) proposes that 2P clitic placement is done entirely in phonology and stipulates the following rule based on Nespor and Vogel's prosodic hierarchy:

(10) Radanović-Kocić's 2P clitic movement rule

Move all [+clitic] elements within an IP into the position after the first P of the same IP.[8]

Thus, she defines second position to be after the first phonological phrase. Clitics cannot move out of the intonational phrase (IP) they start in, accounting for the unacceptable judgment in (d) below in (11). In an analysis based on Radanović-Kocić's 2P clitic movement rule (10), it must be the case that in (11d), as in (11a), the 2P clitic string **sam ti** is after a phonological phrase (P) consisting of one prosodic word: *obećala* in (11a) and *ja* in (11d). Radanović-Kocić's analysis is that the 2P clitic string in the appositive construction in (11) belongs to the IP beginning with *obećala* and thus cannot be moved out of this IP into the earlier one consisting of *ja*, as in the unacceptable construction (11d).

(11) Appositives delay clitic placement

a. *Ja, tvoja mama, obećala* ***sam*** ***ti*** *igračku.*
I your Mom promised AUX.1sg 2sg toy
'I, your Mom, promised you a toy.'

b. **Ja, tvoja mama,* ***sam ti*** *obećala igračku.*

c. *Ja* ***sam ti*** *obećala igračku.*

[8]Here, P stands for P(honological Phrase) and IP for Intonational Phrase.

'I promised you a toy.'

d. **Ja* ***sam ti****, tvoja mama, obećala igračku.*

(Radanović-Kocić 1996: 437 (18))

1.2.2 The 1W placement and prosodic inversion

In addition to Radanović-Kocić's proposal for movement in phonology, an especially influential mechanism for deriving 1W placement involving movement in phonology is prosodic inversion, proposed by Halpern (1992, 1995), who was the first to propose a derivation for 1W involving last resort movement in PF. The proposal states that before PF, 2P clitics are phrase-initial. In PF, to satisfy the phonological constraint that they follow a phonological word host, 2P clitics undergo 'prosodic inversion' and invert with the first prosodic word, as shown below in Figure 1.2.2 for the 1W example (4b). In this example, **je** is phrase-initial before PF, and then inverts with the prosodic word *taj* in PF.

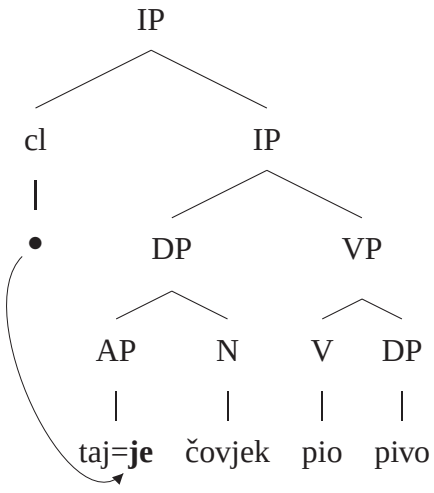


Figure 1.1: Tree showing prosodic inversion mechanism in PF with 2P clitic **je** inverting with prosodic word *taj* (adapted from Halpern 1995: 18 (8)).

1.2.3 The 1W placement as a split construction

In contrast, a number of syntacticians have argued that the 1W placement does not involve movement in phonology. Rather, it is a split construction and a case of left branch extraction, no different from extractions in (12), where (12a) shows default word order and (12b) shows word order after extraction: the adjective/determiner has been moved before the 2P clitic (Wilder and Ćavar 1994, Bošković 2001, Progovac 2000, Progovac 2005). In (12a), *zeleni auto* 'green car' is not split and is a syntactic constituent, but in (12b), *zeleni* has been extracted to sentence-initial position (Wilder and Ćavar 1994: 36).[9] Similarly, for 1W placement in (12c), *taj* has been extracted to sentence-initial position.

(12) a. *Ivan **je** kupio zeleni auto.*
Ivan AUX.3sg bought green car
'Ivan bought a green car.'

b. *Zeleni **je** Ivan kupio auto.*
Green AUX.3sg Ivan bought car
'Ivan bought a green car.'

c. Taj **je** čovjek pio pivo.

In support of this account, Bošković (2001) i.a. argues that some speakers have marginal judgments for 1W placements where clitics follow syntactically unextractable elements, such as first names (13), conjuncts (14), and nouns followed by a genitive modifier (15), and that variation in these judgments by dialect or speaker correlates with variation in judgments for syntax extractability.

[9] All our Zagreb Croatian consultants found (12b) to be incontrovertibly unacceptable, even under contrastive focus discourse conditions, but most (and all whose data are presented in this thesis) found (12c), 1W clitic placement in an Adj-N DP, acceptable, even in broad focus.

(13) *%Lav **je** Tolstoj veliki ruski pisac.*
Leo AUX.3sg Tolstoj great Russian writer
'Leo Tolstoy is a great Russian writer.'

(14) *%Sestra **će** i njen muž doći u utorak.*
sister AUX.3.fut and her husband come in Tuesday
'My sister and her husband will come onTuesday.'

(15) *%Prijatelji **su** moje sestre upravo stigli.*
friends AUX.3pl my sister just arrived
'The friends of my sister have just arrived.'

(Halpern 1995: 74, Progovac 1996: 418-419)

1.3 Focus and second position clitic placement in BCS

Split constructions such as those discussed above in (12) are associated with or even motivated by contrastive focus (Bašić 2004, Pereltsvaig 2008, 2007). Bašić (2004) explains that:

> split constructions are used if the speaker wants to focus a certain part of an XP that normally would not receive the main stress. If a prenominal element is separated from the rest of the phrase, then it constitutes the most informative part of the phrase. Assignment of contrastive focus is one of the most typical functions of split structures.
> (Bašić 2004: 68)

Thus, a more accurate gloss for the split construction of *zeleni auto* 'green car' could be:

(16) *<u>Zeleni</u> **je** Ivan kupio <u>auto</u>.*
Green AUX.3sg Ivan bought car
'It was a GREEN car that Ivan bought.'

Similarly, a possible gloss for 1W placement would be:

(17) *Taj* ***je*** *čovjek pio pivo.*
That AUX.3.sg man drink.ppt beer
'It was THAT man that drank beer.'

Glosses indicating focusing or contrasting such as in (17) have been proposed by Progovac for 1W placement, cf. Progovac (2005): 136 (62-63). However, in general, restrictions on 1W placement such as pragmatic focus conditions have been little discussed in the literature on 2P clitic alternation in BCS.

1.3.1 Pragmatics and the 1W alternation

Even the seminal article on BCS 2P clitics in generative linguistics, Browne (1974), mentioned that the 1W placement is more marked than the 1C, but this was in the context of register or sociolinguistics rather than pragmatics:

> The choice between "first word" and "first phrase" in placement of enclitics is often a matter of individual taste, and different speakers and writers may express different preferences. In general it is more old-fashioned and literary to break up a phrase by putting the enclitics after the first word. This is especially true when a name is broken up, as in Lav je Tolstoj, or when there are more than one enclitic [. . .] In everyday and conversational style, enclitics are more likely to be put after the whole phrase. (Browne 1974: 114)

Our Zagreb Croatian speakers confirm that sociolinguistic factors play a role in determining clitic placement; some describe the 1W placement as more proper, literary, formal, archaic, but they also suggest a role of pragmatics in determining a context

for 1W placement: they describe the 1W placement as being most natural if the first word, or alternatively, if the noun following the 2P clitics, is narrowly focused. BCS linguists also have the same intuitions that the 1W placement is most natural under narrow focus conditions, particularly if the word preceding the 1W clitic string is focused (Radanović-Kocić 1996, Bošković, p.c., Zec, p.c.).

In the literature, the interaction between 1W placement and pragmatic focus has also been mentioned (Bošković 2001, Progovac 2005, Radanović-Kocić 1988, 1996).

Radanović-Kocić (1988, 1996) asserts an interaction between focus, intonational structure and phonological phrasing, and 2P clitic placement. She argues that the conditions for degemination mirror conditions for clitic placement, e.g. in (18) and (19). In these examples, words are written in all caps to indicate they are narrowly focused, and the vertical lines |, added by the author, indicate where Radanović-Kocić posits phonological breaks.

(18) Degemination is blocked in a but not b

a. *MOJ | jorgan **je** od perja.* /mojjorgan/ ↛ /mojorgan/
my comforter is of down
'My comforter is made of down.'

b. *Moj JORGAN | **je** od perja* /mojjorgan/ → /mojorgan/

(19) Clitic placement occurs after an appropriate break

a. MOJ | **je** jorgan od perja. (1W, narrow focus on adjective)

b. *Moj **je** JORGAN | od perja. (1W, narrow focus on noun)

c. Moj JORGAN | **je** od perja. (1C, narrow focus on noun)

d. MOJ | jorgan **je** od perja. (1C, narrow focus on adjective)

(slightly modified from Radanović-Kocić 1996: 438 (22-23))

According to Radanović-Kocić, the parallel conditions for blocking degemination and allowing 1W clitic placement are the result of phonological phrasing which causes a break after the focused element:

> When the adjective *moj* is separated by a pause (i.e. when it is focused), degemination does not take place. Similarly, in [(19a)], clitic *je* is placed after *moj* since it is pronounced with a break, while in [(19c)] it follows the entire DP, since that is where the first appropriate break occurs.
> (Radanović-Kocić 1996: 438)

That is, for Radanović-Kocić, in contrast to our Zagreb consultants, 1W placement is only acceptable when "the adjective is stressed for the purpose of contrasting" (Radanović-Kocić 1996: 441) as in (19a), but not when the noun following the 2P clitics is focused as in (19b), while the 1C placement is acceptable regardless of whether the adjective or noun is focused, as in (19c) or (19d).

The examples (18) and (19) are problematic for two reasons: first, Radanović-Kocić's clitic movement rule (10) defines second position as coming after a phonological phrase, but the adjective is a prosodic word and lower in the prosodic hierarchy. To address this issue, Radanović-Kocić suggests that pragmatic focus promotes the adjective to a higher level in the prosodic hierarchy so that it may optionally be treated as a phonological phrase.

Additionally, as 2P clitics in BCS have traditionally been described as enclitic, the presence of a prosodic break preceding a 2P clitic as in (19) is counterintuitive given the prosodic requirements of an enclitic: the standard definition of an enclitic is that it requires a preceding prosodic host, as in Zec and Inkelas's subcategorization frame (8). However, there is some evidence that auxiliary 2P clitics can follow an intonational break, e.g. as in (20) after a heavy constituent, and that **je** in particular may behave

exceptionally in not being subject to the usual prosodic constraints on enclitics or may be "losing its clitichood" (Bošković 2001: 130).

(20) *Problemi o kojima ćemo razgovarati* | ***su*** *kompleksni.*
problems about which will converse AUX.3p complex
'The problems that we shall discuss are complex.' (Bennett 1987: 276)

1.3.2 The prosody of focus and clitics in BCS

While the literature on prosody in BCS has not specifically posited a break after narrowly focused elements, as suggested by Radanović-Kocić (1988, 1996), linguists have proposed a tonal marker aligned to the right edge of a focused element (Godjevac 2000a, Godjevac 2000b, Godjevac 2005, Smiljanic 2004). In descriptions of the intonational system of BCS, which has traditionally been described as a lexical pitch accent language, Godjevac and Smiljanic proposed a tone aligned to the right edge of a focused element. Godjevac 2005 proposed a zero phrase accent ∅- which compresses the pitch range of the post-focal material and is "marked on the last syllable of the word at the phrase edge" (Godjevac 2005: 170).

Smiljanic (2004) was a production study with disyllabic target word nouns followed by the clitic **je** in sentences which had the structure $[N]_{DP}$ **je** V {Obj, Adj} as in (21) below and in the schematic in Figure (21):

(21) *[Mama]$_{DP}$* ***je*** *jela bananu.*
Mama AUX.3sg ate banana
'Mama ate bananas.'

The sentences were elicited with broad and narrow focus on the subject DP. Smiljanic found that in broad focus, a low tonal target, marked as "L-" in Figure (21) below, was aligned to the "clitic-verb" boundary, e.g. **je**-jela boundary in (21) in broad focus

(Figure 1.2a), but that this target was retracted in narrow focus on the noun, e.g. on *Mama*, to the "noun-clitic" boundary, e.g. at the Mama-**je** boundary, see Figure 1.2b. Moreover, Smiljanic found that the pitch peak in the subject noun, marked as "H" in Figure 1.2a below, was retracted in narrow focus, as shown in Figure 1.2b. Figure 1.2b also shows the pitch range compression or deaccentuation following the focused subject DP: the peaks on the verb *jela* and object *bananu* are absent or at least very reduced under narrow focus on the subject DP; additionally, the pitch peak on the focused element, "H" is higher compared to in broad focus.

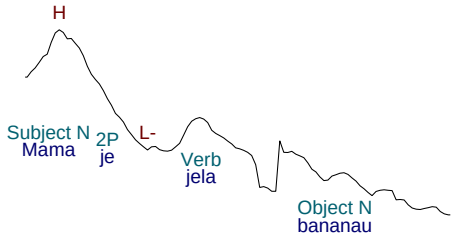
In summary, for the Zagreb Croatian speakers in the Smiljanic 2004 study, narrow focus on the subject noun was realized by: lengthening of the stressed vowel in the noun, retraction of the low tonal target preceding the noun, retraction and raising of the pitch peak in the noun, a lowered low tonal target following the noun, and retraction of this low tonal target following the noun. Particularly of interest for our studies, the low tone immediately following the pitch peak in the noun was retracted from the "clitic-verb" boundary to the "noun-clitic" boundary in narrow focus on the subject noun, i.e.

(22) Retraction of L- in narrow focus on subject noun in Smiljanic 2004

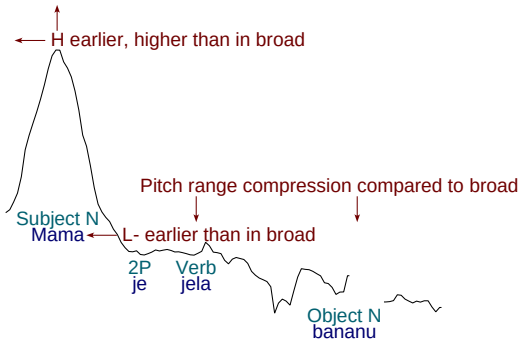
Broad focus: N **je** L- V Obj
Narrow focus: $[N]_{FOC}$ L- **je** V Obj

Smiljanic 2004 suggested that the retracted L- tone was either a phrase accent introduced by narrow focus (this would be consistent with Godjevac's ∅- phrase accent) or a word boundary tone. Based on the global pitch peak retraction in the noun under narrow focus for Zagreb speakers, Smiljanic also suggested that Zagreb speakers neutralized lexical pitch accent contrasts and had instead pragmatic pitch accents: L*+H in broad focus (L aligned onto the stressed syllable) and L+H* in narrow focus (H

aligned onto the stressed syllable).



(a) Broad focus



(b) Narrow focus on DP

Figure 1.2: Schematic for broad vs. narrow focus prosody in BCS based on Smiljanic 2004. The "H" indicates the pitch peak in the subject DP noun and the "L-" indicates the low tonal target called "L2" in Smiljanic 2004. This low tonal target corresponds to Godjevac's ∅- phrase accent. Smiljanic 2004 found that in narrow focus, the H peak and L- are earlier and pitch range compression follows the L-. More specifically, the L- occurred after the 2P clitic in broad focus, at the "clitic-verb" boundary, but before it in narrow focus, at the "noun-clitic" boundary. The dip in the F0 contour at the start of *bananu* is due to the segmental perturbation from the voiced stop [b].

1.4 The interaction of second position clitic placement, focus, and prosody

Because (1) the interaction of pragmatics with 2P clitic placement in BCS has been little studied, (2) the interaction of prosody and 2P clitic placement has been discussed but not investigated in instrumental studies, and (3) prosodic studies have shown that focus in BCS can be realized with prosodic marking, we performed two production experiments to investigate the interaction of 2P clitic placement, focus, and prosody. Our first experiment, Experiment 1, varied clitic placement, clitic string length, and focal domain in stimuli with sentence-initial subject Adj-N DPs, e.g. ADJ **clitics** N V (1W) and ADJ N **clitics** V (1C). Our second experiment, Experiment 2, varied word length in a sentence-initial target word followed by **me je** under broad focus and narrow focus on the target word.

Our central hypothesis was that the 1W clitic placement is inherently associated with focus, based on speaker and linguist intuitions discussed in Section 1.3.1 and the split construction analysis of 1W clitic placement discussed in Section 1.2.3. This hypothesis led to two basic predictions that we discuss below: (1) 1W and 1C clitic placements have different prosodic realizations, and (2) the low tone following the adjective (L-) would be retracted as follows from broad to narrow focus on the adjective for 1W placement:

(23) Hypothesized L- retraction in narrow focus on adjective for 1W placement

Broad focus: ADJ **clitics** L- N V
Narrow focus: $[ADJ]_{FOC}$ L- **clitics** N V

If 1W clitic placement is inherently associated with focus, then it could have a different prosodic realization from 1C clitic placement, i.e. expressed in intonational and

duration characteristics. The 1W clitic placement could signal narrow focus by the split subject DP word order. Other languages mark narrow focus with word order; for instance, Spanish and Italian can mark narrow focus on a word by placing it sentence finally (Face and D'Imperio 2005). Spanish and Italian can also mark narrow focus with intonational cues, and they differ in how they treat the interaction between focal marking using word order and intonation (Face and D'Imperio 2005).

If BCS behaves like Spanish, then there could be a tradeoff between prosodic and syntactic marking of narrow focus. Spanish uses intonational marking sentence-medially but only the word order cue sentence-finally. Similarly, for 1W placement in BCS compared to 1C placement, there could be less or no prosodic marking of narrow focus on the adjective, e.g. less or no pitch peak retraction on the adjective, less or no retraction of the low tonal target preceding and the low tonal target following the adjective, less or no increase in pitch peak height on the adjective. However, if BCS behaves like Italian, which unlike Spanish, uses intonation in addition to the word order cue for narrow focus on a word sentence-finally, then this difference between 1W and 1C placement in narrow focus would not be observed. In addition, in broad focus, due to an inherent association with focus, the 1W placement could manifest prosodic focal marking characteristics, e.g. the pitch peak in the adjective or noun could be retracted compared to that in the 1C clitic placement. We found that, in fact, there was no difference in the intonational realization of 1W and 1C placement in narrow focus on the adjective, but there was in broad focus.

Additionally, the split construction analysis of 1W placement, Radanović-Kocić's proposal of a prosodic break following the adjective for 1W placement in narrow focus on the adjective, and Smiljanic and Godjevac's proposal of a tonal event at the right edge of a focused element suggest the following: there is a syntactic and prosodic boundary after the adjective in a sentence-initial subject (i) for 1W placement, regard-

less of focus conditions, or (ii) for narrow focus on the adjective, regardless of clitic placement, or (iii) for 1W placement under narrow focus on the adjective compared to 1C placement. Thus, prosodic differences between 1W and 1C clitic placements could occur durationally as temporal reflexes of prosodic boundaries. A large body of work has shown that segments near a prosodic boundary are lengthened both phrase-initial and phrase-finally (Gaitenby 1965, Oller 1973, Wightman et al. 1992, Keating et al. 2003 i.a.).

If there was a boundary at the right edge of the adjective for 1W placement: (i) we'd expect pre-boundary lengthening in the adjective relative to 1C placement. If there was a boundary at the right edge of a focused adjective, (ii) we'd expect lengthening within clitic position conditions for narrow vs. broad focus conditions. If there was a boundary under narrow focus only for 1W placement, (iii) then we'd expect pre-boundary lengthening in the adjective under narrow focus compared to broad focus only for 1W placement but not for 1C, and we'd also expect lengthening in the adjective under narrow focus for 1W placement compared to 1C placement. We compared durations of the final segment, final syllable, and entire word for the adjective across focus conditions and across clitic positions and found no consistent results supporting pre-boundary lengthening.

The second hypothesis regarding the retraction of the low tone following the adjective from broad to narrow focus for 1W placement was motivated by the split construction account of 1W placement, Radanović-Kocić's proposal of a prosodic break following the adjective for 1W placement in narrow focus on the adjective, and Godjevac and Smiljanic's work proposing a low tone or zero phrase accent aligned to the right edge of the focal domain. The split construction account of 1W placement implies a syntactic boundary at the adjective-clitic boundary; Radanović-Kocić's data on the domain for degemination provides evidence for a prosodic break at this same

boundary, and Godjevac and Smiljanic's work predicts a phrase accent or boundary tone at this same location. Thus, if our studies showed that the low tonal target following the narrowly focused adjective was aligned to the right edge of the word-clitic boundary, they could support Radanović-Kocić's assertion of a prosodic break after the focused element preceding a 1W clitic string and support a split construction account of 1W clitic placement, under a direct syntax-prosody mapping—for instance, under the direct mapping between syntactic and intonational boundaries suggested as a possibility by Progovac (2000, 2005). We found, in fact, that the low tonal target following the narrowly focused adjective was not aligned to the right edge of the focal domain; rather, it was a focal phrase accent that followed the adjective pitch peak at a fixed duration.

The next chapter, Chapter 2, describes Experiment 1 and its results regarding the interaction of 2P clitic placement, focus, and prosody. Chapter 3 describes Experiment 2 and its results providing a closer look at the alignment of the low tone following the adjective. Finally, we give a general discussion and conclusions in Chapter 4.

CHAPTER 2

Experiment 1: The interaction of second position clitic placement, focus, and prosody

2.1 Introduction

We performed two production experiments investigating the interaction of 2P clitic placement, focus, and prosody. In Experiment 1, we used pronominal and auxiliary clitics and elicited broad focus and narrow focus on the adjective.[1] The second experiment, Experiment 2, was performed concurrently with Experiment 1 and varied the length of target words to investigate the tonal alignment of the L- tone following the focused element. We discuss Experiment 1 here and Experiment 2 in the next chapter.

2.2 Experiment 1

2.2.1 Subjects

Four speakers of Zagreb Croatian living in Los Angeles and ranging in age from 39 to 61 were recorded. They were coded as S1, S2, S3, and S4. All speakers were female

[1] A pilot study used the auxiliary clitic **je** and varied clitic placement and focal domain; the results of this study are not presented in this thesis, but the study is briefly described in the Appendix in Section A.1. We found that we were unable to reliably segment **je** from surrounding material and thus used pronominal as well as auxiliary clitics in following experiments. We also found that speakers in the pilot study had difficulties with multiple focal domains, e.g. narrow focus on the noun, the DP, or double focus on the adjective and noun, so we limited focal domain manipulation to broad focus and narrow focus on the adjective in following studies.

except S2, and all grew up in Zagreb speaking only Standard Croatian and Zagreb dialect at home. While all speakers emigrated to the United States about 15-17 years ago, each one except S4 continues to speak Croatian on a daily basis; S4 speaks in Croatian a few times monthly and returns to Croatia for a month during the summer. Detailed biographical information about the speakers is given in Table 2.2.1, and a profile of the speakers' linguistic backgrounds is given in Table 2.2.1 below.

Because the 1W placement is marked, we screened speakers with 1W placement in Adj-N subject initial DPs and only recorded speakers who were comfortable with the 1W placement in broad and narrow focus. Data from two younger speakers in their mid-20s and early 30s was not used because they were unfamiliar with the possibility of 1W clitic placement. Additionally, all three Serbian speakers (in their 20s) recorded in earlier pilot studies prior to the pilot study mentioned in the Appendix found 1W placement ungrammatical. The existence of speakers without 1W placement in their grammar supports that 1W is a marked structure and may be currently involved in language change.

	Sex	Age	Born/grew up	Parents	Time in US
S1	F	60	Zagreb until 43 yrs.	Both from Zagreb	17 yr.
S2	M	61	Zagreb until 44 yrs.	Mother: Belgrade, Father: Zagreb	17 yr.
S3	F	41	Zagreb until 26 yrs.	Both from Zagreb	15 yr.
S4	F	39	Zagreb until 24 yrs.	Both from Zagreb	15 yr.

Table 2.1: Speaker biographical information.

	Language spoken at home as child	Other languages	Freq. using Croatian	Comments on 2PC clitics
S1	Standard Croatian, Zagreb Kajkavian	German (9), English (15), Italian (15), Spanish (40)	60%	1W more proper, literary
S2	Standard Croatian, Zagreb Kajkavian	German, English, Russian (10)	30%	No preference for 1W or 1C, 1W more natural if emphasizing noun or adj.
S3	Standard Croatian, Zagreb Kajkavian	English (10), Italian (16)	70%	1W more proper, rare in conversation, more natural especially if adj focus
S4	Standard Croatian, Zagreb Kajkavian	English, French, Italian (7)	2-3 times a month	prefers 1W over 1C in broad focus for rhythmic reasons

Table 2.2: Speaker linguistic profiles. Numbers in parentheses in the column 'Other languages' indicates at what age, in years, the speaker started learning the languages.

2.2.2 Materials

The stimuli for this experiment were designed for investigating the interaction of second position CLITIC POSITION (1C, 1W), CLITIC STRING LENGTH (1, 2), and FOCUS (broad, narrow (on the adjective)). The target words were sentence-initial subject DPs with the structure [Adj-N], where the adjectives were descriptive adjectives or possessives. Both the target adjectives and nouns had the syllable structure CVCVCV and short pitch accents,[2] were initially stressed, and had the first vowel [a]. Controlling for these factors allowed us to analyze segment durations, F_0, and alignments of tonal events and their interaction with focus and clitic placement without interaction from lexical or segmental factors.

The sentences were designed to avoid tonal crowding so that all accents were at least one syllable apart, and to avoid segmental perturbation in the F_0 contour, nonsonorants were avoided in the stimuli as much as possible. Target words were elicited in carrier sentences of 11 syllables. Sample stimuli are below; an example filler stimulus with no clitics is given in (1); example stimuli with CLITIC STRING LENGTH 1 are given in (2) for 1C and 1W placement; example stimuli with CLITIC STRING LENGTH 2 are given in (3) for 1C and 1W placement, and an example of the elicitation question-answer pairs for narrow focus on the adjective is given in (4).

Broad focus was elicited using a question like *Što se jučer dogodilo?,* 'What happened yesterday?', and Y/N questions were used to elicit narrow (corrective) focus on the adjective, cf. (4). For narrow focus, speakers were given the orthographic cue of all capitalized adjectives and '(No)' in parentheses, not to be uttered, at the beginning of the sentence in the stimuli. The full set of question/answer pairs is given in the

[2]BCS has four lexical pitch accents, traditionally categorized by the phonemic length of the stressed vowel and tonal alignment; they are called the short rise, short fall, long rise, and long fall (Godjevac 2000a, Smiljanic 2004). Smiljanic (2004) found Zagreb speakers to neutralize lexical pitch accent contrasts.

Appendix in Section A.2.1.

(1) no clitics

a. *Manjina malina mami Ljiljanu.*
Manja.poss raspberry entice Ljiljana-ACC
'Manja's raspberry is enticing Ljiljana.'

(2) 1 clitic

a. 1C

Manjina malina ***me*** *mami danas.*
Manja.poss raspberry 1sg.ACC entice today
'Manja's raspberry is enticing me today.'

b. 1W

Manjina ***me*** *malina mami danas.*
Manja.poss 1sg.ACC raspberry entice today
'Manja's raspberry is enticing me today.'

(3) 2 clitics

a. 1C

Manjina malina ***me*** ***je*** *mamila.*
Manja.poss raspberry 1sg.ACC AUX.3sg enticed
'Manja's raspberry enticed me.'

b. 1W

Manjina ***me*** ***je*** *malina mamila.*
Manja.poss 1sg.ACC AUX.3sg raspberry enticed
'Manja's raspberry enticed me.'

(4) Narrow focus example

a. Question

Je ***li*** ***Vas*** *Lukina malina mamila?*
AUX.3sg Q 2Pl.ACC Luka's raspberry enticed
'Did Luka's raspberry entice you?'

b. Answer

(Ne), MANJINA malina ***me*** ***je*** *mamila.*
(No), Manja.poss raspberry 1sg.ACC AUX.3sg enticed
'(No), MANJA's raspberry enticed me.'

The speakers were presented with slides with the prompting question and the answer and asked to read both silently and then to say the answer at a natural speech rate for them in Standard Croatian. Each sentence was read five times in two blocks, the first in broad focus, and the second in narrow focus. Sentences within the block were pseudorandomized. The fillers for the experiment were the stimuli for Experiment 2 as well as sentences matching those in the stimuli set for Experiment 1, but with narrow focus on the noun or with no clitics. The stimuli set including only narrow focus on the adjective and including clitics consisted of 160 sentences per speaker (2 clitic positions x 2 clitic string lengths x 4 words x 2 focus conditions x 5 repetitions), plus 40 fillers without clitics, and 25 fillers with narrow focus on the noun.

2.2.3 Methods

Speakers were recorded onto a laptop at 22 kHz/16 bit using a Logitech Premium USB Headset 30. The recording sessions were done in a quiet room at the speakers' homes or offices. The sentences were segmented and labeled for intonational landmarks using a wide band spectrogram supplemented by a waveform display and a F_0 pitch track and analyzed for segment durations and timing and intonational parameters using Praat (Boersma and Weenink 2008). Statistical analyses were carried out in R 2.6.0 (R Development Core Team 2007), and graphic displays of statistical plots were

prepared using the lattice R package (Sarkar 2007).

2.2.4 Analysis

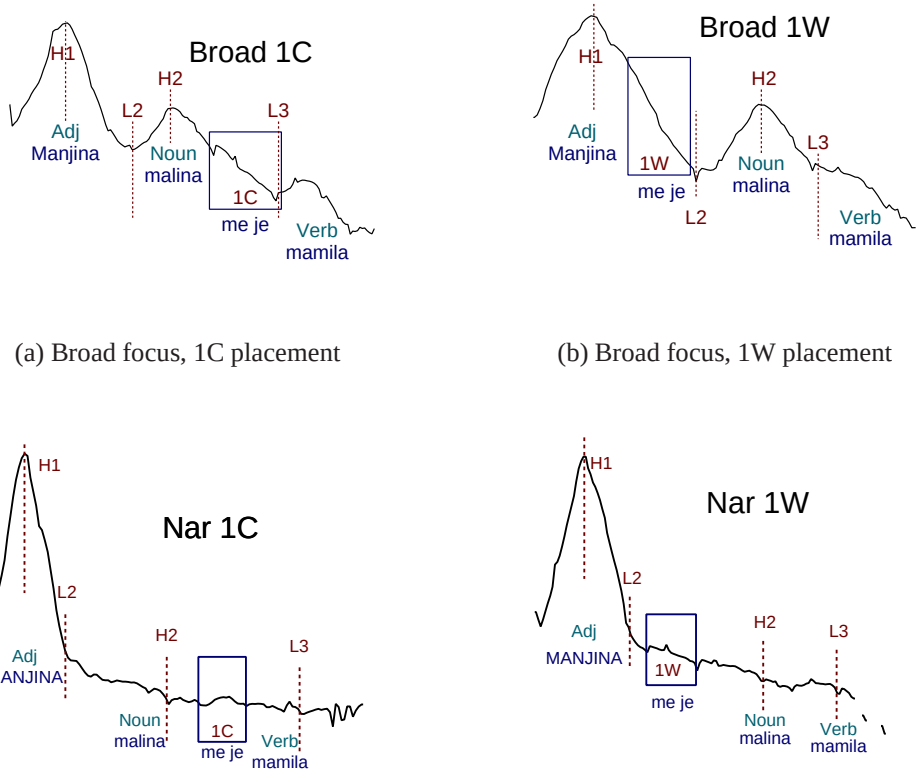
Segmentation and intonational labeling were done by hand. Difficult boundaries between [l] and vowels were segmented based on discontinuities in the second formant and the waveform. Segmentation was used to find crucial landmarks for tonal alignment: the onset of the adjective and noun, the onset and offset of the first vowel in the adjective and noun (the offset was the end of the stressed syllable), and the end of the adjective and noun.

Five tonal landmarks were labeled for each utterance: L1, H1, L2, H2, and L3, and those used in analyses are shown in Figure 2.2.4. These were named simply by order of occurrence in the speech signal, "L" for low and "H" for high, without reference to potential differences in prosodic function of the tonal targets in broad and narrow focus.[3] While L1, the low target preceding H1, was labeled, we did not analyze it further in this study because two of the four items tested had initial voiceless fricatives that disturbed L1. The pitch peaks were labeled by finding the relevant pitch maxima in Praat and manually correcting the label if there was a segmental perturbation. If a pitch peak was realized as a plateau, the middle of the plateau was labeled as the peak. L2 and L3 were labeled by eye[4] at the first inflection point in the fall from the preceding pitch peak to a lower pitch. Thus, in some cases, the low tonal target was measured at a pitch "elbow" point prior to the onset of the lowest pitch in the utterance. In narrow focus, H2 and L3 were in the postfocal deaccentuation region following the adjective and were therefore labeled at fixed points: H2 was labeled at the offset of

[3]For instance, L2 in broad focus could have been a word boundary tone or part of a bitonal pitch accent, but a focal phrase accent in narrow focus.

[4] Barnes et al. (2008) found 'strong reliability' between labeling the L- phrase accent in English by eye and with a line-fitting algorithm.

the second vowel in the noun and L3 at the offset of the first vowel in the verb. F_0 of H2 but not L3 was analyzed because F_0 of L3 showed creaky voice quality for a high number of tokens.



(a) Broad focus, 1C placement

(b) Broad focus, 1W placement

(c) Narrow focus on adjective, 1C placement

(d) Narrow focus on adjective, 1W placement

Figure 2.1: Schematic of labeled tonal targets for data analysis. The location of the 2P clitic string is boxed. In narrow focus, H2 was labeled at the offset of the second vowel in the noun and L3 at the offset of the first vowel in the verb for all tokens for F_0 comparisons between focus conditions.

Tokens were discarded if the speaker was disfluent and also if the speaker used an inappropriate intonational contour for the pragmatic context. The appropriateness of the intonational contour was decided by the author based on the presence of deaccentuation and pitch peak retraction based on strict criteria. If, for broad focus, the speaker either produced (1) noun focus, operationalized as deaccentuation of the adjective and

the verb and pitch peak retraction on the noun, or (2) adjective focus, operationalized as deaccentuation of the noun and the verb and pitch peak retraction on the adjective, cf. Figure (5), the token was discarded. Based on these criteria, seven tokens in broad focus were discarded for S2 who produced narrow focus on the noun in broad focus contexts for these tokens. No other speaker had a similar production error.

All dependent variables were statistically analyzed with 3-way repeated measures ANOVAs with the fixed factors FOCUS (broad, narrow), CLITIC POSITION (1C, 1W), and CLITIC STRING LENGTH (1, 2) with the threshold criterion for significance set at $p = 0.05$. Missing values were removed from the analysis. For the tonal alignment dependent variables, if there was a main effect for FOCUS, they were reanalyzed within each focus condition because the tonal landmarks for alignment could be different in broad and narrow focus.

2.3 Results

In this section, we describe the results for Experiment 1. First, we show sample intonational contours in Section 2.3.1, and then we provide quantitative results: duration meausres (Section 2.3.2), F_0 of peaks and valleys (Section 2.3.3), and tonal alignment (Section 2.3.4). We then give a summary of the results in Section 2.3.4.5.

2.3.1 General intonational contour shapes

In this section, we provide some sample intonational contours for broad and narrow focus and 1C and 1W clitic placment for the sentence pair below in (5). Note that <manjina> is pronounced [ˈma.ɲi.na], with a palatal nasal [ɲ] (Landau et al. 1999).

(5) a. 1C placement

*Manjina malina **me** **je** mamila.*
Manja.poss raspberry 1sg.ACC AUX.3sg enticed
'Manja's raspberry enticed me.'

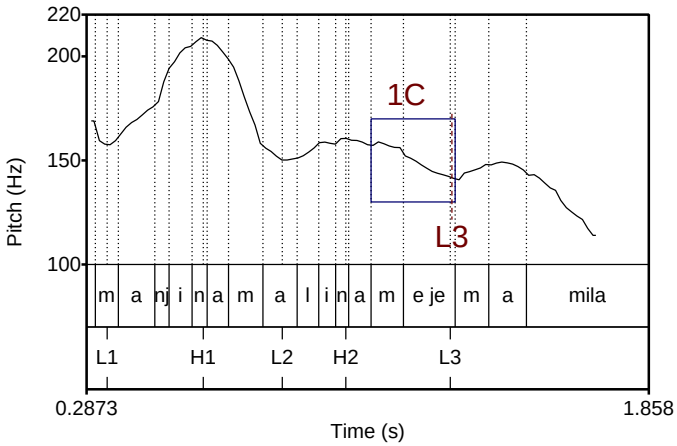
b. 1W placement

*Manjina **me** **je** malina mamila.*
Manja.poss 1sg.ACC AUX.3sg raspberry enticed
'Manja's raspberry enticed me/It was Manja's raspberry that enticed me.'

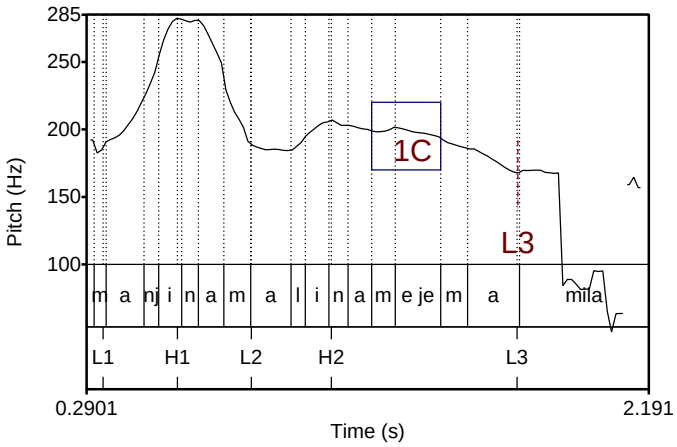
As found previously by Godjevac (2000b), interpolation usually occurred over the clitic string, as for Subject S4 in Figures 2.2a (between H2 and L3 for 1C placement) and 2.3a (between H1 and L2 for 1W placement) from the preceding pitch peak to a low tonal target. However, in some cases, as for Subject S1 in Figure 2.2b, the pitch stayed high over the 1C clitic string and then dropped to the next tonal target. For 1W placement, sometimes L2 was aligned to a timepoint well before the onset of the noun

as in Figure 2.3b, where L2 occurred before the end of 2P clitic string.

In narrow focus, the typical contour exhibited deaccentuation following a pitch peak over the adjective, as shown in Figure (5). The beginning of the region of low pitch, L2, typically began before the end of the adjective for all speakers except S3, for which the low region began a little later.

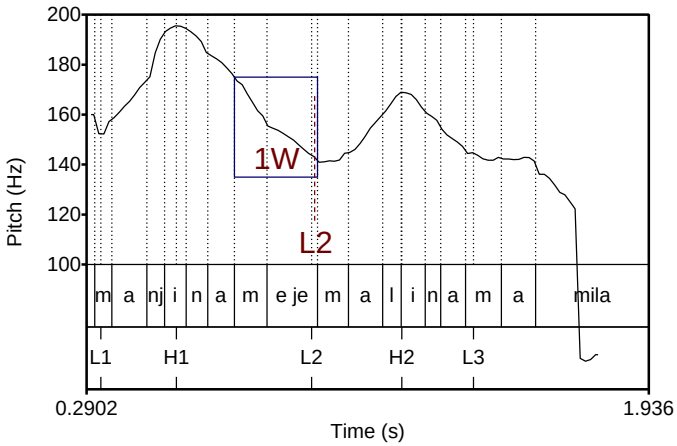


(a) Broad focus, 1C placement, S4. Interpolation over clitic string **me je** from H2 to L3.

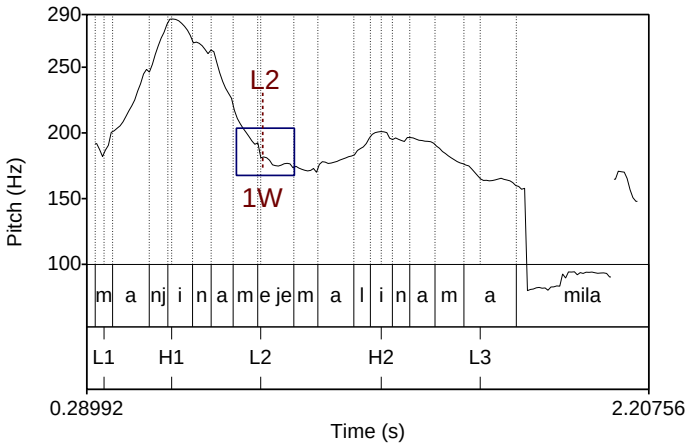


(b) Broad focus, 1C placement, S1. F_0 stays high into clitic string **me je** after H2.

Figure 2.2: Sample intonational contours for 1C placement in broad focus.

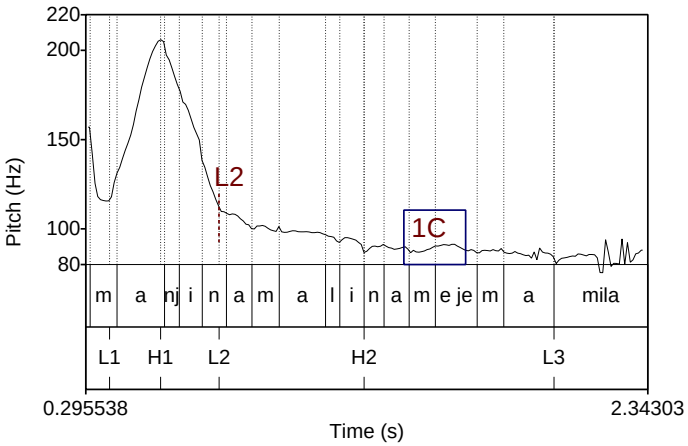


(a) Broad focus, 1W placement, S4. Interpolation over clitic string **me je** from H1 to L2.

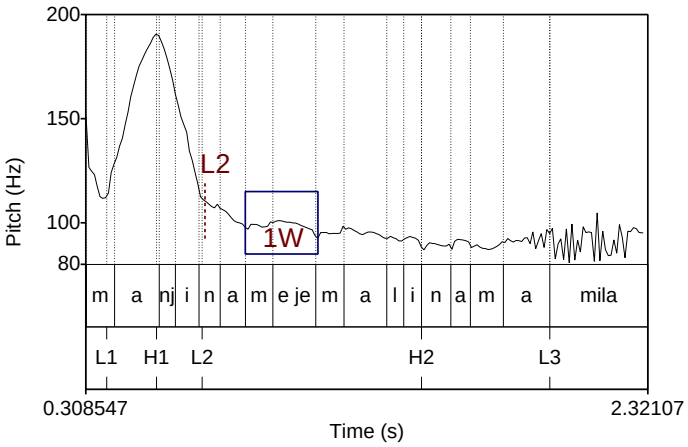


(b) Broad focus, 1W placement, S1. L2 occurs in clitic string **me je**.

Figure 2.3: Sample intonational contours for 1W placement in broad focus.



(a) Narrow focus, 1C placement, S2. L2 occurs before the end of the adjective.



(b) Narrow focus, 1W placement, S2. L2 occurs before the end of the adjective.

Figure 2.4: Sample intonational contours for narrow focus on the adjective.

2.3.2 Duration

We investigated the interaction of focus and 2P clitic position with word, syllable, and segmental duration. We analyzed the duration of the first vowel in the adjective (adjective V1) and in the noun (noun V1), i.e. the stressed vowels, and the ratio between them across all conditions (Section 2.3.2.1). We also analyzed the duration of the last vowel, last syllable, and word for the adjective to look for evidence of pre-boundary final lengthening (Section 2.3.2.2).

2.3.2.1 Segmental duration: Duration of first vowel in adjective and noun

Based on Smiljanic (2004), we expected the duration of V1 in the adjective to be longer in narrow focus. Results from a repeated measures 3-way ANOVA for adjective V1 duration with the fixed factors FOCUS, CLITIC POSITION, and CLITIC STRING LENGTH are given below in Table 2.3.2.1. A significant main effect is shown in a non-shaded cell in the table, and a non-significant one is shown in a shaded cell. The same convention is used for all tables reporting statistical data.

ANOVA-Adj V1 duration	S1	S2	S3	S4
FOCUS	F(1,152) = 50.00, p = 5.2e-11	F(1,143) = 89.61, p < 2e-16	F(1,144) = 8.7e-3, p = 0.93, n.s.	F(1,152) = 4.98, p = 0.027
CLITIC POSITION	F(1,152) = 0.77, p = 0.38, n.s.	F(1,143) = 5.50, p = 0.020	F(1,144) = 0.72, p = 0.40, n.s	F(1,152) = 4.80, p = 0.030
CLITIC STRING LENGTH	F(1,152) = 0.15, p = 0.70, n.s.	F(1,143) = 0.97, p = 0.32, n.s.	F(1,144) = 0.18, p = 0.67, n.s	F(1,152) = 0.39, p = 0.53, n.s.

Table 2.3: ANOVA results for duration of first vowel in adjective with FOCUS, CLITIC POSITION and CLITIC STRING LENGTH as the fixed factors for all speakers.

The results in Table 2.3.2.1 show that for all speakers except S3, there was a main

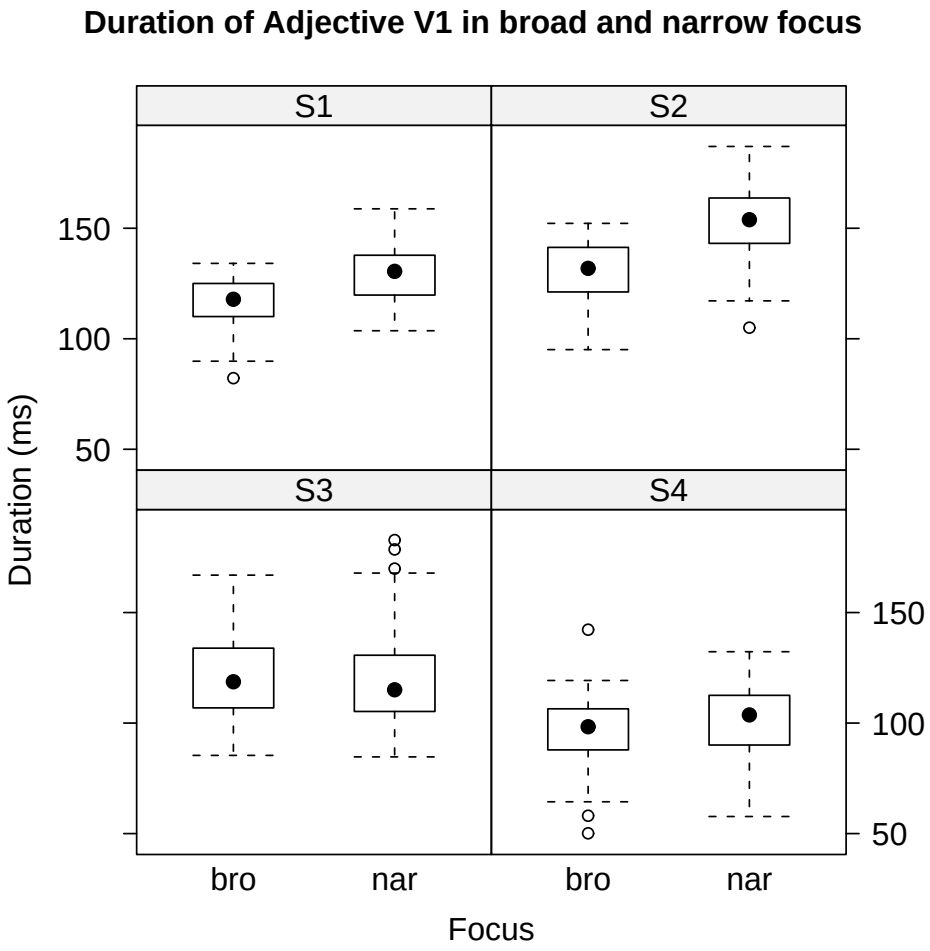


Figure 2.5: Duration of first vowel in adjective in broad and narrow focus. All speakers except S3 showed a main effect for FOCUS; the vowel was longer in narrow focus.

effect of FOCUS on duration of the first vowel in the adjective. Figure 2.3.2.1 shows the duration of the first vowel in the adjective in broad and narrow focus; for all speakers but S3, the vowel was longer in narrow focus. Additionally, S2 and S4 showed a main effect for CLITIC POSITION; the vowel was longer in 1C than 1W position. There was no main effect of clitic string length.

ANOVA-N V1 duration	FOCUS	Mean±S.D., broad/narrow focus (ms)
S1	F(1,152) = 14.44, p = 2.1e-4	130 ± 19 / 139 ± 10
S2	F(1,143) = 0.36, p =0.55, n.s.	153 ± 16 / 152 ± 16
S3	F(1,144) = 6.91, p = 9.5e-3	107 ± 11 / 102 ± 9
S4	F(1,152) = 3.45, p =0.065, n.s.	105 ± 19 / 101 ± 10

Table 2.4: ANOVA results for duration of first vowel in noun with FOCUS as the fixed factors for all speakers and mean and standard deviations of duration of first vowel in noun in broad and narrow focus. Other significant results are discussed in the body of the text.

Table 2.3.2.1 shows the ANOVA results for FOCUS for duration of the first vowel in the noun. For S1 and S3, there was a main effect of FOCUS on duration of the first vowel in the noun; S1 had a shorter vowel in broad focus, while S3 had a longer vowel. Additionally, S2 showed main effects for CLITIC POSITION, F(1,143) = 23.68, p = 2.97e-6, and CLITIC STRING LENGTH, F(1,143) = 5.06, p = 0.03: the first vowel in the noun was longer for 1C position and longer for clitic strings of length 1. S4 also showed a significant interaction between CLITIC POSITION and CLITIC STRING LENGTH, F(1,152) = 8.57, p = 4.0e-3, but posthoc tests found no significant differences.

Table 2.3.2.1 shows the ANOVA results for the ratio of the duration of the first vowel in the adjective to the duration of the first vowel in the noun. For S2 and S4, there was a main effect of FOCUS on the ratio of the duration of the first vowel in the adjective to the duration of the first vowel in the noun; both speakers had a larger ratio in narrow focus. Considering taking the ratio as a way to normalize for speech rate changes across the elicitation session, these results suggest that of the three speakers who had longer initial vowels in the adjective in narrow focus, two, S2 and S4 had

lengthened vowels even taking into account speech rate changes.

ANOVA- Adj V1/ N V1 duration	S1	S2	S3	S4
FOCUS	F(1,152) = 0.46, p = 0.50, n.s.	F(1,143) = 73.00, p = 1.77e-14	F(1,144) = 1.37, p = 0.24, n.s.	F(1,152) = 9.40, p = 2.6e-3

Table 2.5: ANOVA results for ratio of duration of first vowel in adjective to duration of first vowel in noun with FOCUS as the fixed factor for all speakers. No other results were significant.

In summary, all speakers except S3 had a significantly longer stressed vowel in the adjective in narrow focus compared to broad focus. Thus, as found in Smiljanic (2004), stressed vowels in the target words were lengthened in narrow focus for most speakers. This was the case though our study included only short initial vowels in the target words: Smiljanic (2004) found that speakers tended to lengthen long vowels more than short in narrow focus. S2 and S4 also had a significantly larger ratio of duration of initial vowel in adjective to noun in narrow focus. If this ratio is taken as a way to normalize for changes in speech rate during the elicitation session, these results suggest that S2 and S4 had longer initial vowels in the adjective when normalizing for speech rate. S1 had a significantly longer and S3 a significantly shorter initial vowel in the noun in narrow focus compared to broad focus. That S1 had longer stressed vowels in both the adjective and noun in narrow focus could be explained if she had slowed down her speech rate in narrow focus, but, impressionistically, this doesn't seem to be the case.

Effects of clitic position on the vowel duration that occurred for at least two speakers were that the initial, stressed vowel in the adjective was longer for 1C clitic position for S2 and S4. This may have been the case because the adjective for 1C, without a following clitic string, was effectively shorter than the adjective complex in 1W, to

which the 2P clitic string was encliticized; shorter words tend to have longer segment durations than longer ones (Lehiste 1972, Turk and Shattuck-Hufnagel 2000). Since lengthening of the stressed vowel in the focused element is a characteristic prosodic marking for narrow focus, the longer stressed vowel in the adjective for 1C compared to 1W placement could also be consistent with our hypothesis that 1W could show less prosodic marking for narrow focus. However, ANOVAs for narrow focus showed no main effects of CLITIC POSITION on the vowel duration, so vowel duration did not provide evidence for a prosodic-syntactic tradeoff in focal marking for 1W placement.

2.3.2.2 Phrase-final lengthening?: Duration of last segment, syllable, and word for adjective

Because of the split construction analysis of 1W placement (Section 1.2.3), Radanović-Kocić's assertion of a prosodic break following a focused adjective under narrow focus with 1W but not 1C placement (Section 1.3.1), and Godjevac and Smiljanic's proposals of a tonal marker at the right edge of a sentence-initial focused element (Section 1.3.2), we looked for evidence of pre-boundary (phrase-final) lengthening in the duration of the last segment, the last syllable, and the word for the adjective, e.g. for the (possessive) adjective *Manjina* as in (5), we compared the duration of the underlined portions: *Manjin<u>a</u>* (last segment), *Manji<u>na</u>* (last syllable), and <u>*Manjina*</u> (word duration). If we could find lengthening evidence for a boundary, we expected the temporal scope of the pre-boundary lengthening to extend through the last segment and last syllable (Krivokapić 2007 and ref. therein) . Wagner (2005) measured pre-boundary lengthening occurring in word durations so we also measured the duration of the adjective.

The split construction analysis of 1W placement implies a boundary after the adjective for 1W placement but not 1C placement. It's not clear how focus conditions affect this analysis, so we compared durations both within and across focus

conditions. Within broad focus, the split construction analysis would be consistent with lengthening in the adjective for 1W compared to 1C placement. Within narrow focus, Radanović-Kocić's analysis would be (and the split construction analysis might be) consistent with lengthening in the adjective for 1W compared to 1C placement. Radanović-Kocić (1988, 1996) proposed a prosodic break after a narrowly, but not broadly, focused adjective for 1W but not 1C placement. Therefore, Radanović-Kocić's analysis would also be consistent with lengthening in the adjective under narrow focus, compared to broad focus, for 1W but not 1C placement. However, Godjevac and Smiljanic's intonational analyses positing a boundary tone after the focused element would be consistent with lengthening in the adjective under narrow focus compared to broad focus for both 1W and 1C placements. These predictions are summarized below in Table 2.3.2.2.

Factor	Constant	Predictions for durations
CLITIC POS.	broad focus	1W > 1C (split construction analysis)
CLITIC POS.	narrow focus	1W > 1C (Radanović-Kocić)
FOCUS	1W or 1C	nar > broad, 1W only (Radanović-Kocić)
FOCUS	1W or 1C	nar > broad, 1W and 1C (Godjevac, Smiljanic)

Table 2.6: Predictions for pre-boundary lengthening for compared adjective segment, syllable, and word durations. Durations were compared between levels in the manipulated factor, shown in the first column, with the factor in the second column held constant. The levels for the factor FOCUS were broad and narrow, and the levels for the factor CLITIC POS(ITION) were 1W and 1C.

We were unable to find any consistent trends across speakers to provide evidence for pre-boundary lengthening in any case. Below, we summarize results in Tables 2.3.2.2, 2.3.2.2, 2.3.2.2, and 2.3.2.2. We show where significant differences occurred between measured durations in the unshaded cells. For significant results, the direction of lengthening is given, e.g. "1W < 1C" means that the duration for 1W was shorter than that for 1C, and a checkmark indicates lengthening in the direction predicted in Table 2.3.2.2. We give detailed statistical results in the Appendix in Section A.3.1.

Duration	S1	S2	S3	S4
Last segment	1W < 1C	✓1W > 1C		
Last syllable	1W < 1C			
Word			✓1W > 1C	

Table 2.7: Comparison of adjective durations across clitic positions under broad focus for each speaker S1-S4.

Duration	S1	S2	S3	S4
Last segment	1W < 1C	✓1W > 1C	✓1W > 1C	
Last syllable	1W < 1C	✓1W > 1C		
Word				

Table 2.8: Comparison of adjective durations across clitic positions under narrow focus for each speaker S1-S4.

Duration	S1	S2	S3	S4
Last segment				
Last syllable		✓nar > bro		nar < bro
Word	nar < bro	✓nar > bro		✓nar > bro

Table 2.9: Comparison of adjective durations across focus conditions for 1W placement for each speaker S1-S4.

Duration	S1	S2	S3	S4
Last segment			nar < bro	nar < bro
Last syllable		✓nar > bro		nar < bro
Word	✓nar > bro	✓nar > bro		✓nar > bro

Table 2.10: Comparison of adjective durations across focus conditions for 1C placement for each speaker S1-S4.

Table 2.3.2.2 shows that under broad focus, no speaker showed consistent evidence for pre-boundary lengthening for 1W placement. S2 and S3 showed lengthening in the final segment and word for 1W, respectively, but not for any other durations measured. Opposite to predictions consistent with a split construction analysis of 1W placement, S1 showed lengthening in the final segment and syllable of the adjective for 1C compared to 1W.

Table 2.3.2.2 shows that under narrow focus, three speakers showed differences between clitic placements in durations measured for the adjective. Two speakers showed lengthening in the last segment and last syllable: S1 showed lengthening in 1C placement, and S2 showed lengthening in 1W placement. S3 showed lengthening in 1W placement for the last segment only. Thus, S2 and S3's results were consistent with Radanović-Kocić's proposal of a prosodic break following a narrowly focused sentence-initial adjective for 1W but not 1C placement, but S1's were not.

Table 2.3.2.2 shows differences in durations in the adjective between broad and narrow focus for 1W placement. Three speakers, S1, S2, and S4 showed significant differences for word duration, and S2 and S4 showed lengthening in the predicted direction, with lengthening under narrow focus. However, because the word duration includes duration of the stressed vowel, which was lengthened under narrow focus for all speakers but S3, as discussed in Section 2.3.2.1, this result is confounded. S2 and S4 also showed lengthening in the last syllable, but only S2 showed lengthening in the right direction, for narrow focus. The results provide no clear evidence for a prosodic boundary after the narrowly focused adjective for 1W placement.

Table 2.3.2.2 shows differences in durations in the adjective between broad and narrow focus for 1C placement. All speakers but S3 showed lengthening under narrow focus in the word duration, as predicted, but as discussed for Table 2.3.2.2, this result is confounded with lengthening in the stressed vowel under narrow focus. S2

showed lengthening in the same direction, under narrow focus, for the last syllable, too. However, S4 showed lengthening in the opposite direction for the last segment and syllable in the adjective, as did S3 for the last segment. Results across speakers therefore provide no clear evidence for a prosodic boundary after the narrowly focused adjective for 1C placement.

In summary, there were no consistent trends in lengthening for all speakers, or even a majority of speakers, across clitic positions or focus conditions. We could find no convincing evidence to support final lengthening under any circumstances in the duration of the last segment, syllable, or word for the adjective consistent with a boundary following the adjective for 1W placement or under narrow focus. Interestingly, S2 consistently showed lengthening in the predicted direction consistent with a boundary following the adjective for 1W placement and under narrow focus.

2.3.3 F_0 of peaks and valleys

Since raising of the pitch peak of the focused element and lowering of the low tonal target following the focused element were found to be prosodic markers of narrow focus by Smiljanic (2004), we hypothesized that F_0 of H1, the adjective peak, would be higher under narrow focus on the adjective, and that F_0 of L2, the low tonal target following the adjective, would be lower under adjective focus. Moreover, if there was a prosodic-syntactic focal marking tradeoff for 1W because 1W constructions already indicate focal marking from word order, then the prediction would be that there would be less prosodic marking of focus for 1W than 1C placement. This line of reasoning predicted F_0 of H1 to be lower and F_0 of L2 to be higher for 1W placement compared to 1C placement in narrow focus.

ANOVAs showed a main effect for FOCUS for F_0 of H1, F_0 of H2, the ratio of F_0 of H1 to F_0 of H2, F_0 of L2, and the ratio of F_0 of H1 to F_0 of L2 for all speakers except

for F_0 of L2 for S2, as shown in Table 2.3.3.

ANOVA-FOCUS	S1	S2	S3	S4
F_0 of H1	F(1,152) = 23.22, p = 3.5e-6	F(1,143) = 47.61, p = 1.6e-10,	F(1,144) = 12.74, p = 4.9e-4	F(1,152) = 297.56, p < 2e-16
F_0 of H2	F(1,152) = 872.68, p < 2.2e-16	F(1,143) = 845.50, p < 2e-16	F(1,144) = 1377.86, p < 2e -16	F(1,152) = 701.01, p < 2e-16
F_0 of H1/ F_0 of H2	F(1,152) = 178.04, p < 2e-16,	F(1,143) = 1515.75, p < 2e-16	F(1,144) = 487.42, p < 2e -16	F(1,152) = 612.67, p < 2e-16
F_0 of L2	F(1,152) = 60.57, p = 1.0e-12,	F(1,143) = 0.80, p = 0.37, n.s.	F(1,144) = 49.69, p < 6.91e-11	F(1,152) = 4.12, p = 0.044
F_0 of H1/ F_0 of L2	F(1,152) = 4.48, p = 0.036	F(1,143) = 38.71, p = 5.1e-9	F(1,144) = 11.18, p =1.0e-3	F(1,152) = 169.19, p < 2e-16

Table 2.11: ANOVA results for F_0 of H1 and F_0 of H1/ F_0 of H2, F_0 of H2, F_0 of L2, and F_0 of H1/ F_0 of L2 for the fixed factor FOCUS for all speakers. All comparisons were significant except for F_0 of L2 for S2.

For S2 and S4, F_0 was higher for H1 in narrow focus than in broad focus, as expected based on Smiljanic (2004) and cross-linguistic pitch range expansion in narrow focus. However, for S1 and S3, F_0 of H1 was higher in broad than narrow focus. This was most likely due to reduction in pitch range across the elicitation session for some speakers, since data for broad focus was collected before data for narrow focus. Thus, the raw F_0 values could be misleading. For the ratio F_0 of H1 to F_0 of H2, though, all speakers had a larger ratio in narrow focus, see Figure 2.3.3, and H2 was lower in narrow than broad focus for all speakers. That the ratio F_0 of H1 to F_0 of H2 as well as F_0 of H2 was consistently lower in narrow focus for all speakers suggests that speakers regulate not the pitch of H1 alone in realizing narrow focus, but the pitch in the deaccented postfocal region (since F_0 of H2 was measured in this region, and because the F_0 in this region was often stable), and the relative peak heights of H1 and H2.

L2 was lower in narrow compared to broad focus for S1 and S3 and higher in

narrow focus for S4. For S2, there was no main effect of focus on L2. However, as for raw F_0 measurements for H1, the inconsistency in the change in height of F_0 of L2 between broad and narrow focus across speakers may have been due in part to changes in pitch range across the elicitation session: as discussed above, S1 and S3 both unexpectedly had a higher F_0 of H1 in broad focus than in narrow focus, and it was also these two speakers that had a higher L2 in broad than narrow focus. Indeed, for the ratio F_0 of H1 to F_0 of L2, all speakers had a larger ratio in narrow focus: F_0 of L2 normalized with respect to the F_0 of H1 was lower in narrow focus than in broad focus, see Figure 2.3.3.

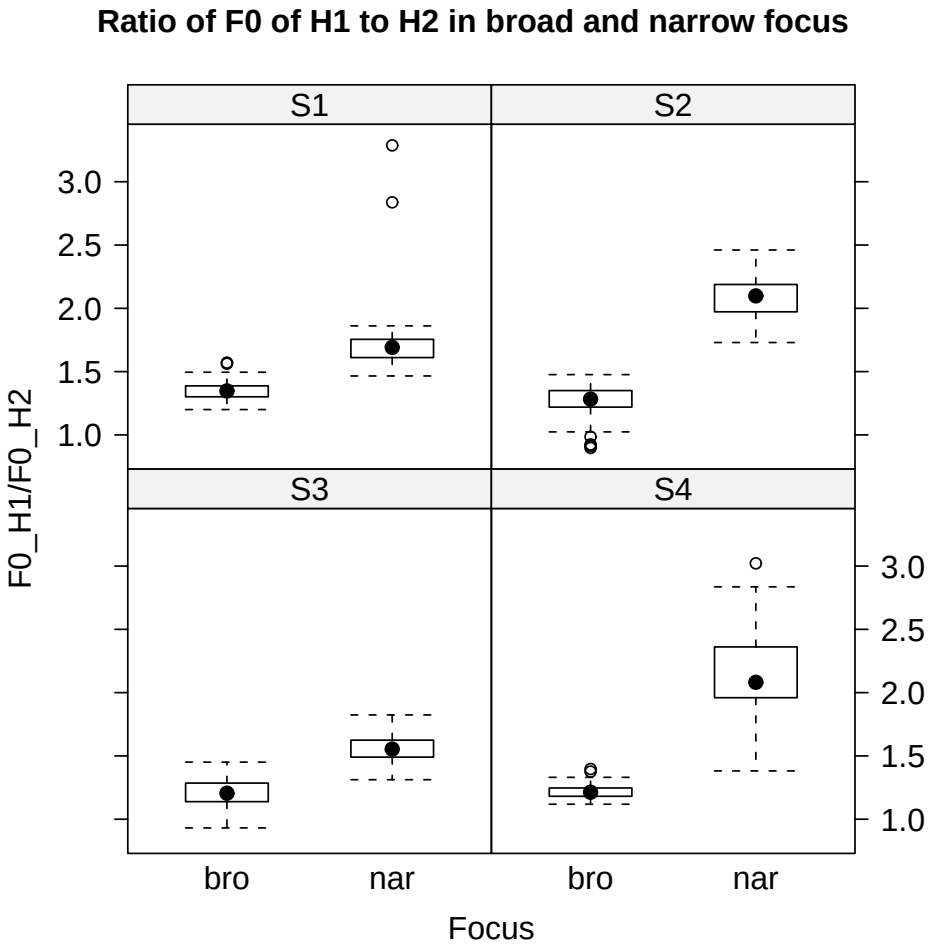


Figure 2.6: Ratio of F_0 of H1 to H2 in broad and narrow focus. The ratio was higher in narrow focus for all speakers.

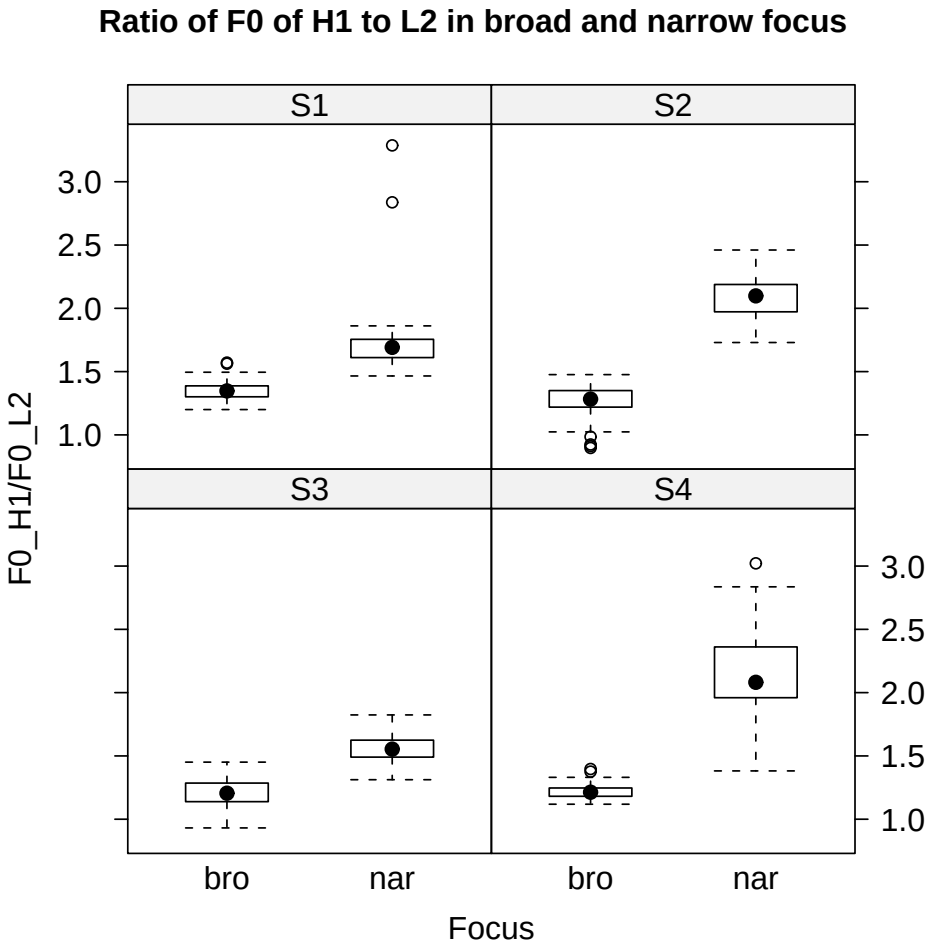


Figure 2.7: Ratio of F_0 of H1 to L2 in broad and narrow focus. The ratio was higher in narrow focus for all speakers.

In summary, we found the same prosodic markings of narrow focus in F_0 of peaks and valleys as Smiljanic (2004): the pitch peak in the focused sentence-initial adjective (normalized to the pitch peak in the noun) was higher in narrow focus and the low tonal target following the adjective peak (normalized to the pitch peak in the adjective) was lower. Together, the higher adjective peak and the lowered low tonal target in narrow focus may have indicated pitch range expansion, and the lowered low tonal target may also have indicated separation of the focused element from the rest of the sentence, as suggested by Smiljanic (2004).

Because of the possible changes in pitch range across the elicitation discussed above and also because there was some interaction between FOCUS and other factors, we analyzed F_0 data within each FOCUS condition.

2.3.3.1 Broad focus

Two-way ANOVAs for F_0 of H1 showed no main effects or interactions for CLITIC POSITION or CLITIC STRING LENGTH, except for S1, which showed a main effect of CLITIC STRING LENGTH, $F(1,76) = 12.13$, $p = 8.2e\text{-}4$, with H1 higher for a clitic string of length 1. Table 2.3.3.1 shows two-way ANOVAs for F_0 of H2; it shows main effects for CLITIC POSITION and CLITIC STRING LENGTH: only S4 showed no main effect of CLITIC POSITION. H2 was higher for clitic strings of length 1 and also higher for 1C clitic placement; this is not unexpected since a shorter clitic string or 1C clitic placement would both entail less phonetic material preceding H2 so that there would be less declination before H2.

What is surprising is that S4 showed no main effect of CLITIC PLACEMENT on F_0 of H2. We would expect H2 to be lower for 1W placement due to declination, but this is not the case for S4. This suggests that at least for S4, the pitch peak height of H2 was higher than we would expect in 1W placement, cf. Figures 2.2a and 2.3a, which

display contours from S4 for 1C and 1W placement in broad focus; since a prosodic marker of focus is a higher pitch peak in the focused element, this result is consistent with inherent focushood of 1W placement resulting in prosodic marking of focus, in this case on the noun, even in broad focus. For the other speakers, it is difficult to determine whether H2 peak height is higher than we'd predict if its height relative to H1 were regulated only by declination. Further analysis of this would require modeling of declination.

ANOVA-F_0 of H2 for broad focus	S1	S2	S3	S4
CLITIC POSITION	F(1,76) = 29.09, p = 7.5e-7	F(1,67) = 17.86, p = 7.4e-5,	F(1,70) = 26.07, p = 2.7e-6	F(1,75) = 1.77, p = 0.19, n.s.
CLITIC STRING LENGTH	F(1,76) = 73.69, p = 8.4e-13	F(1,67) = 4.54, p = 0.037	F(1,70) = 9.11, p = 3.5e-3	F(1,75) = 4.30, p = 0.042
CLITIC POS. X CLITIC STR. LEN.	F(1,76) = 9.72, p = 2.6e-3	F(1,67) = 0.47, p =0.50, n.s.	F(1,70) = 2.29, p = 0.13, n.s.	F(1,75) = 7.37, p = 8.2e-3

Table 2.12: ANOVA results for F_0 of H2 in broad focus.

As shown in Table 2.3.3.1, F_0 of L2 showed main effects for CLITIC POSITION for all speakers except S1, who showed a main effect for CLITIC STRING LENGTH. For all speakers except S1, 1C clitic position produced a higher F_0 for L2 than 1W, and S1 had a higher F_0 for L2 for clitic string length 1 than for length 2. As for H2, this could be explained due to less declination before L2 for 1C compared to 1W and 1 clitic compared to 2 clitics. Posthoc tests with 1C, 1W, and no clitics supported this explanation, since F_0 of L2 for 1C and no clitics were not significantly different, but F_0 of L2 for 1W was significantly lower than for 1C and no clitics.

Results for F_0 of H1/F_0 of H2 showed a main effect of CLITIC POSITION for S2 (F(1,67) = 17.22, p = 9.6e-5) and S3 (F(1,70) = 12.75, p = 6.5e-4): the ratio was higher

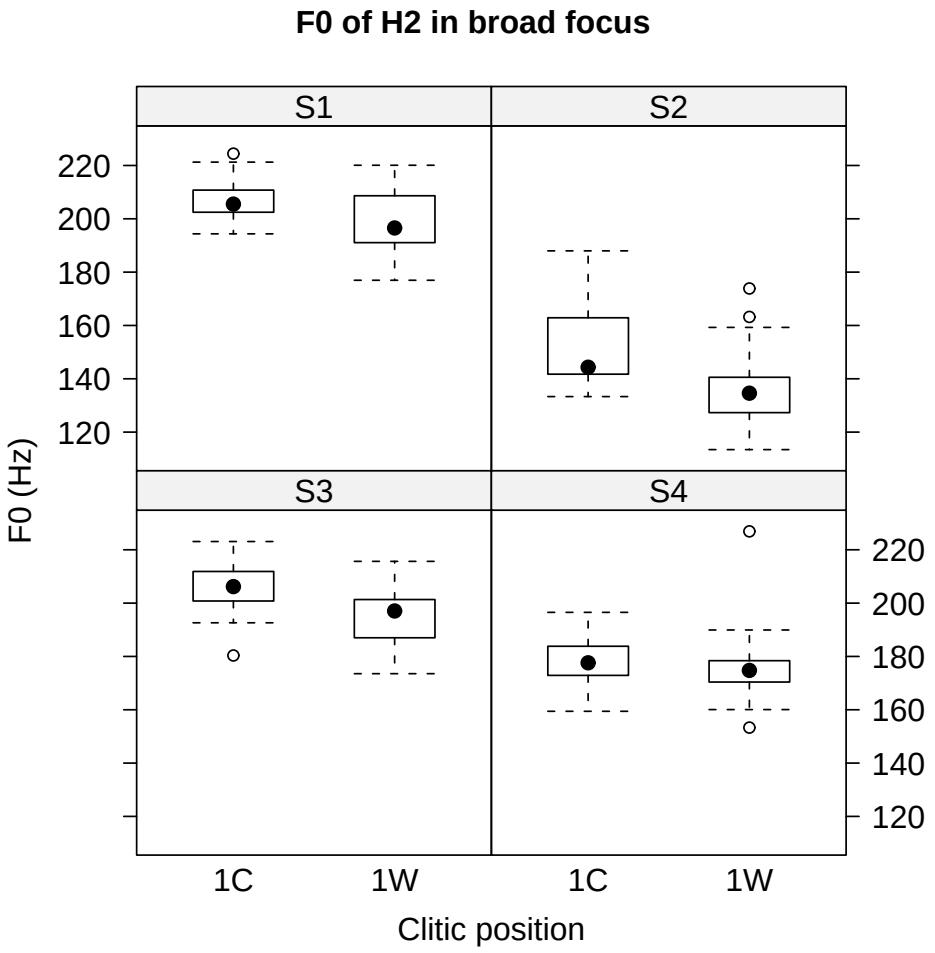


Figure 2.8: F_0 of H2, noun peak in broad focus for 1C and 1W clitic positions. H2 was lower in narrow focus for all speakers for 1W placement except for S4.

ANOVA-F_0 of L2 for broad focus	S1	S2	S3	S4
CLITIC POSITION	F(1,76) = 8e-4, p = 0.97, n.s.	F(1,67) = 17.22, p = 9.6e-5	F(1,70) = 8.42, p = 5.0e-3	F(1,75) = 26.19, p = 2.2e-6
CLITIC STRING LENGTH	F(1,76) = 6.33, p = 0.014	F(1,67) = 0.47, p = 0.50, n.s.	F(1,70) = 2.06, p = 0.16, n.s.	F(1,75) = 0.42, p = 0.52, n.s.

Table 2.13: ANOVA results for F_0 of L2 in broad focus.

for 1W placement, as shown in Figure 2.3.3.1. These results, as those for F_0 of H2, are explainable due to declination, as discussed above. However, F_0 of H2 for S1 in addition and S4 were not significantly different across clitic placements, suggesting that H2 was higher than expected for 1W placement not only for S4, as discussed above, but also for S1.

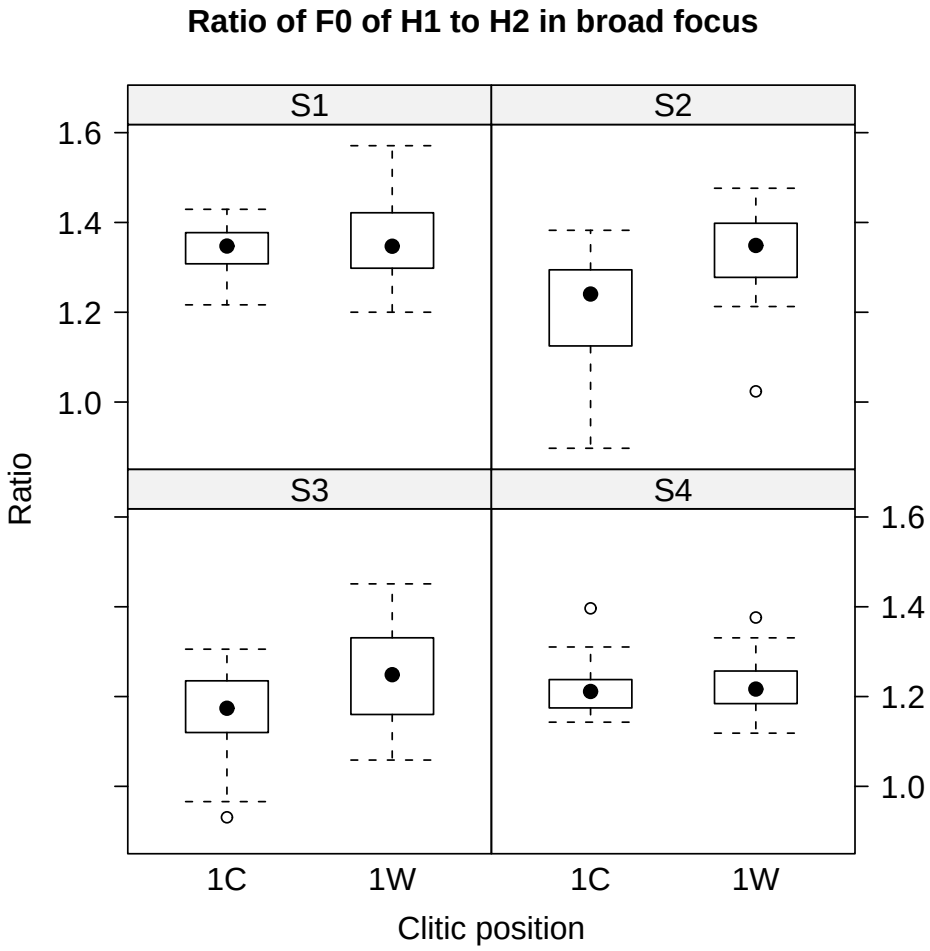


Figure 2.9: Ratio of F_0 of H1 to F_0 of H2 in broad focus for 1C and 1W clitic positions. The ratio was higher for 1W placement for S2 and S3.

In narrow focus, there were few significant statistical results, and these did not pattern consistently across speakers. Therefore, these results are given in the Appendix

in Section A.3.2.

In summary, results from F_0 of peaks and valleys replicated Smiljanic (2004)'s findings for narrow focus realization: after normalization, the pitch peak in the focused adjective was significantly higher than in broad focus and the low tonal target following the adjective peak was significantly lower than in broad focus. In addition, within the broad focus condition, CLITIC PLACEMENT affected F_0 of peaks and valleys in some ways explainable by declination and in some ways not. For most speakers, the noun peak, H2, and the low tonal target following the adjective, L2, was significantly higher for 1C compared to 1W placement. In 1C placement, no clitic string follows the adjective, so less phonetic material precedes H2 and L2 than for 1W placement and less declination has occurred before these tonal targets than for 1W placement. However, for S4, F_0 of H2 was not significantly different between clitic placements, and for S1 and S4, the ratio F_0 of H1/F_0 of H2 was not significantly different across clitic placements. These results are opposite of what we would expect due to declination: due to the phonetic material from the clitic string preceding the noun for 1W placement, we would expect H2 to be lower for 1W placement than for 1C. The higher than expected H2 for S1 and S4 is consistent with inherent focushood of the 1W placement, in this case, with focus on the noun, since pitch peak raising is a characteristic prosodic marker of focus.

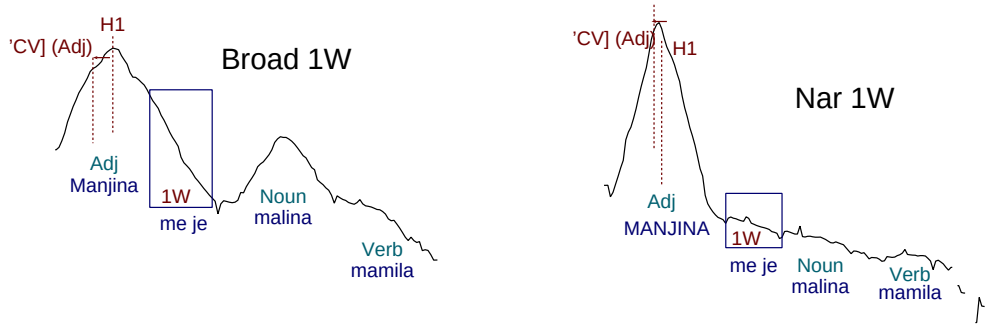
2.3.4 Tonal alignment

Our main hypothesis regarding tonal alignment was that L2, the low target following the adjective, would retract in 1W placement from the right edge of the 2P clitic string, just before the verb in broad focus, to the left edge of the 2P clitic string, just after the adjective in narrow focus. In addition, we expected as in Smiljanic (2004) that the adjective peak, H1, would be retracted in narrow focus on the adjective. In broad focus,

we hypothesized that 1W and 1C placements could be realized prosodically differently such that tonal alignments could reflect inherent focushood of 1W placement. Since Smiljanic (2004) found tonal target retraction to be a marker of prosodic focus, we hypothesized that 1W placement could show earlier alignments of tonal targets than 1C.

2.3.4.1 H1

Three-way repeated measures ANOVAs for each speaker showed a main effect of FOCUS on H1 alignment with respect to the end of the stressed syllable in the adjective, i.e. at the end of the first vowel in the adjective, see Figure 2.3.4.1.



(a) Broad focus, 1W placement

(b) Adjective focus, 1W placement

Figure 2.10: Schematic of measured H1 alignment to offset of stressed syllable in adjective, i.e. to the offset of the initial CV syllable in the adjective, in broad and narrow focus for 1W. Note that <manjina> is pronounced ['ma.ɲi.na].

All speakers aligned H1 earlier in narrow focus on the adjective than in broad focus, consistent with Smiljanic (2004) alignment results for narrow focus. Additionally, all speakers except S4 showed a main effect of CLITIC POSITION on H1 alignment: for S1, S2, and S3, H1 was aligned earlier for 1W than 1C clitic placement. S3 also showed an interaction FOCUS X CLITIC POSITION, $F(1, 144) = 4.47$, $p = 0.04$. The results for the main effects are shown in Table 2.3.4.1.

ANOVA-FOCUS	S1	S2	S3	S4
H1-ALIGNMENT	F(1,152) = 332.62, p < 2e-16	F(1,143) = 61.73, p = 8.59e-13	F(1,144) = 216.89, p < 2e-16	F(1,152) = 228.75, p < 2e-16
CLITIC POSITION	F(1,152) = 8.47, p = 4.2e-3	F(1,143) = 4.20, p = 0.042	F(1,144) = 4.42, p = 0.037	F(1,152) = 2.76, p = 0.099, n.s.

Table 2.14: ANOVA results for H1 alignment to end of stressed syllable in adjective for the factors FOCUS and CLITIC POSITION.

Figure 2.3.4.1 shows that while the H1 peak was retracted in narrow focus, as hypothesized based on Smiljanic 2004, it was not consistently retracted to the tonic syllable, as found in Smiljanic 2004 for Zagreb speakers for disyllabic words. This can be seen from Figure 2.3.4.1 because for narrow focus, the boxplots show a distribution of points that fall to the right of the alignment line marked at the end of the tonic syllable. This suggests that the H1 peak in narrow focus may not be anchored to the stressed syllable.

Because there was a main effect of FOCUS on H1 alignment, we reanalyzed H1 alignment within each focus condition, but found no robust results across speakers. Details on results within each focus condition are given in the Appendix in Section A.3.4.

In summary, H1 was aligned significantly earlier in narrow than broad focus for all speakers. Pitch peak retraction is a common strategy cross-linguistically for narrow focus realization, e.g. in Spanish (Face 2001), in Neapolitan Italian (D'Imperio 2001), and in Greek (Arvaniti et al. 2006, Baltazani and Jun 1999), and Smiljanic (2004) also found pitch peak retraction in narrow focus in Belgrade Serbian and Zagreb Croatian. Within focus conditions, some isolated results for two speakers showed that H1 is aligned earlier for 1W placement compared to 1C placement, but this was not a robust

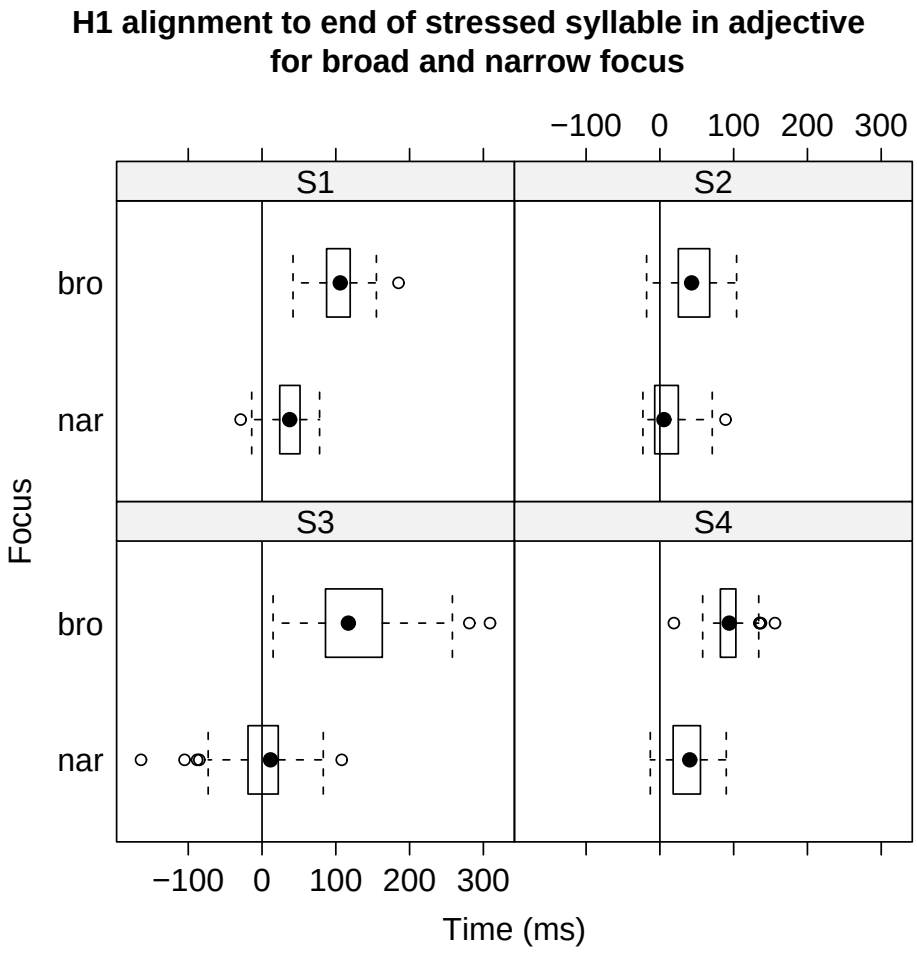
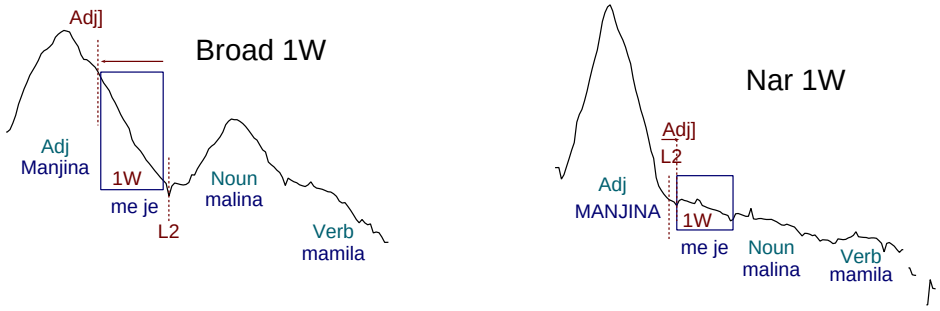


Figure 2.11: Alignment of H1 to offset of stressed syllable in broad and narrow focus for all speakers. The vertical line (x=0) marks the point of alignment, the offset of the stressed syllable in the adjective, i.e. values falling to the left of the line indicate H1 targets in the tonic syllable, while values falling to the right indicate H1 targets following the tonic syllable.

result across speakers and all clitic string lengths.

2.3.4.2 L2

Because L2 was aligned in the vicinity of the end of the adjective in broad and narrow focus, we measured L2 alignment to the end of the adjective;[5] see Figure 2.3.4.2 for a schematic of the L2 alignment for 1W placement in broad and narrow focus.



(a) L2 alignment in broad focus, 1W placement (b) L2 alignment in narrow focus on the adjective, 1W placement

Figure 2.12: Schematic of measured L2 alignment to offset of adjective in broad and narrow focus for 1W.

Results from three-way ANOVAs with fixed factors FOCUS, CLITIC POSITION and CLITIC STRING LENGTH, given in Table 2.3.4.2, show that there was a main effect of FOCUS and CLITIC POSITION for all speakers and a main effect of CLITIC STRING LENGTH for all speakers except S2. All speakers aligned L2 earlier in narrow focus than broad focus and earlier for 1C placement than 1W placement, and all speakers but S2 aligned L2 earlier for clitic strings of length 1 than length 2. Speakers S1 and S4 showed some additional significant interactions but posthoc tests did not show these were significant.

[5]This is comparable to the alignment measured for L2 following the target noun in Smiljanic 2004; L2 for that study was measured with respect to the end of the target noun.

ANOVA-L2 alignment	S1	S2	S3	S4
FOCUS	F(1,152) = 502.25, p < 2e-16	F(1,143) =1085.69, p < 2e-16	F(1,144) = 91.67, p < 2e-16	F(1,152) = 176.81, p < 2e-16
CLITIC POS.	F(1,152) = 28.92, p = 2.80e-7	F(1,143) =90.16, p < 2e-16	F(1,144) = 14.00, p = 2.6e-4	F(1,152) = 43.41, p = 6.9e-10
CLITIC STR. LEN.	F(1,152) = 10.24, p = 1.7e-3	F(1,143) = 3.00, p = 0.086, n.s.	F(1,144) = 6.98, p = 9.1e-3	F(1,152) = 5.09, p = 0.025
FOCUS X CLITIC POS.	F(1,152) = 11.19, p = 1.0e-3	F(1,143) = 147.97, p < 2e-16	F(1,144) = 39.79, p = 3.27e-9	F(1,152) = 14.51, p = 2.0e-4

Table 2.15: ANOVA results for L2 alignment to the end of the adjective for the factors FOCUS, CLITIC POSITION, and CLITIC STRING LENGTH. All speakers showed a main effect for FOCUS, CLITIC POSITION, and a significant interaction FOCUS X CLITIC POSITION. All speakers except S2 showed a main effect for CLITIC STRING LENGTH.

Figure 2.3.4.2 shows that L2 was aligned significantly earlier in narrow focus for all speakers. For broad focus, L2 was generally aligned to a point following the end of the adjective. For narrow focus, L2 alignment with respect to the end of the adjective was variable across speakers; L2 was before the end of the adjective for S1 and S2, close to the end of the adjective for S4, and later than the end of the adjective for S3.

Because L2 was aligned differently in broad and narrow focus and because there was a significant interaction FOCUS X CLITIC POSITION for all speakers, we reanalyzed L2 alignment within each focus condition. Smiljanic (2004) found that for single word initial noun phrases (i.e. a noun) followed by the 2P auxiliary clitic **je**, L2 aligned to the end of the clitic **je** in broad focus, but to the end of the noun, at the noun-clitic boundary in narrow focus. To compare our results with Smiljanic (2004), we measured the alignment of L2 in broad focus to the onset of the noun, (i.e. the end of the clitic string, if it was 1W placement, and at the end of the adjective, if it was 1C

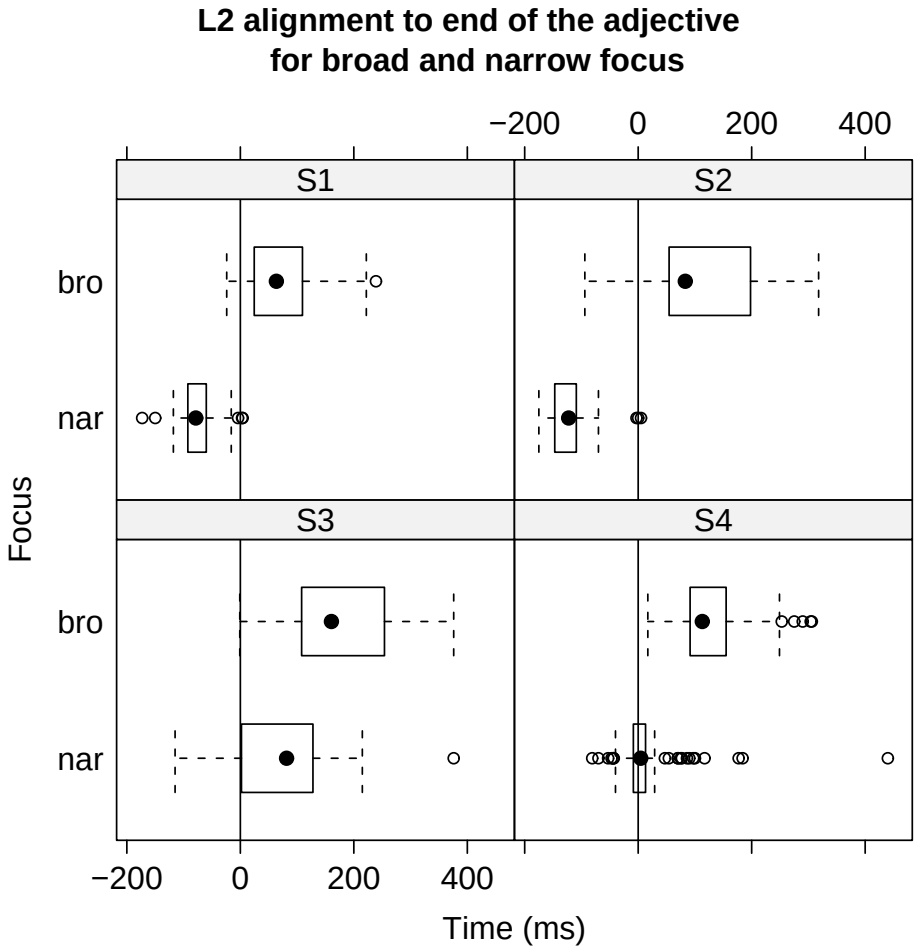
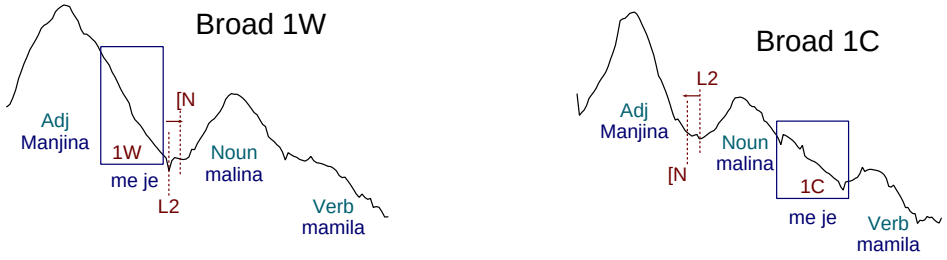


Figure 2.13: Alignment of L2 to end of adjective for broad and narrow focus for all speakers. The vertical line (x=0) marks the point of alignment, the end of the adjective. L2 was aligned significantly earlier in narrow focus for all speakers.

placement), see Figure 2.3.4.2. In narrow focus, we measured the alignment of L2 to the end of the adjective. We also measured the alignment of L2 in narrow focus with respect to H1.[6]



(a) Broad focus, 1W placement

(b) Adjective focus, 1W placement

Figure 2.14: Schematic of measured L2 alignment to the onset of the noun in broad focus for 1C and 1W.

In broad focus, there was a main effect of CLITIC POSITION for all speakers, as shown in Table 2.3.4.2. Additional statistical results for S4 are given in the Appendix in Section A.3.4.1.

ANOVA-L2, broad focus	S1	S2	S3	S4
CLITIC POSITION	F(1,76) = 94.94, p = 5.1e-15	F(1,67) = 12.18, p = 8.6e-4	F(1,70) = 5.81, p = 0.019	F(1,76) = 136.71, p < 2e-16

Table 2.16: ANOVA results for L2 alignment to the onset of the noun for the factor CLITIC POSITION in broad focus. All speakers show a main effect for CLITIC POSITION. Addtitionally, S4 showed a main effect of Clitic string length and an interaction CLITIC POSITION x CLITIC STRING LENGTH, discussed in the Appendix in Section A.3.4.1.

Figure 2.3.4.2 shows that in broad focus, for all speakers, L2 aligned to the onset of the noun was earlier for 1W clitic placement than for 1C. For 1W clitic placement

[6]This alignment choice is discussed further in Chapter 3 in Section 3.2.2.2.

for S1 and S4, L2 generally occurred in the clitic string before the onset of the noun, while L2 generally occurred in the noun for 1C placement. For S2 and S3, L2 was generally aligned to the onset of the noun or later for 1W placement, and L2 for 1C placement occurred in the noun. In Figure 2.3.4.2, we show L2 alignment to the onset of the initial vowel of the noun. The onset of the initial vowel of the noun is a plausible location for L2 for S3 and S4 for 1C placement. S1 and S2 aligned L2 in the noun-initial consonant.

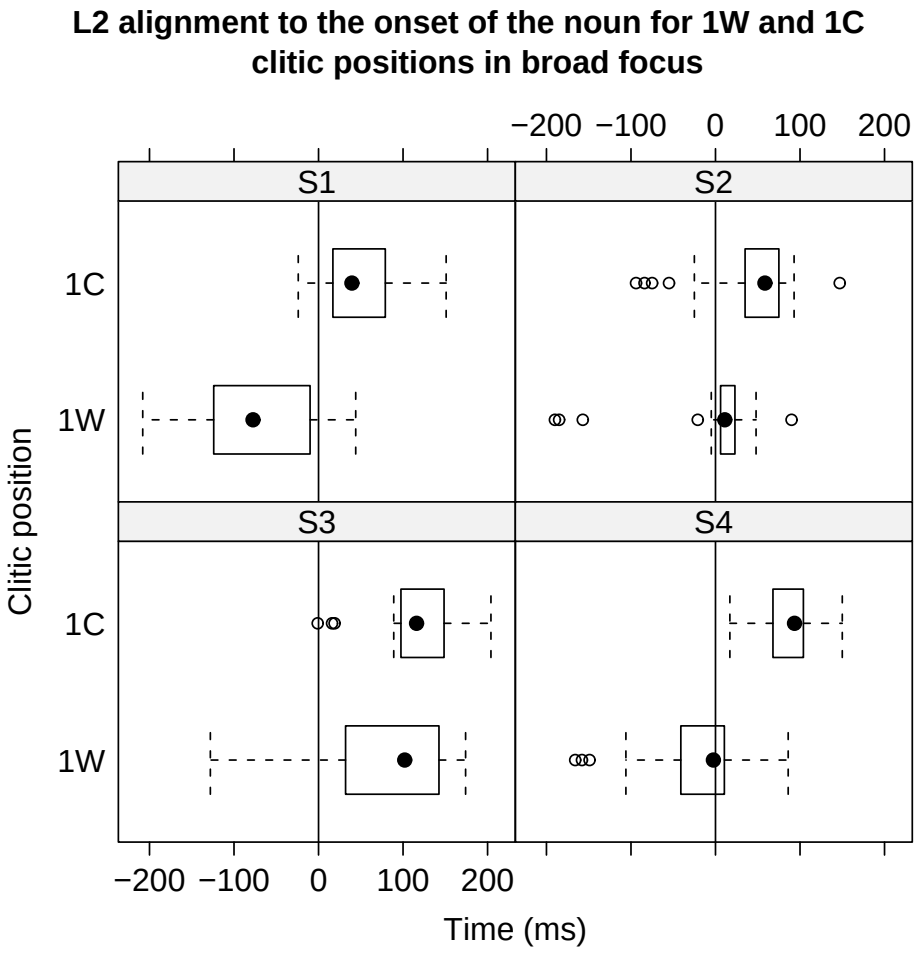


Figure 2.15: Alignment of L2 to onset of noun for 1C and 1W clitic positions in broad focus for all speakers. The vertical line (x=0) marks the point of alignment, the onset of the noun. L2 was aligned earlier for 1W compared to 1C clitic position for all speakers.

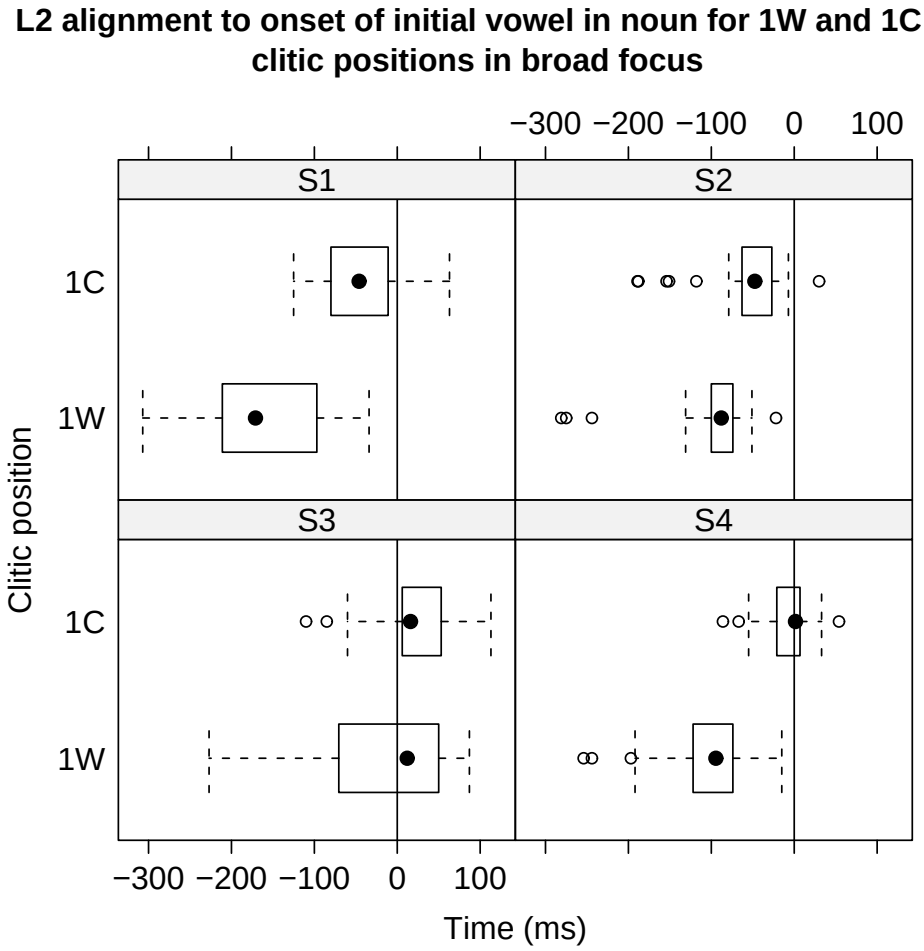


Figure 2.16: Alignment of L2 to onset of first vowel in noun for 1C and 1W clitic positions in broad focus for all speakers. The vertical line (x=0) marks the point of alignment, the onset of the first vowel in the noun.

In narrow focus, with L2 alignment to the end of the adjective, there were no significant effects except for speaker S1.[7] Figure 2.3.4.2 shows L2 alignment to the the end of the adjective. Although we hypothesized based on Smiljanic (2004) and Godjevac (2000a, 2005) that L2 would fall at the end of the adjective for 1W placement, the figure shows that regardless of clitic placement, S1 and S2 both aligned L2 before the end of the adjective, S4 aligned L2 on the word boundary, and S3 aligned L2 in the noun.

When we measured L2 alignment with respect to H1 in narrow focus, see schematic in Figure 2.3.4.2, there were no significant effects for the fixed factors at all. In fact, if the stimuli without any clitics are included, there are also no significant effects: Figure 2.3.4.2, which displays L2 alignment to H1 in narrow focus for 1C, 1W clitic positions, and no clitics, shows that L2 occurred at a fixed duration after H1 for each speaker (range of speaker means: 178 - 301 ms); means and standard deviations are given below in Table 2.3.4.2.

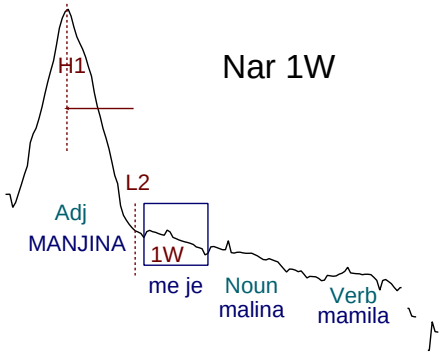


Figure 2.17: Schematic of measured L2 alignment with respect to H1 in broad focus for 1W.

[7] S1 showed a main effect for CLITIC POSITION, F=4.50, p = 0.037 and an interaction CLITIC POSITION x CLITIC STRING LENGTH, F = 10.03, p = 2.2e-3. S1 aligned L2 significantly earlier for 1C than for 1W clitic placement for clitic string lengths of 1 (t(38) = -3.39, p = 1.6e-3) and for 1C clitic placement, earlier for clitic string lengths of 2 than 1 (t(38) = 2.69, p = 0.010).

Speaker	Time to L2 after H1 peak in narrow focus (ms)
S1	178 ± 32
S2	186 ± 34
S3	301 ± 72
S4	222 ± 56
All	220 ± 70

Table 2.17: Mean and standard deviation of time to H1 peak after target word onset in broad focus for all speakers.

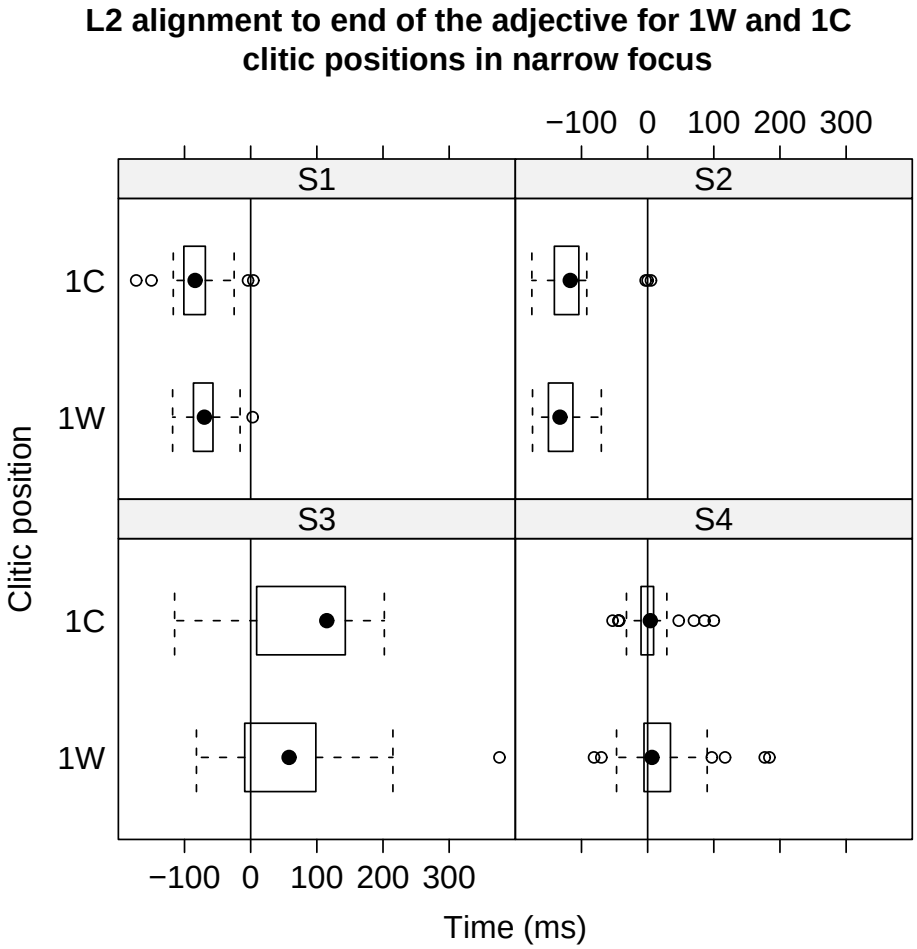


Figure 2.18: Alignment of L2 to end of adjective for 1C and 1W clitic positions in narrow focus for all speakers. The vertical line (x=0) marks the point of alignment, the end of the adjective.

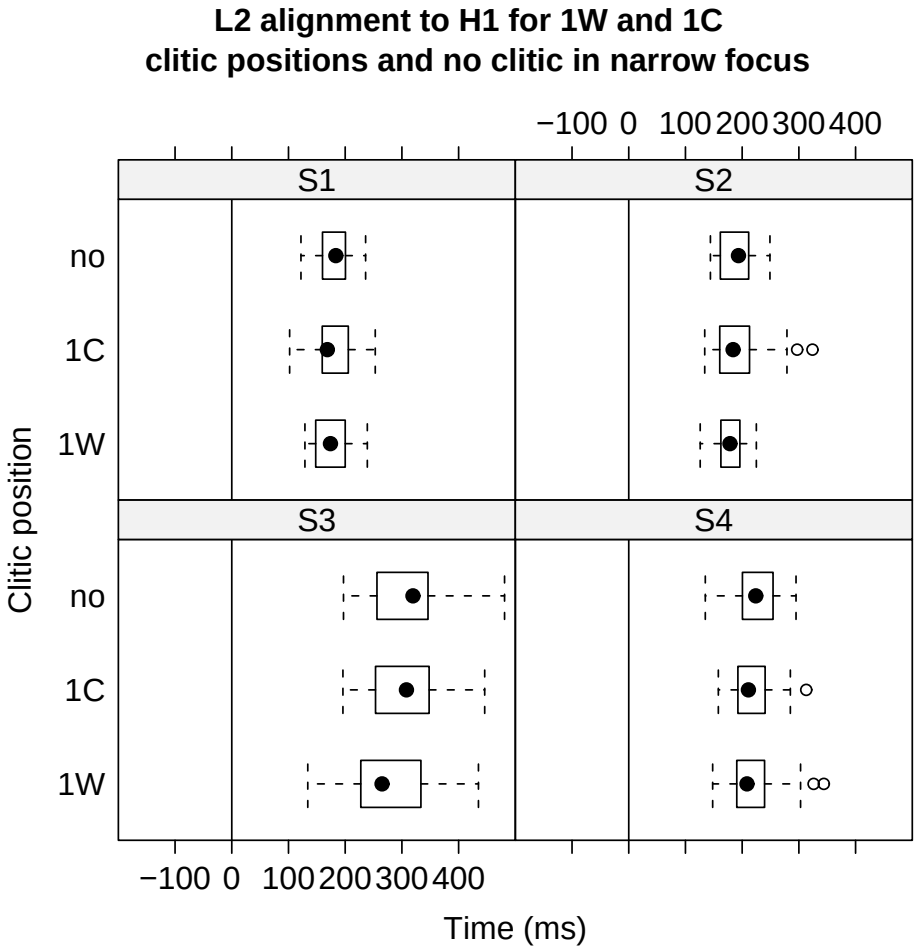


Figure 2.19: Alignment of L2 to H1 for 1C and 1W clitic positions and no clitics in narrow focus for all speakers. The vertical line (x=0) marks the point of alignment, H1. There were no significant effects for any factors or any interactions.

In summary, L2 was retracted in narrow focus compared to broad focus. In broad focus, L2 was aligned to the onset of the noun or to the first vowel in the noun. In narrow focus, depending on the speaker, L2 fell anywhere from before the end of the adjective to after the first consonant in the noun. For the 3-syllable words in Experiment 1, L2 was well-aligned at some speaker-dependent fixed distance before or after the end of the adjective, and it was also aligned to trail H1 at some speaker-dependent fixed duration, regardless of clitic placement or even the presence of clitics. In broad focus but not narrow focus, there was a main effect of clitic position: for 1W placement, L2 was aligned earlier than for 1C placement. We discuss L2 alignment further in Chapter 4. Unlike pitch peak retraction in narrow compared to broad focus, pitch peak retraction as a function of clitic placement has not been discussed previously in the literature and is discussed further in Chapter 4.

2.3.4.3 H2

The noun was deaccented in the adjective narrow focus condition, so the H2 peak was not present or very reduced. Thus, as discussed above in Section 2.2.4, H2 was labeled at the offset of the second vowel in the noun for all tokens in narrow focus, solely for F_0 comparison across FOCUS conditions. Alignment of the labeled points for H2 was irrelevant in narrow focus, and we only examined H2 alignment in broad focus. We measured H2 alignment with respect to the onset of the noun, i.e. the onset of the stressed syllable, as schematized in Figure 2.3.4.3 below.[8]

There was a main effect for CLITIC POSITION for all speakers, c.f. Table 2.3.4.3.[9]

[8]This alignment choice was based on findings on H1 alignment in broad focus discussed in Chapter 3 in Section 3.2.1.1.

[9]When H2 alignment was measured with respect to the onset or offset of the second vowel in the noun, all speakers except S3 showed a main effect for CLITIC POSITION. For H2 alignment to the offset of the stressed syllable, only S4 showed a main effect, and then other speakers have p-values ranging from 0.061 to 0.072.

(a) H2 alignment in broad focus, 1C placement (b) H2 alignment in broad, 1W placement

Figure 2.20: Schematic of measured H2 alignment to the onset of the noun in broad focus for 1C and 1W.

H2 was aligned significantly earlier for 1W clitic position than 1C for all speakers, and H2 alignment for 1C was not significantly different from H2 alignment for no clitics in the utterance, see Figure 2.3.4.3. In the figure, the string of outliers to the right for 1C clitic placement for S3 was due to instances where the speaker reached the H near the onset of the clitic string.

ANOVA-H2, broad focus	S1	S2	S3	S4
CLITIC POSITION	F(1,76) = 6.36, p = 0.014	F(1,67) = 10.02, p = 2.3e-3	F(1,70) = 4.78, p = 0.032	F(1,75) = 26.27, p = 2.2e-6

Table 2.18: ANOVA results for H2 alignment to the onset of the stressed syllable in the noun for the factor CLITIC POSITION. All speakers showed a main effect for CLITIC POSITION.

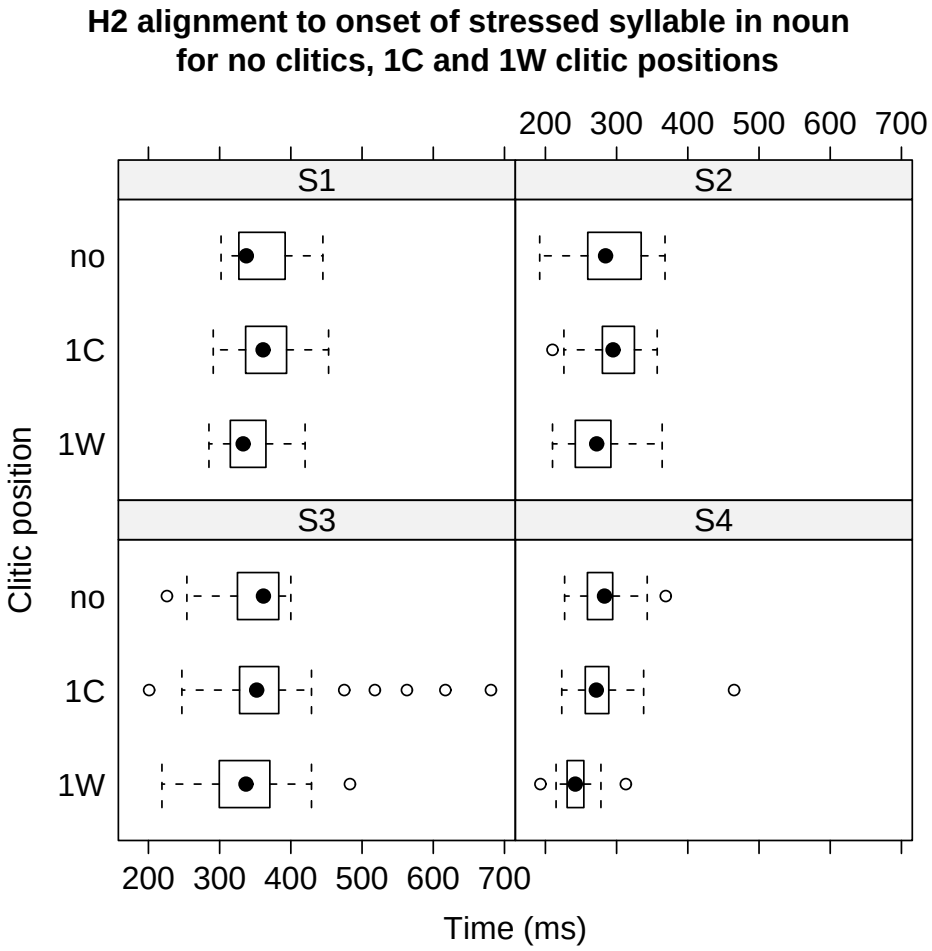


Figure 2.21: Alignment of H2 to onset of stressed syllable for no clitics, and 1C and 1W clitic position for all speakers.

ANOVA-L3, CLITIC POSITION	S1	S2	S3	S4
FOCUS	F(1,76) = 12.33, p = 7.5e-4	F(1,67) = 2.40 p = 0.13, n.s.	F(1,70) = 6.70, p = 0.01	F(1,76) = 51.70, p = 3.9e-10
CLITIC STRING LENGTH	F(1,76) = 99.10, p = 2.0e-15	F(1,67) = 3.59 p = 0.063, n.s.	F(1,70) =0.12 p = 0.72, n.s.	F(1,76) = 9.09, p = 3.5e-3

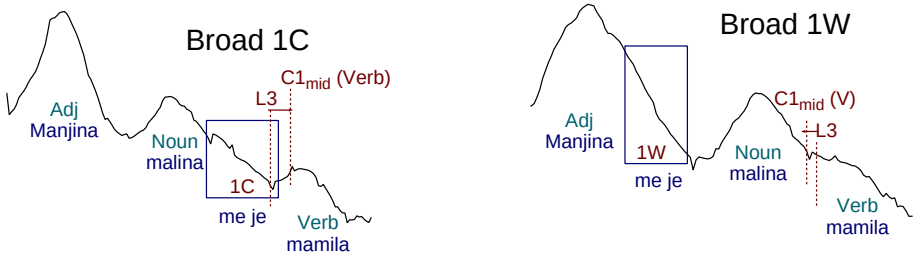
Table 2.19: ANOVA results for L3 alignment to the midpoint of the word-initial consonant in the verb in broad focus.

In summary, for the H2 pitch peak in the noun, clitic placement had the effect that 1W placement was associated with an earlier alignment of the H peak than 1C placement.

2.3.4.4 L3

As for H2, we only examined L3 alignment in broad focus. This was because, in narrow focus, L3 was labeled at a fixed point at the offset of the first vowel in the verb since there was deaccentuation. Measuring L3 to the midpoint of the word-initial consonant in the verb, see Figure 2.3.4.4, all speakers had a main effect of CLITIC POSITION, except S2. S1 and S4 had main effects for CLITIC STRING LENGTH, and S1 but not S4 showed a significant interaction CLITIC POSITION x CLITIC STRING LENGTH, F(1,76) = 5.43, p = 0.022. Posthoc tests showed that S1 had an earlier L3 alignment for 1W placement only for a clitic string of length 1 (t(38) = 5.44, p = 3.30e-6) and not for a clitic string of length 2, and S4 had L3 aligned significantly earlier for a clitic string of length 1 compared to for a clitic string of length 2 for 1C placement. [10]

[10] L3 alignment to the onset of the verb or onset of the stressed vowel in the verb gave the same pattern of results, except for an additional main effect of CLITIC STRING LENGTH for S2 (F(1,76) = 5.31, p = 0.024) for alignment to the onset of the stressed vowel in the verb.



(a) L3 alignment in broad focus, 1C placement (b) L3 alignment in broad focus, 1W placement

Figure 2.22: Schematic of measured L3 alignment to the midpoint of the word-initial consonant in the verb in broad focus for 1C and 1W.

Figure 2.3.4.4 shows L3 alignment to the midpoint of the word-initial consonant in the verb. For all speakers but S2, L3 alignment was significantly earlier for 1C than 1W clitic placement. For S2 and S4, L3 alignment for 1C placement was to the onset of the verb, as can be seen in Figure 2.3.4.4, but alignment for 1W placement was appoximately the midpoint of the word-initial consonant in the verb.

In summary, in broad focus, the alignment of H2, the noun peak, and L2, the low target between the adjective and the noun, was earlier for 1W placement than 1C placement for all speakers, but the alignment of L3, the low target between the noun and verb, was earlier for 1C placement for three speakers. These effects are schematized in Figure 2.3.4.4.

2.3.4.5 Experiment 1 summary

In Experiment 1, we were able to replicate many of Smiljanic (2004)'s results for the prosodic realization of narrow focus. We found that, in narrow focus on the adjective compared to broad focus, speakers lengthened the stressed vowel in the focused adjective, retracted the pitch peak H1 in the adjective and the low tonal target L2 following

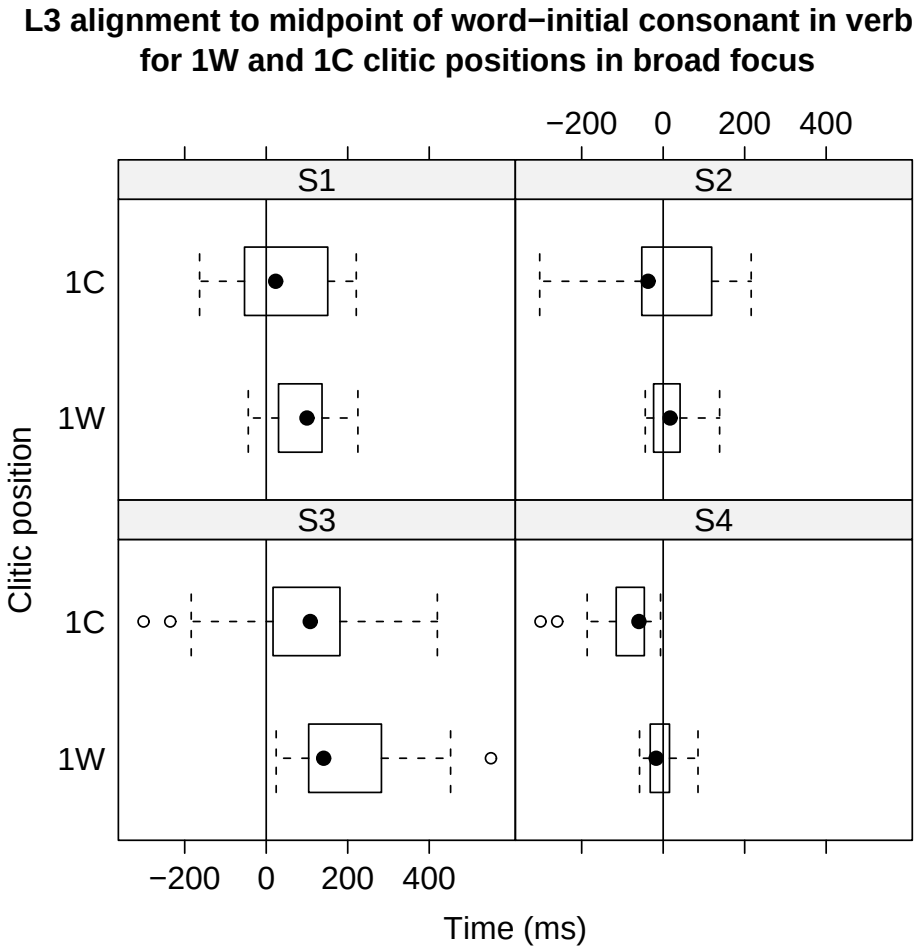


Figure 2.23: Alignment of L3 to midpoint of word-initial consonant in verb for all speakers. The vertical line (x=0) marks the point of alignment, the midpoint of the word-initial consonant in the verb.

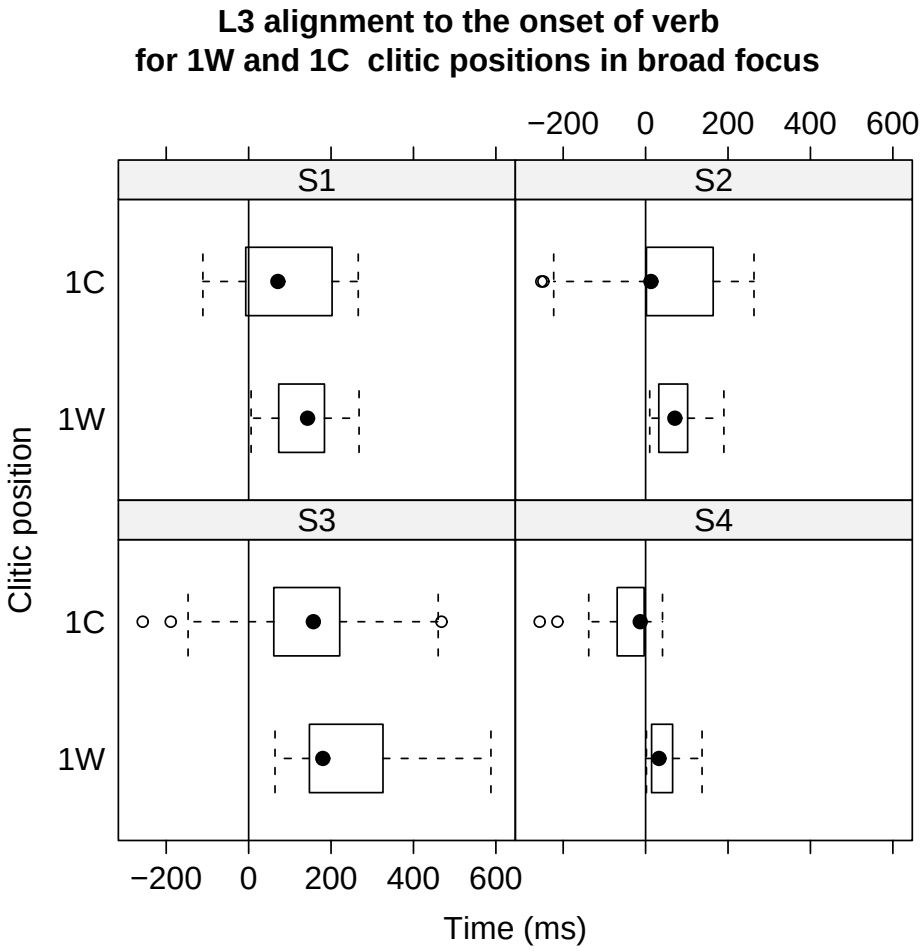
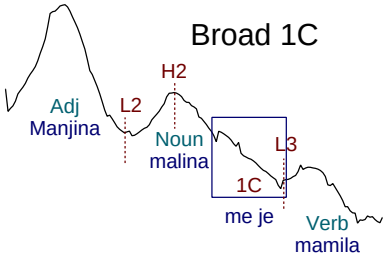
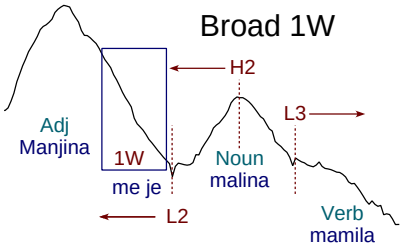


Figure 2.24: Alignment of L3 to onset of verb for all speakers. The vertical line (x=0) marks the point of alignment, the onset of the verb.



(a) Broad focus, 1C placement



(b) Broad focus, 1W placement

Figure 2.25: Schematic for earlier alignment of H2 and L2 and later alignment of L3 in 1W placement compared to 1C placement in broad focus.

the adjective, and, (with normalization), raised the pitch peak H1 and lowered the low tonal target L2.

However, we found differences from Smiljanic (2004) in the alignment of the retracted tonal targets H1 and L2 in narrow focus on the adjective. Smiljanic (2004) found that, for Zagreb Croatian speakers, in disyllabic, initially stressed target words, H1 shifted from the posttonic syllable in broad focus to the tonic syllable in narrow focus. Smiljanic therefore proposed that Zagreb speakers have pragmatic rather than lexical pitch accents: L*+H in broad focus and L+H* in narrow focus. In our study with initially stressed trisyllabic words, we found that H1 in broad focus fell in the second syllable, posttonically, and this was consistent with Smiljanic's proposed L*+H in broad focus. However, we found that H1 in narrow focus did not necessarily fall on the tonic syllable, a result not consistent with Smiljanic's proposed timing for L+H* in narrow focus: rather, H1 tended to fell anywhere from the end of the stressed syllable to the end of the consonant in the syllable following the stressed syllable. Although the alignment of the pitch accents for broad and narrow focus we found was not as strict as proposed by Smiljanic, we still saw the same pattern of retraction in narrow focus, showing contrast in alignment between pitch accents for broad and narrow focus.

We also found results for L2 alignment different than those hypothesized. Based on Smiljanic (2004), Godjevac (2000b, 2005), and Radanović-Kocić (1988, 1996), we expected L2 in narrow focus to fall at the right edge of the focused adjective, before the clitic string:

(6) Hypothesized L- retraction in narrow focus on adjective for 1W placement

Broad focus: ADJ **clitics** L- N V
Narrow focus: [ADJ]$_{FOC}$ L- **clitics** N V

While we found that L2 did generally fall at the end of the clitic string or later in broad

focus, L2 in narrow focus did not fall consistently at the right edge of the adjective, but rather, fell before the end of the adjective for two speakers, at the end of the adjective for one, and after the end of the adjective for another. The next chapter, Chapter 3, is devoted primarily to further investigating L2 alignment.

In addition to results on the prosodic realization of narrow focus, we found that 1W and 1C clitic placements did have different prosodic realizations, but only in broad focus and not in narrow focus. Thus, in narrow focus, we found no evidence for a prosodic-syntactic focal marking tradeoff: there was no evidence that because the word order in 1W placement marked narrow focus, there was less prosodic marking of narrow focus for 1W than for 1C. In broad focus, the alignment of H2, the noun peak, and L2, the low target between the adjective and the noun, was earlier for 1W placement than 1C placement for all speakers, but the alignment of L3, the low target between the noun and verb, was earlier for 1C placement for three speakers. We discuss whether these results are consistent with an inherent focushood of 1W in Chapter 4 in Section 4.3.

Finally, we were unable to find any evidence for pre-boundary lengthening across speakers to support a boundary after the adjective for either 1W placement and/or narrow focus on the adjective. Therefore, we found no positive durational evidence for Radanović-Kocić's proposed prosodic break following the adjective for 1W placement in narrow focus, or for any other prosodic phrase boundary after the adjective after 1W placement or under narrow focus.

CHAPTER 3

Experiment 2: Alignment of the focal phrase accent

3.1 Introduction

For Experiment 2, we designed target words to vary in length to investigate the alignment of the low tone, L2, following the narrowly focused target word. In Experiment 1 in Chapter 2, we already found evidence that our initial hypothesis regarding L2 alignment in narrow focus was incorrect:

(1) Hypothesized L- retraction in narrow focus on adjective for 1W placement

Broad focus: ADJ **clitics** L- N V
Narrow focus: $[ADJ]_{FOC}$ L- **clitics** N V

For three syllable adjectives under narrow focus, we found that the L2 target was not necessarily aligned at the end of the adjective, but that L2 could fall before or after the end of the adjective, depending on the speaker. Experiment 2 in this chapter varied word length in the focused word to determine if L2 was a boundary tone aligned at the right edge of the focused word or a focal phrase accent not necessarily aligned to a boundary. The two factors in the experimental design were thus WORD LENGTH (1-4 syllables) and FOCUS (broad, narrow). Section 3.1.1 describes the materials for the experiment; Section 3.1.2 describes the analysis procedure; Section 3.2 presents the results for the experiment and is split into a section about broad focus 3.2.1 and a section

about narrow focus 3.2.2; Section 3.3 summarizes the findings for the experiment.

3.1.1 Materials

The stimuli were elicited in broad as well as narrow focus so that the alignment of L2 in broad focus could serve as a baseline comparison for the alignment of the putative focal phrase accent in narrow focus. Elicitation contexts for broad and narrow focus were as in Experiment 1, with 'What happened yesterday?' for broad focus and Y/N questions eliciting corrective focus for narrow focus.

The number of syllables in the target words ranged from 1 to 4 and there were six items per word length condition. The target words were initially stressed adjectives and nouns and were elicited in carrier sentences with a total of 9-11 syllables. Some example stimuli for narrow focus are given below in (2) and (3), and the full set of question/answer pairs is given in the Appendix in Section A.2.2.

(2) 1 syllable target word

a. *Je* ***li Vas*** *njen nalaz raspoložio?*
AUX.3s Q 2s.pl 3s.fem.poss report cheered
'Did her doctor's report put you in a good mood?'

b. *(Ne), MOJ* ***me*** ***je*** *nalaz raspoložio.*
(NEG), MY 1sg.ACC AUX.3sg report cheered
'(No), MY doctor's report put me in a good mood.'

(3) 4 syllable target word

a. *Je* ***li Vas*** *karcinom ranio?*
AUX.3s Q 2s.pl cancer wounded
'Did cancer leave you stricken?'

b. *(Ne), MALARIJA* ***me*** ***je*** *ranila.*
(NEG), malaria 1sg.ACC AUX.3sg wounded
'(No), MALARIA left me stricken.'

As seen in the examples above, the target words occurred sentence-initially and were always followed by the clitic string **me je** (1sg.ACC AUX.3sg). Thus, for sentences with target adjectives, e.g. (2), the 2P clitic position was fixed to be 1W, while for sentences with target nouns, e.g. (3), clitic position was irrelevant or ambiguous between 1W/1C.

The sentences were designed to avoid tonal crowding so that all accents were at least one syllable apart, and to avoid segmental perturbations in the F_0 contour, non-sonorants were avoided in the stimuli as much as possible. Due to the difficulty of finding sonorant stimuli, we did not control for vowel quality, syllable structure, or pitch accent in this stimuli set. Based on data from the pilot work described in the Appendix in Section A.1, it was not expected that these factors or the part of speech of the target word would affect the alignment for the speakers. In the pilot work, we found that in narrow focus on sentence initial target words, L2 was aligned to a fixed point in the target word in the second or third syllable (depending on the speaker), regardless of whether it was a noun or adjective or how many syllables were in the target word or what pitch accent the word had. Further pilot work manipulating syllable structure suggested that syllable structure might not affect L2 alignment, either.

Since the target words included both adjectives and nouns so that the syntactic structure was not constant across the stimuli, we attempted to balance the part of speech of the target word across conditions between adjectives and nouns; our stimuli set had four adjectives for 4 syllable words so that we had one more adjective than noun in the entire stimuli set, but the stimuli were otherwise balanced within syllable conditions. 144 sentences per speaker were recorded (4 (WORD LENGTH) x 2 (FOCUS) x 6 items x 3 repetitions) for this stimuli set, from which three items for the 3 syllable condition were reused from the 1W, 2 clitic condition in Experiment 1. The target words used in the stimuli set are given below in Table (3). We avoided morphological

Syllables	Target word	Gloss	Part of speech
1	lan	flax	noun
	lim	sheet metal	noun
	noj	ostrich	noun
	gol	naked	adj.
	moj	my	adj.
	njen	her	adj.
2	majmun	monkey	noun
	mama	mama	noun
	mula	mule	noun
	Lanin	Lana's	adj.
	Manjin	Manja's	adj.
	Ninin	Nina's	adj.
3	domino	domino	noun
	marama	shawl	noun
	moruna	beluga	noun
	Hanina	Hana's	adj.
	Sanjina	Sanja's	adj.
	malena	small	adj.
4	malarija	malaria	noun
	ironija	irony	noun
	minimalni	minimal	adj.
	nemoralni	amoral	adj.
	nenormalni	abnormal	adj.
	nominalni	nominal	adj.

Table 3.1: Target words for Experiment 2.

boundaries at the offset of the second syllable because pilot work showed L2 occurring close to after the second syllable, and we wanted to insure that the L2 was not falling at morphological boundaries.

Additionally, we elicited some target words with noninitial stress, e.g. *me'ni* 'menu', *alu'minij* 'aluminium', *mari'nada* 'marinade,' to preliminarily probe the interaction of position of stress in the target word and the L2 low tone. If L2 were a boundary tone at the end of the target word, the position of stress should not affect its alignment, unless a very late peak in the word due to stress near the end of the word caused tonal crowding

next to L2. If L2 alignment was sensitive to stress placement in a systematic fashion, e.g. if L2 was aligned later for later placement of stress, then this would be evidence for L2 being part of a pitch accent or a focal phrase accent, but not a boundary tone.

Two of the nonintially stressed target words were also used in the main stimuli set in a variant pronunciation with initial stress. In colloquial Zagreb dialect, the words have noninitial stress, but in formal speech, they are initially stressed, e.g. *ma'larija* vs. *'malarija* 'malaria' or *i'ronija* vs. *'ironija* 'irony'.[1]

3.1.2 Analysis

Analysis of data was carried out as in Experiment 1, although fewer landmarks were labeled. Tonal landmarks labeled were L1, H1, and L2 for the target word; L1 was not analyzed because perturbations of the F_0 contour due to the presence of initial stops, nasals, or voiceless segments in target words made labeling of L1 unreliable. Segmentation landmarks labeled for tonal alignment analysis were the onset of the target word, the offset of the stressed syllable in the target word, the offset of the target word, the offset of the clitic string, and the onset of the stressed syllable in the word following the target word.

For correlation analyses, all time points were aligned to the onset of the target word. Because some dependent variables showed nonnormal distributions, all analyses were done using nonparametric Spearman rank-order correlations with added jitter to break ties in the ranking.

[1]Two of the speakers, S3 and S4, were unable to comfortably produce two of the four syllable items with initial stress, *malarija* and *ironija*, so data for these words was missing for these speakers.

3.2 Results

All speakers showed main effects for FOCUS, WORD LENGTH, and a significant FOCUS X WORD LENGTH interaction for tonal alignment of L2 and H1, cf. Table 3.2 below, which shows results from a 2-way repeated measures ANOVA for L2 aligned to the end of the target word. Tonal targets were aligned earlier in narrow focus. Thus, we analyzed tonal alignment separately within each FOCUS condition.

ANOVA-L2 alignment	S1	S2	S3	S4
FOCUS	F(1,140) = 75.12, p = 9.84e-15	F(1,134) = 95.45, p < 2e-16	F(1,128) = 38.37, p = 7.38e-9	F(1, 110) = 142.82, p < 2e-16
WORD LENGTH	F(1,140) = 255.21, p < 2e-16	F(1,134) = 572.60, p < 2e-16	F(1,128) = 146.04, p < 2e-16	F(1, 110) = 389.35, p < 2e-16
FOC X WORD LEN.	F(1,140) = 19.91, p = 1.65e-5	F(1,134) = 77.30, p = 6.29e-15	F(1,128) = 16.81, p = 7.31e-5	F(1, 110) = 91.49, p = 3.89e-16

Table 3.2: ANOVA results for L2 alignment to the end of the target word for fixed factors FOCUS and WORD LENGTH. All speakers showed main effects for FOCUS and WORD LENGTH and a significant interaction FOCUS X WORD LENGTH.

We first discuss tonal alignment in broad focus in Section 3.2.1 and then tonal alignment in narrow focus on the adjective in Section 3.2.2.

3.2.1 Broad focus

In broad focus, we hypothesized from Smiljanic (2004) that the low tonal target following the target word, L2, would fall at the offset of the clitic string. Additionally, we hypothesized that H1, the F_0 in the target word, would fall posttonically but had no further predictions, e.g. whether H1 would align to a particular syllable or fall at a fixed duration following the stressed syllable.

3.2.1.1 H1 alignment

Although the alignment of L2 was the main object of investigation for Experiment 2, because L2 alignment may also be affected by H1 alignment, we also investigated H1 alignment. In general, H1 was aligned to a fixed duration following the onset of the target word, i.e. the onset of the stressed syllable, for all speakers. This is shown below in Figure 3.2.1.1. The results of the one-way repeated measures ANOVA with WORD LENGTH as the fixed factor for the dependent variable H1 alignment with respect to the onset of the target word are given in Table 3.2.1.1 below. Only S3 shows a main effect of WORD LENGTH, and posthoc tests with Bonferroni corrections show that the main effect is due to a significant difference between the H1 alignment for 2- and 4-syllable words and 2- and 3-syllable words. Table 3.2.1.1 also shows means and standard deviations for the time elapsed to the H1 peak from the onset of the target word.

ANOVA-H1, broad focus	WORD LENGTH	Mean/S.D. (ms)
S1	F(3,68)=0.44, p = 0.72, n.s.	288 $\pm$ 75
S2	F(3,63)=2.08, p = 0.11, n.s.	315 $\pm$ 50
S3	F(3,62)=5.47, p = 2.1e-3	333 $\pm$ 100
S4	F(3,62)=1.62, p = 0.19, n.s.	262 $\pm$ 42

Table 3.3: ANOVA results for H1 alignment with respect to target word onset in broad focus with WORD LENGTH as the fixed factor for S1, S2, S3, and S4 and mean and standard deviations for time elapsed from target word onset to H1. The mean and standard deviation over all speakers was 287 $\pm$ 75 ms.

The H1 peak in broad focus mostly occurred after the tonic syllable, even for 1-

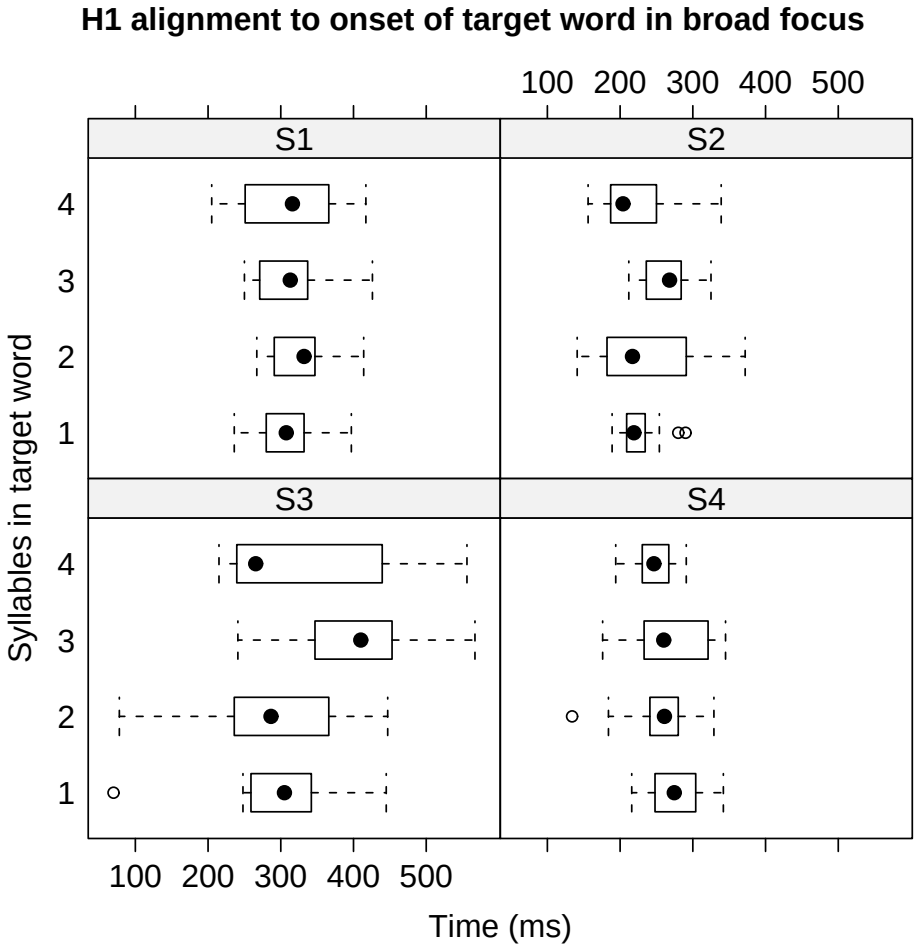


Figure 3.1: Time elapsed to H1 peak from onset of target word in broad focus across word lengths for all speakers.

syllable words, in which case a posttonic H1 peak occurred during the clitic string. For 1 syllable-words, though, speakers sometimes aligned H1 within the tonic syllable, i.e. before the end of the target word. Figure 3.2.1.1 below shows the alignment of H1 to the offset of the stressed syllable. Comparing Figure 3.2.1.1 and Figure 3.2.1.1 especially for 1-syllable words suggests that H1 alignment to the onset of the target word (for the initially stressed words, the same as the onset of the stressed syllable) is better able to account for variance in H1 across word lengths than H1 alignment to the offset of the stressed syllable in broad focus.

A one-way repeated measures ANOVA with WORD LENGTH as the fixed factor for the dependent variable H1 alignment with respect to the offset of the stressed syllable in the target word showed a main effect for all speakers. T-tests with Bonferroni adjustments indicated that for S2, H1 alignment for 1-syllable words was significantly earlier than for all other word length, and for S1, the same was true except between 1- and 3-syllable words. For S3, 1-syllable words had a significantly earlier H1 alignment than for 3-syllable words, and additionally, 2-syllable words had an earlier alignment than 3-syllable words. For S4, 1-syllable words had a significantly earlier H1 alignment for 4-syllable words than 1-syllable words.

For H1 alignment to be to a fixed duration for speakers, it should not be correlated to other quantities; and, in fact, correlation analyses support target word duration as a contributor to the variance in the alignment of H1 only for S3 but no other speakers, as shown in the scatterplot and Spearman's rank correlation coefficients for target word duration in Figure 3.2.1.1.

In summary, H1, the pitch peak in the target word, fell posttonically, as hypothesized—even for 1 syllable target words, where it generally occurred in the clitic string. H1 followed the onset of the stressed syllable at a speaker-dependent fixed duration. While for 2 through 4 syllable words, H1 could be described for most speakers as occurring

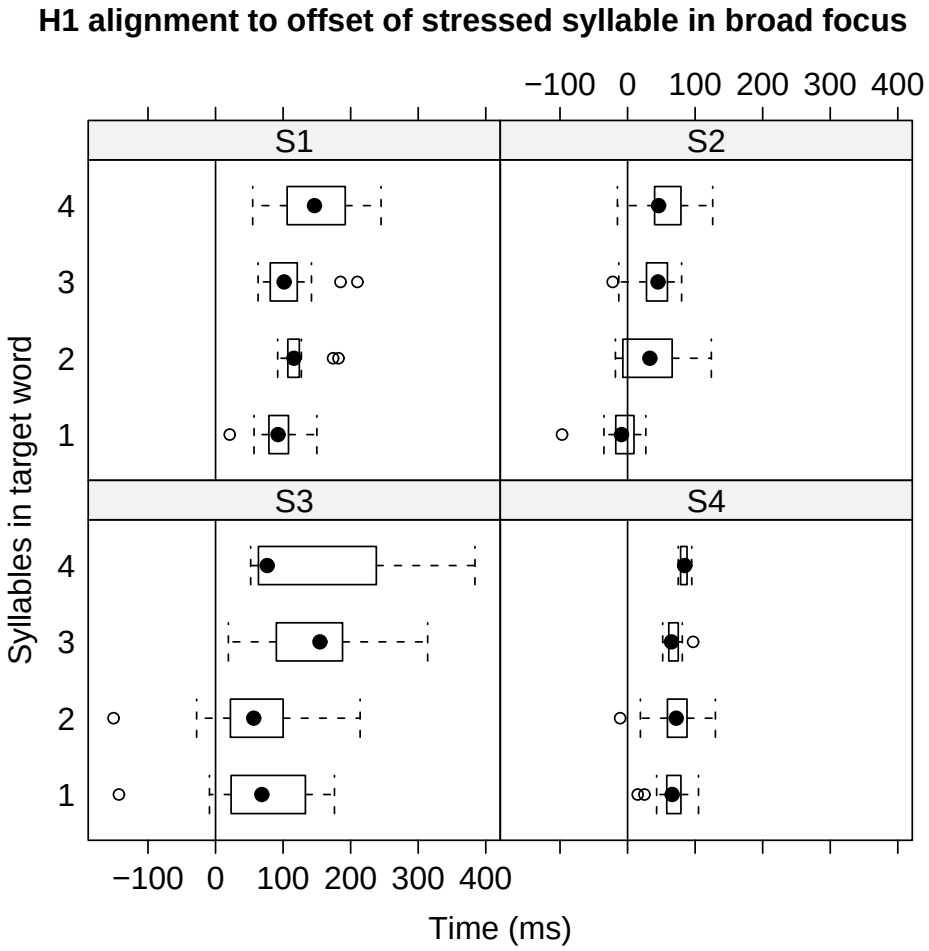


Figure 3.2: Alignment of H1 to offset of stressed syllable in broad focus across word lengths for all speakers. The vertical line (x=0) marks the point of alignment, the offset of the stressed syllable in the target word.

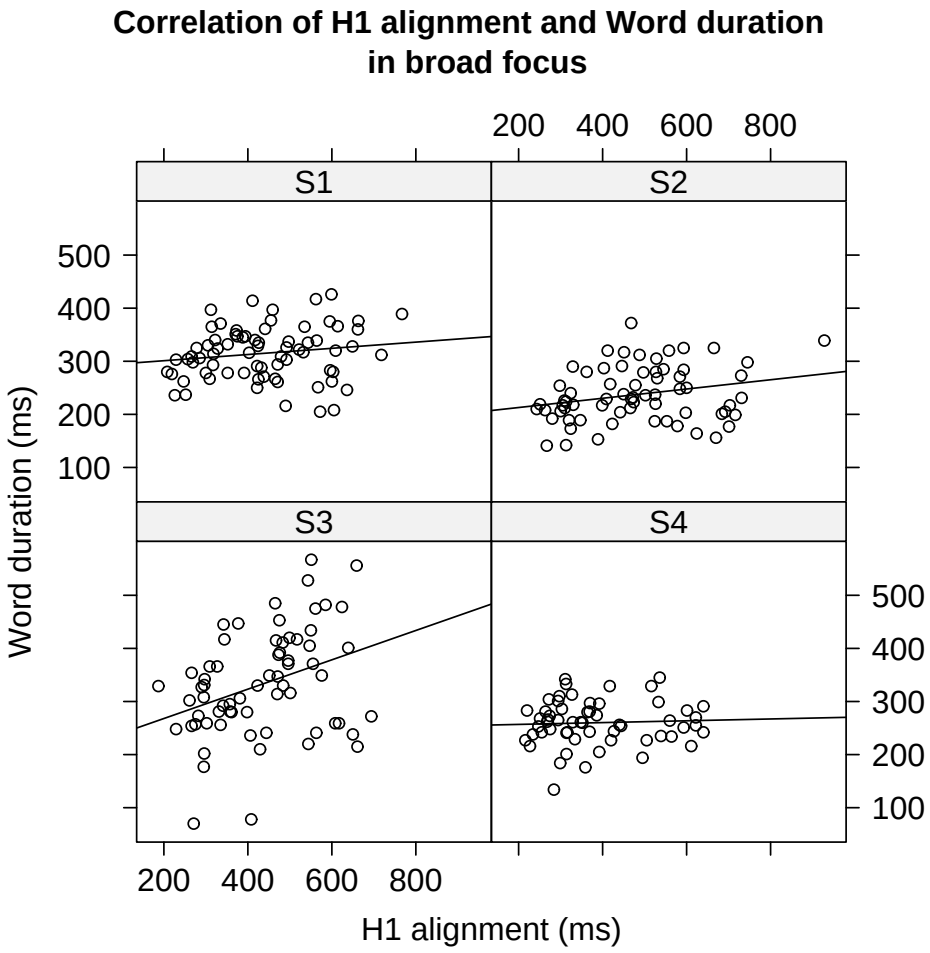


Figure 3.3: Correlation of H1 and target word duration in broad focus for all speakers. The linear regression best-fit lines are shown for each speaker. Spearman's rank correlation coefficients for for S1-S4, respectively, were ρ = 0.16, p = 0.18, n.s. (S1); ρ = 0.22, p = 0.078, n.s. (S2); ρ = 0.33, p = 6.8e-3 (S3); ρ = 0.010, p = 0.94, n.s. (S4).

in the second syllable, immediately following the tonic syllable, this description cannot explain H1 alignment for 1 syllable target words, which had no posttonic syllable, unless the clitic string is counted as part of the word.

3.2.1.2 L2 alignment

In broad focus, as hypothesized, L2 generally aligned to the offset of the clitic string for all target word lengths in all speakers except S3, as shown in Figure 3.2.1.2 below.

The results of the one-way repeated measures ANOVA with WORD LENGTH as the fixed factor for the dependent variable L2 alignment with respect to the offset of the clitic string are given in Table 3.2.1.2 below. Only S1 showed a main effect of WORD LENGTH, and posthoc tests with Bonferroni adjustments showed that the main effect was due to a significant difference between the L2 alignment for 1- and 4-syllable words.

ANOVA-L2 alignment in broad focus	WORD LENGTH (1, 2, 3, 4 syllables)
S1	F(3,68)=3.05, p = 0.034
S2	F(3,63)=1.28, p = 0.29, n.s.
S4	F(3,68)=2.56, p = 0.063, n.s.

Table 3.4: ANOVA results for L2 alignment with respect to offset of clitic string in broad focus with WORD LENGTH as the fixed factor for S1, S2, and S4.

For S1, L2 could be aligned earlier in the clitic string for 4 syllable target words. In contrast, for S1, for 1 syllable target words, L2 was generally aligned to the onset of the first vowel in the following word. For S3, L2 alignment was variable, but was generally to the onset of the first vowel in the word following the target word. Alignment of L2 to the onset of the first vowel in the word following the target word is shown in Figures 3.2.1.2 and 3.2.1.2 below for S1 and S3. Additionally, the L2 alignment was complicated for S1 and S3 because both speakers occasionally aligned L2 to a

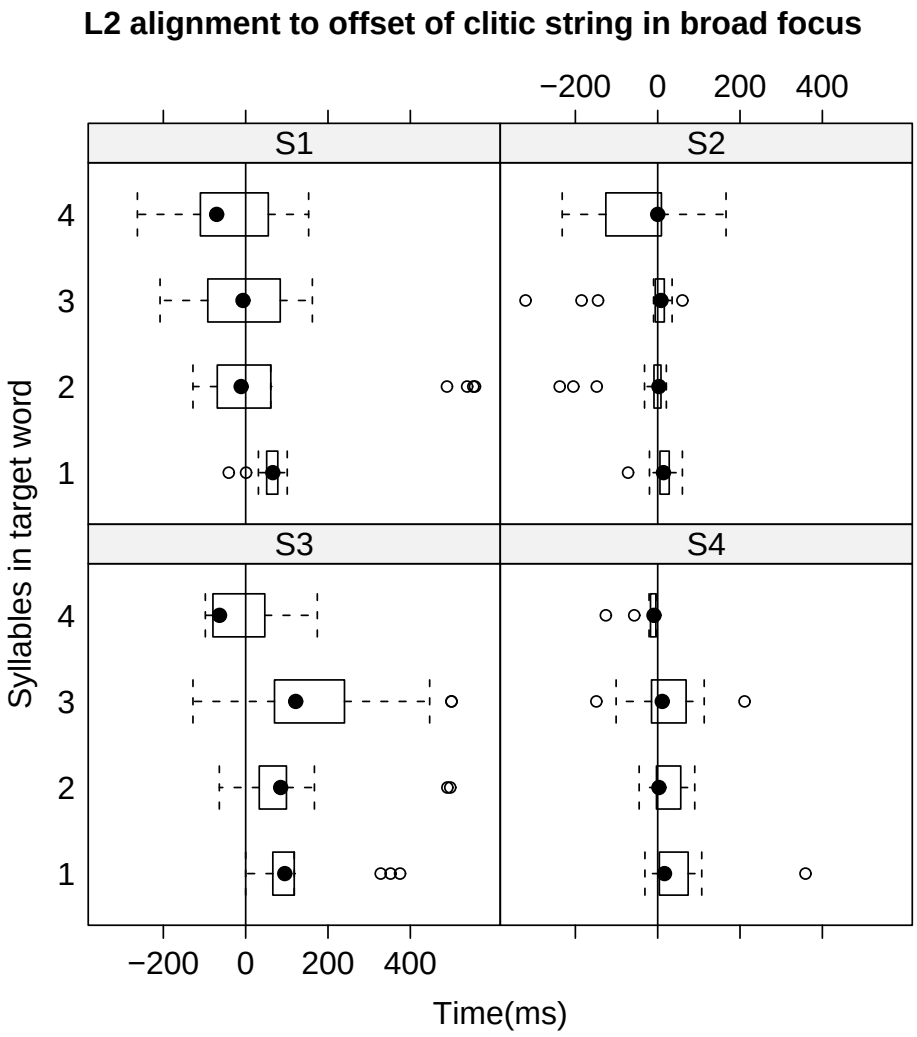


Figure 3.4: Alignment of L2 to offset of clitic string in broad focus across word lengths for all speakers. The vertical line (x=0) marks the point of alignment, the offset of the clitic string.

noninitial stressed syllable in the verb, e.g. *nasa'mario*, which skewed L2 alignment to the right.

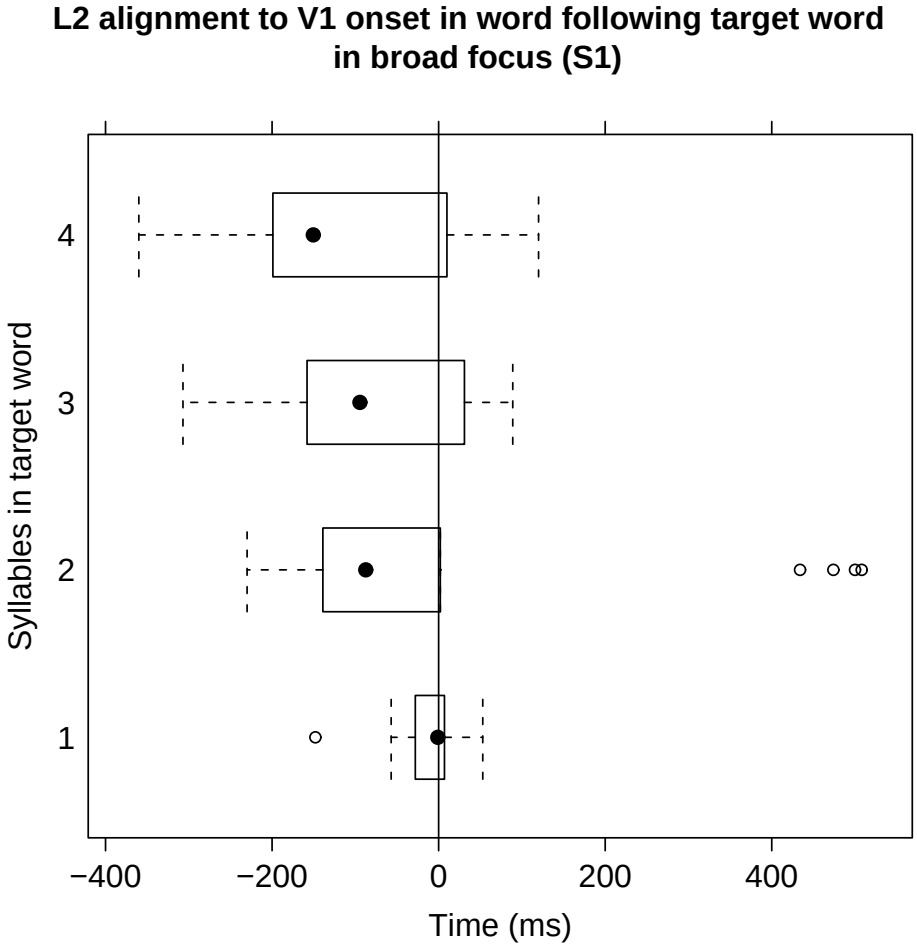


Figure 3.5: Alignment of L2 to onset of first vowel in word following target word in broad focus across word lengths for S1. The vertical line (x=0) marks the point of alignment, the onset of the first vowel in the word following the target word. For S1, this is an alignment target only for 1 syllable words.

Correlation analyses support "target word+clitic string" duration or "target word" duration as a main contributor to the variance in the alignment of L2, as shown in the scatterplot and Spearman's rank correlation coefficients for "target word+clitic string" and "target word" duration in Figure 3.2.1.2. The outliers in the upper-left quadrant

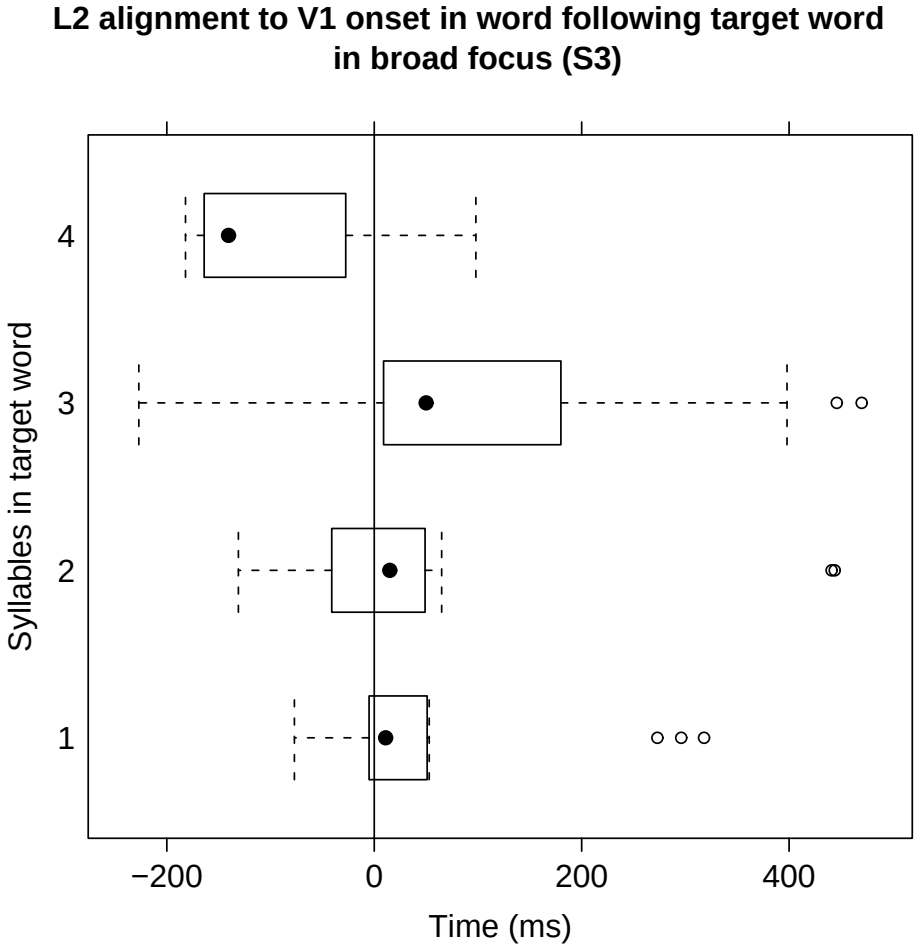


Figure 3.6: Alignment of L2 to onset of first vowel in word following target word in broad focus across word lengths for S3. The vertical line (x=0) marks the point of alignment, the onset of the first vowel in the word following the target word.

for S1 and S3 correspond to L2 targets that were aligned to nonintial stressed syllables in the verb following the target word.

The scatterplot and coefficients for target word duration alone, not including the clitic string, are similar. This suggests that the duration of the clitic string had low variability, and indeed, the duration of the clitic string had a mean and standard deviation of 223±35 ms across speakers in all conditions, and for only broad focus, 221±33 ms.

Correlation analyses also supported H1 alignment as a contributor to the variance in the alignment of L2 in broad focus, for S1 and S3, as shown in the scatterplot in Figure 3.2.1.2 and Spearman's rank correlation coefficients below, although H1 alignment explains much less of the variance than "target word+clitic string" duration or "target word" duration.

In summary, broad focus, L2 following the target word was generally aligned to the offset of the clitic string, as hypothesized, and its alignment was strongly correlated with "target word+clitic string" duration and "target word" duration for all speakers. H1, the pitch peak in the target word, followed the onset of the stressed syllable at a speaker-dependent fixed duration, typically in the posttonic syllable, even for 1-syllable words. Our results for broad focus provided a baseline for results in narrow focus, discussed in the following section, Section 3.2.2.

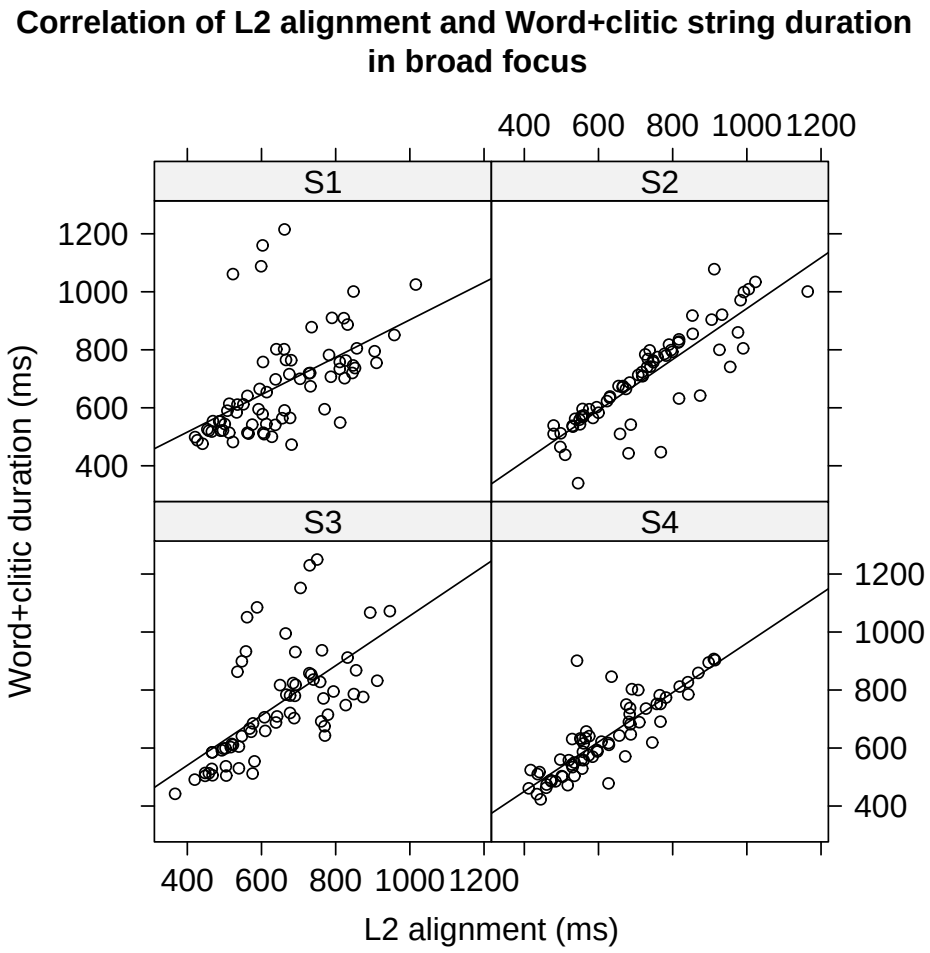


Figure 3.7: Correlation of L2 and "target word+clitic string" duration in broad focus for all speakers. The linear regression best-fit lines are shown for each speaker. Spearman's rank correlation for all speakers corresponded to a p-value < 2.2e-16, and were, for S1-S4, respectively, ρ = 0.65, 0.88, 0.70, 0.86. These coefficients for L2 and "target word" duration were ρ = 0.67, 0.84, 0.65, 0.87.

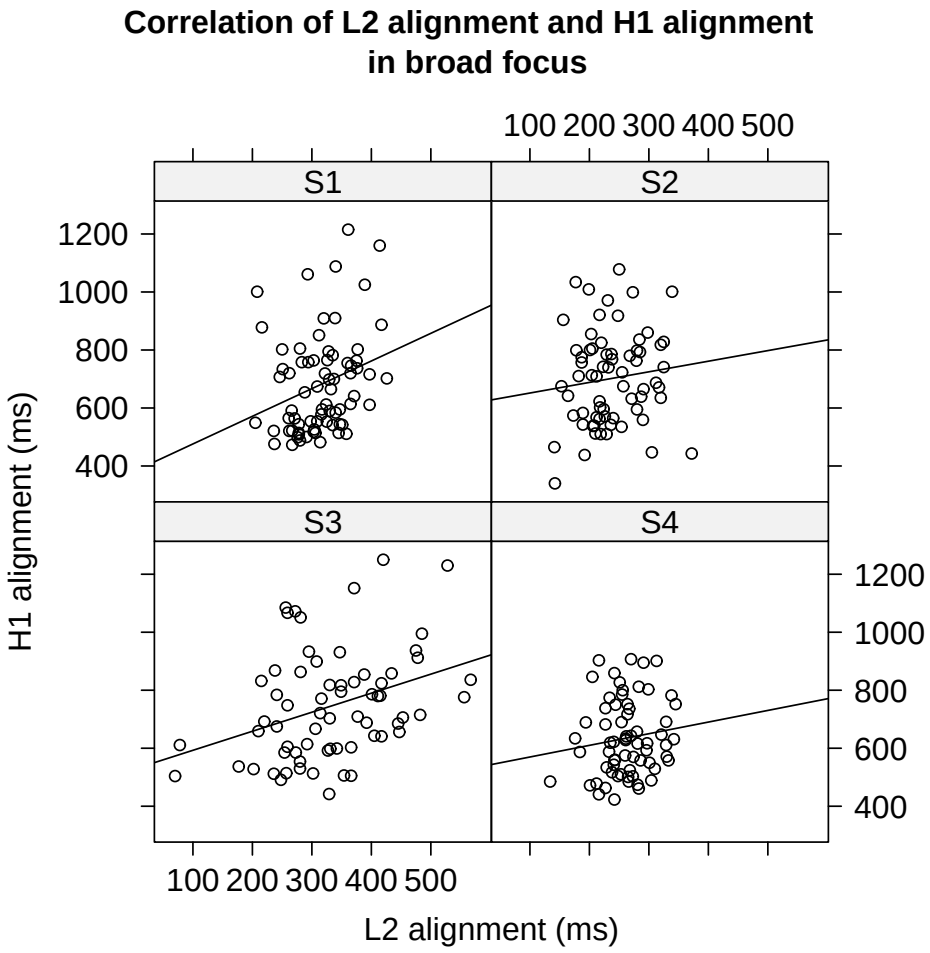


Figure 3.8: Correlation of L2 and H1 alignment in broad focus for all speakers. The linear regression best-fit lines are shown for each speaker. Spearman's rank correlation coefficients for S1-S4, respectively, were ρ = 0.31, p = 9.3e-3 (S1); ρ = 0.12, p = 0.35, n.s. (S2); ρ = 0.35, p = 4.4e-3 (S3); ρ = 0.12, p = 0.32, n.s. (S4).

3.2.2 Narrow focus

In narrow focus, our main interest was understanding the alignment of L2: Experiment 1 suggested that perhaps it was not a boundary tone aligned to the right edge of the focused domain. Below, we discuss H1 alignment in Section 3.2.2.1, since it could be relevant for L2 alignment, and then L2 alignment in Section 3.2.2.2.

3.2.2.1 H1 alignment

Alignment of the H1 peak in narrow focus was to a fixed duration after the onset of the stressed vowel, as shown in Figure 3.2.2.1. Alignment of H1 to the onset of the target word or the offset of the stressed syllable was unsupported because it was unable to account for variance in alignment across word lengths. In particular, alignment of H1 to the offset of the stressed syllable could not account for H1 alignment in 1-syllable words as H1 was aligned before the end of the target word, i.e. before the offset of the stressed syllable, yet H1 alignment for longer words was generally to posttonic syllables.

A one-way repeated measures ANOVAs with WORD LENGTH as the fixed factor for the dependent variable H1 alignment with respect to the onset of the stressed vowel showed a main effect of WORD LENGTH for S3. However, posthoc tests found no significant differences for this speakers. Results from the ANOVA and means and standard deviations are given in Table 3.2.2.1.

Correlation analyses supported duration from H1 to the onset of the stressed syllable as a main contributor to the variance in the alignment of H1 in narrow focus for all speakers, as shown in the scatterplot and Spearman's rank correlation coefficients for target word duration in Figure 3.2.2.1.

In summary, we found that the H1 peak in the target word in narrow focus was

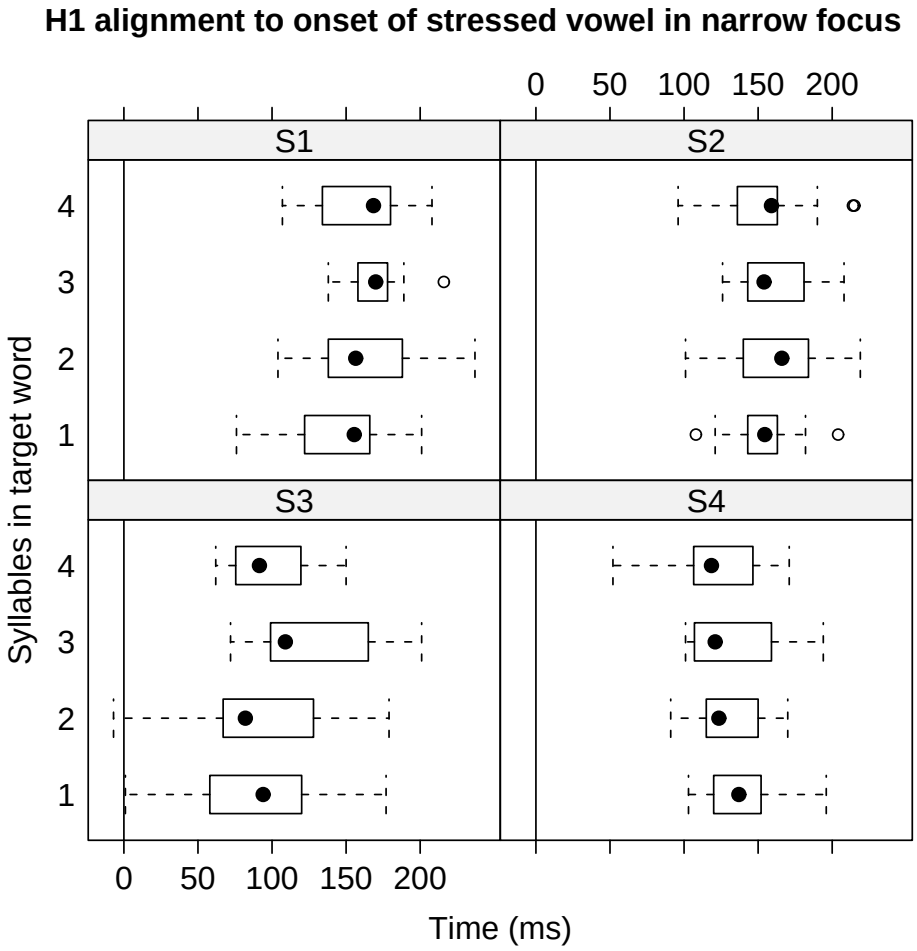


Figure 3.9: Alignment of H1 to the onset of stressed vowel in narrow focus across word lengths for all speakers. The vertical line (x=0) marks the point of alignment, the onset of the stressed vowel.

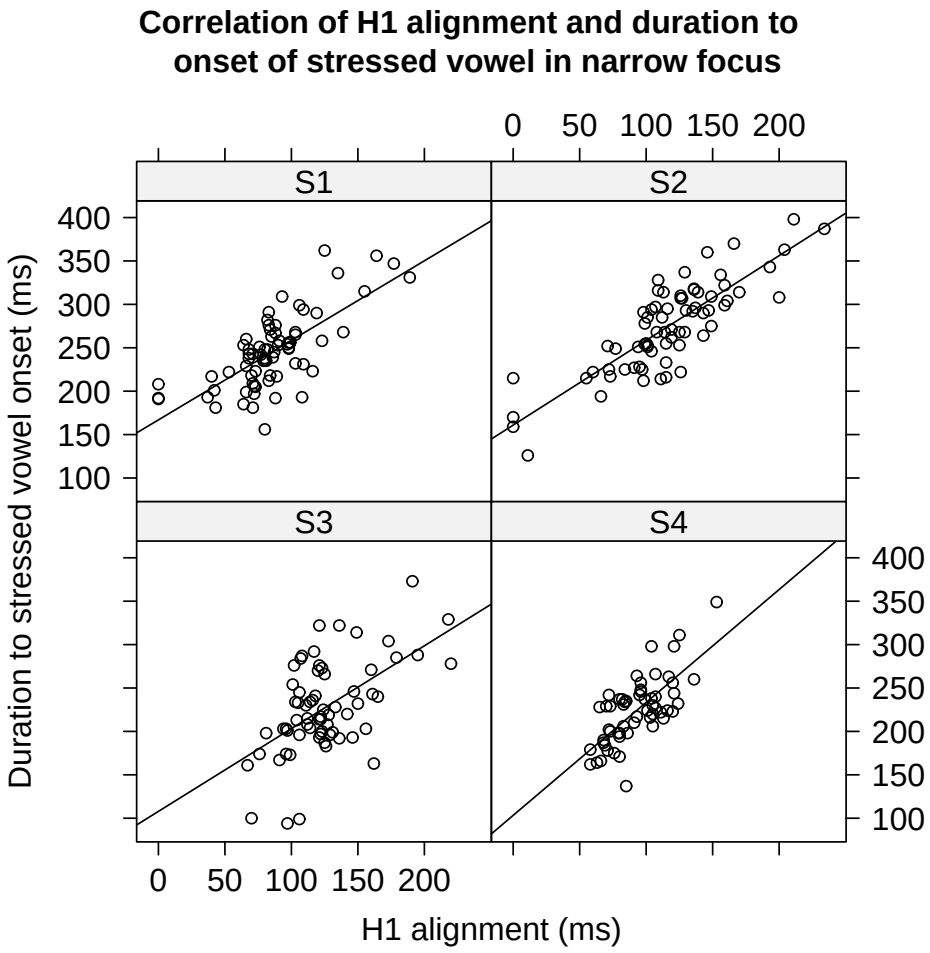


Figure 3.10: Correlation of H1 and duration to onset of stressed vowel in target word in narrow focus for all speakers. The linear regression best-fit lines are shown for each speaker. Spearman's rank correlation coefficients for for S1-S4, respectively, were ρ = 0.67, p < 2.2e-16 (S1); ρ = 0.80, p < 2.2e-16 (S2); ρ = 0.44, p = 2.8e-4 (S3); ρ = 0.66, p = 6.8e-8 (S4).

Speaker	WORD LENGTH H1- V1 onset	Mean and S.D. (ms)
S1	F(3,68)=2.21, p = 0.09, n.s.	160 $\pm$ 30
S2	F(3,67)=0.36, p = 0.78, n.s.	158 $\pm$ 28
S3	F(3,62)=3.04, p = 0.04	102 $\pm$ 44
S4	F(3,62)=1.05, p = 0.38, n.s.	131 $\pm$ 28

Table 3.5: ANOVA results for H1 alignment to the onset of the stressed vowel in the target word in narrow focus with WORD LENGTH as the fixed factor for S1, S2, S3, and S4 and mean and standard deviations for this duration. S3 showed a main effect for WORD LENGTH, but posthoc tests found no significant differences. The mean and standard deviation for all speakers was 139 $\pm$ 41 ms.

aligned at a fixed duration after the onset of the stressed vowel in the target word.

3.2.2.2 L2 alignment

Based on results on L2 alignment from Smiljanic (2004), we expected L2 in narrow focus to be aligned to the offset of the target word, at the boundary between the target word and the clitic string. However, this was not the case, as shown in Figure 3.2.2.2. From the plots, it is clear that L2 alignment with respect to the target word offset is dependent on the target word length, which would not be the case if L2 was a word boundary tone at the right edge of the target word. While L2 for disyllabic words, which had the same word length as target words from Smiljanic (2004), fell close to or at the offset of the target word, this was not true words of other lengths: L2 for 4-syllable words fell well before the target word offset, whereas L2 for 1-syllable words fell after the target word offset.

Since L2 in narrow focus is not a boundary tone, we investigated other possibilities for its realization falling at a fixed duration after: (1) the onset of the target word/stressed syllable,[2] (2) the H1 peak, (3) the onset/offset of the stressed vowel. Alignment to the offset of the stressed syllable was unsupported because it was incon-

[2]The onset of the target word was identical to the onset of the stressed syllable for our main stimuli set since all words were initially stressed.

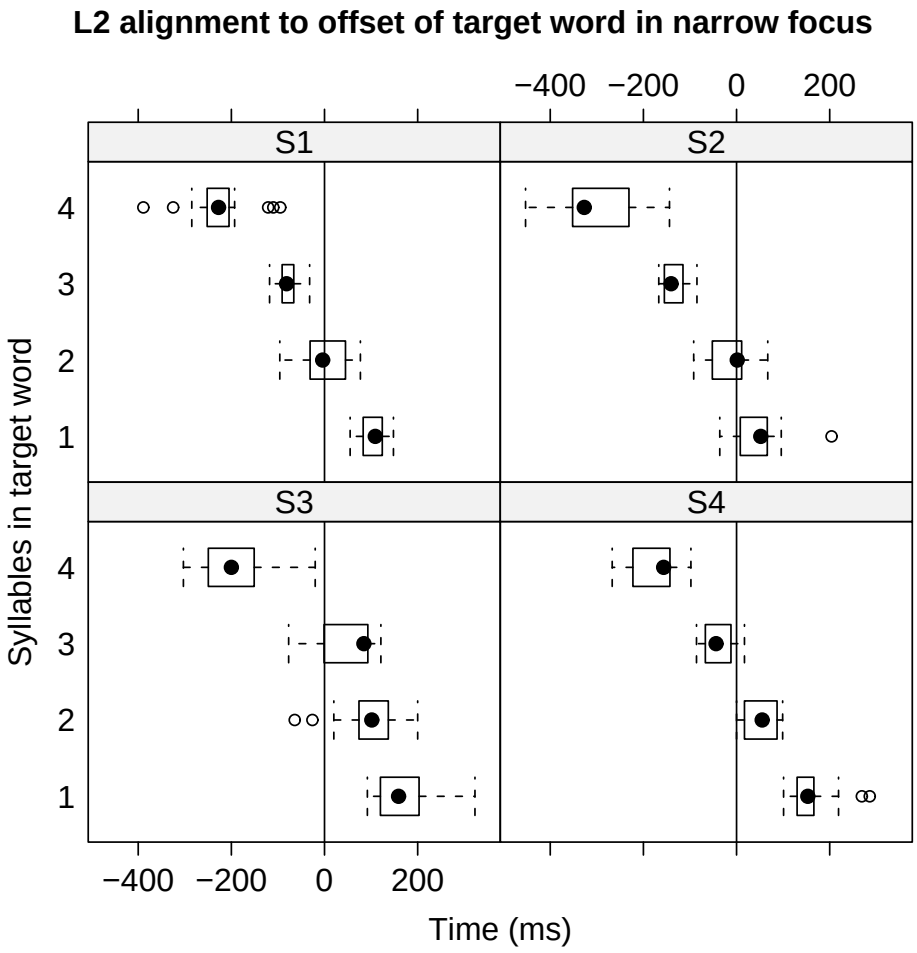


Figure 3.11: Alignment of L2 to offset of target word in narrow focus across word lengths for all speakers. The vertical line (x=0) marks the point of alignment, the offset of the target word. For disyllabic words, the word length used in target words for Smiljanic 2004, alignment is close to or at the target word offset for all speakers.

sistent across word lengths. However, alignment to the onset of the target word (also the onset of the stressed syllable), the H1 peak, or to the onset of the stressed vowel were all plausible based on statistical analyses. One-way repeated measures ANOVAs with WORD LENGTH as the fixed factor for the dependent variable H1 alignment with respect to these different landmarks showed a main effect of WORD LENGTH for all three for some speakers. However, posthoc tests found no significant differences for alignment to H1 or to the onset of the stressed vowel, although they did show significant differences for alignment to the onset of the target word between 3-syllable and 1- and 2-syllable words for S3 and between 1-syllable and 4-syllable words for S2. Thus, alignment of L2 to either H1 or the onset of the stressed vowel better accounts for the variance in the data than alignment to the onset of the target word/stressed syllable. We can also rule out alignment to the target word onset based on evidence from noninitially stressed words (Section 3.2.3), which shows that shifts in the position of stress in the target word cause concomitant shifts in L2 alignment.

L2 alignment to H1 and to the onset of the stressed vowel is shown in Figure 3.2.2.2 and Figure 3.2.2.2, respectively, and in Table 3.2.2.2 are the results from the one-way ANOVA for L2 alignment in narrow focus to H1 and to the onset of the stressed vowel in the target word.

Speaker	WORD LENGTH, L2 - H1	WORD LENGTH, L2 - V1 onset
S1	F(3,68)=1.27, p = 0.29, n.s.	F(3,68)=2.20, p = 0.09, n.s.
S2	F(3,67)=5.34, p = 2.3e-3	F(3,67)=2.05, p = 0.12, n.s.
S3	F(3,62)=2.01, p = 0.12, n.s.	F(3,62)=4.31, p = 7.9e-3
S4	F(3,62)=0.62, p = 0.60, n.s.	F(3,62)=1.18, p = 0.32, n.s.

Table 3.6: ANOVA results for L2 alignment with respect to H1 and the onset of the stressed vowel in the target word in narrow focus with WORD LENGTH as the fixed factor for S1, S2, S3, and S4. S2 and S3 showed main effects for WORD LENGTH, but posthoc tests found no significant differences.

The fixed duration from the H1 peak to the following L2 and from the onset of the

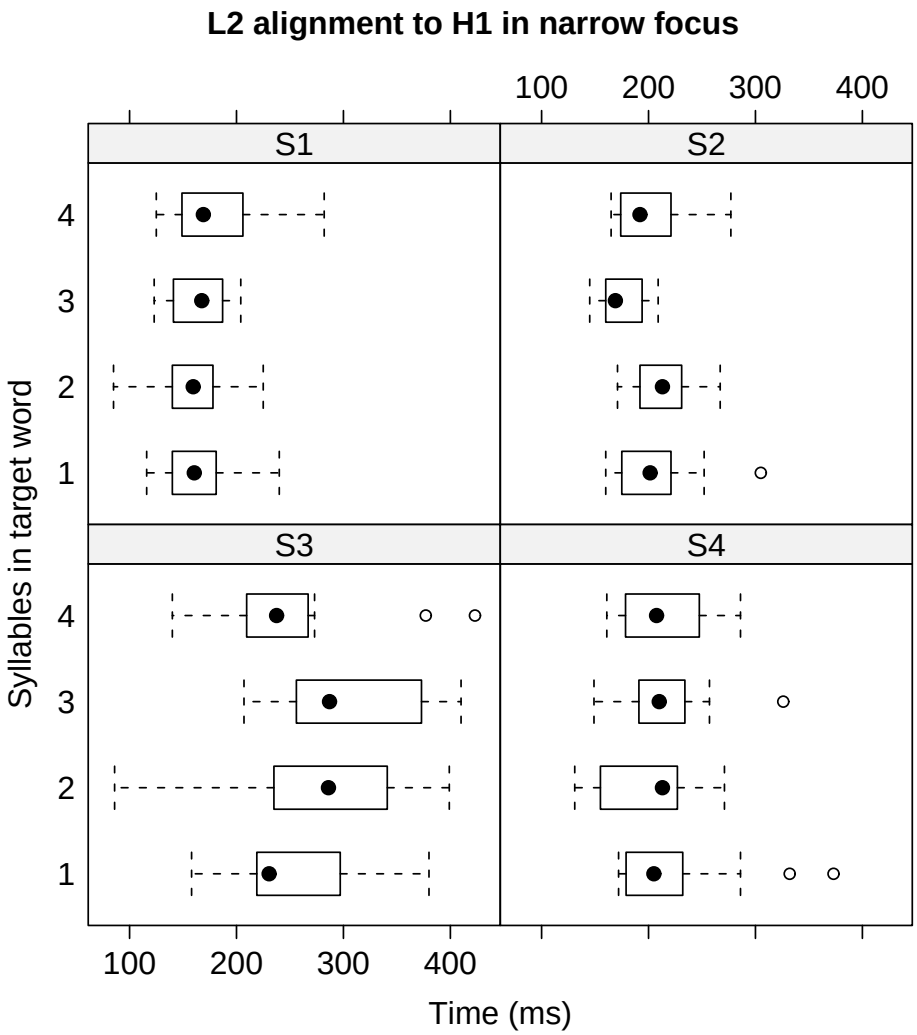


Figure 3.12: Time elapsed to L2 from H1 in narrow focus across word lengths for all speakers.

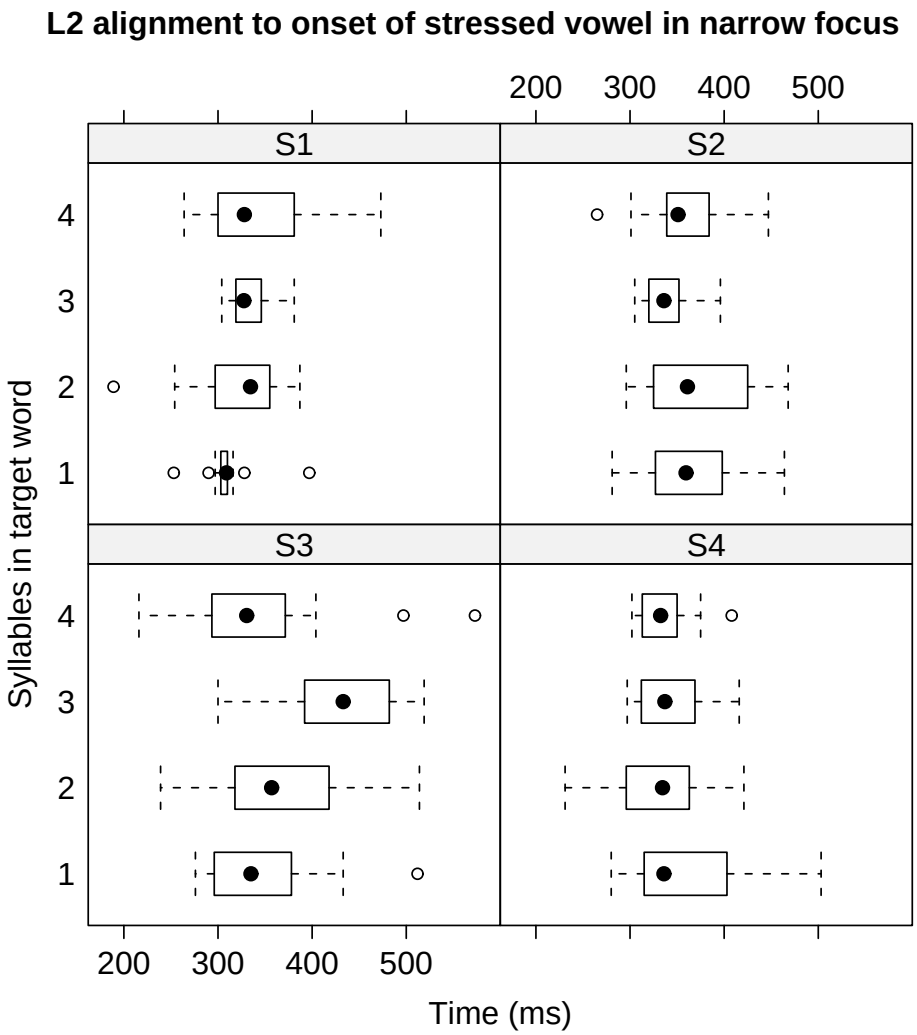


Figure 3.13: Time elapsed to L2 from onset of stressed vowel in narrow focus across word lengths for all speakers.

stressed vowel in the target word to L2 is shown in Table 3.2.2.2 below. The tightness of the distribution of the means is similar between the time from L2 to H1 and the onset of the stressed vowel, as is the magnitude of the standard deviations. This suggests that both the H1 peak and the onset of the stressed vowel are equally strong candidates for being anchor points for alignment of the L2 target.

Speaker	Time to L2 after H1 peak (ms)	Time to L2 after V1 onset (ms)
S1	168 ± 34	327 ± 43
S2	198 ± 32	357 ± 44
S3	274 ± 73	375 ± 82
S4	212 ± 45	342 ± 51
All	211 ± 62	350 ± 60

Table 3.7: Mean and standard deviation of time to L2 after H1 and after the onset of the stressed vowel in the target word in narrow focus for all speakers.

Correlation analyses support some contribution of target word duration to the variance in the alignment of L2 in narrow focus for S1 and S3, as shown in the scatterplot and Spearman's rank correlation coefficients for Word (target word) duration in Figure 3.2.2.2. However, the main contributors to the variance in L2 alignment for all speakers is the duration from the onset of the target word to H1, as shown in Figure 3.2.2.2 and duration to the onset of the stressed vowel V1 in the target word, in Figure 3.2.2.2.

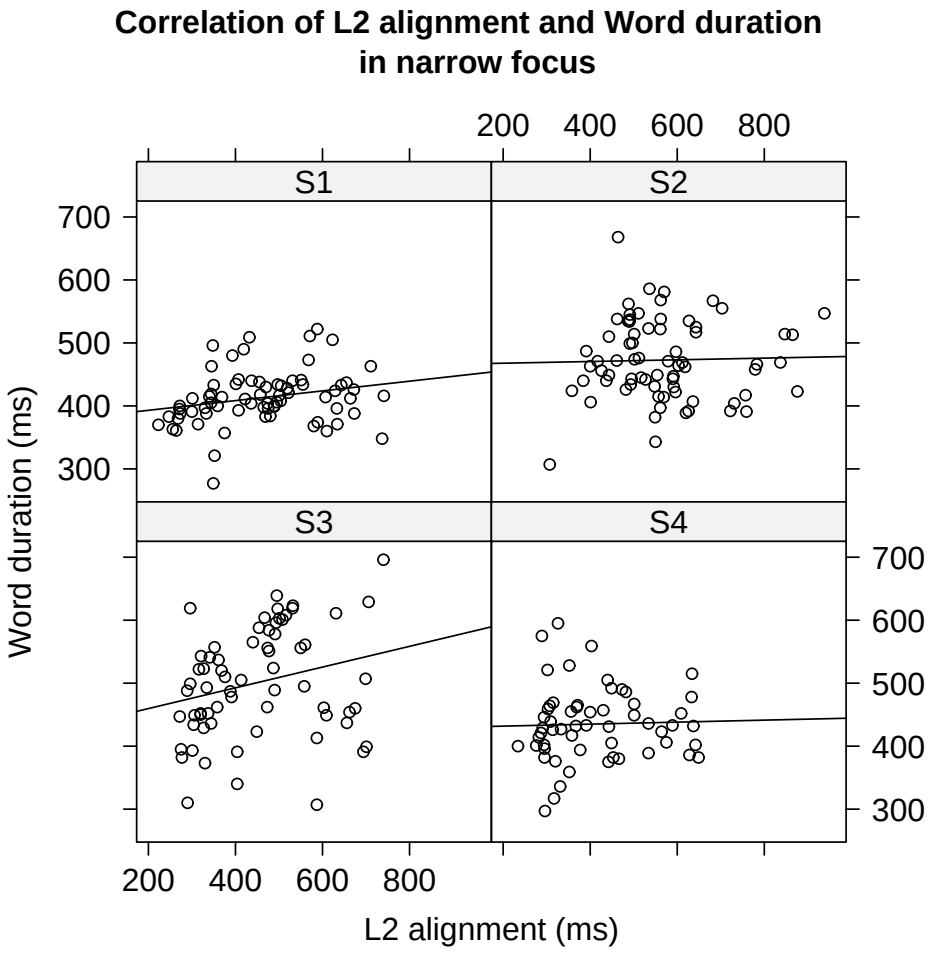


Figure 3.14: Correlation of L2 and Word (target word) duration in narrow focus for all speakers. The linear regression best-fit lines are shown for each speaker. Spearman's rank correlation coefficients for for S1-S4, respectively, were ρ = 0.27, p = 0.02 (S1); ρ = -0.049, p = 0.69, n.s. (S2); ρ = 0.30, p = 0.013 (S3); ρ = 0.08, p = 0.54, n.s. (S4).

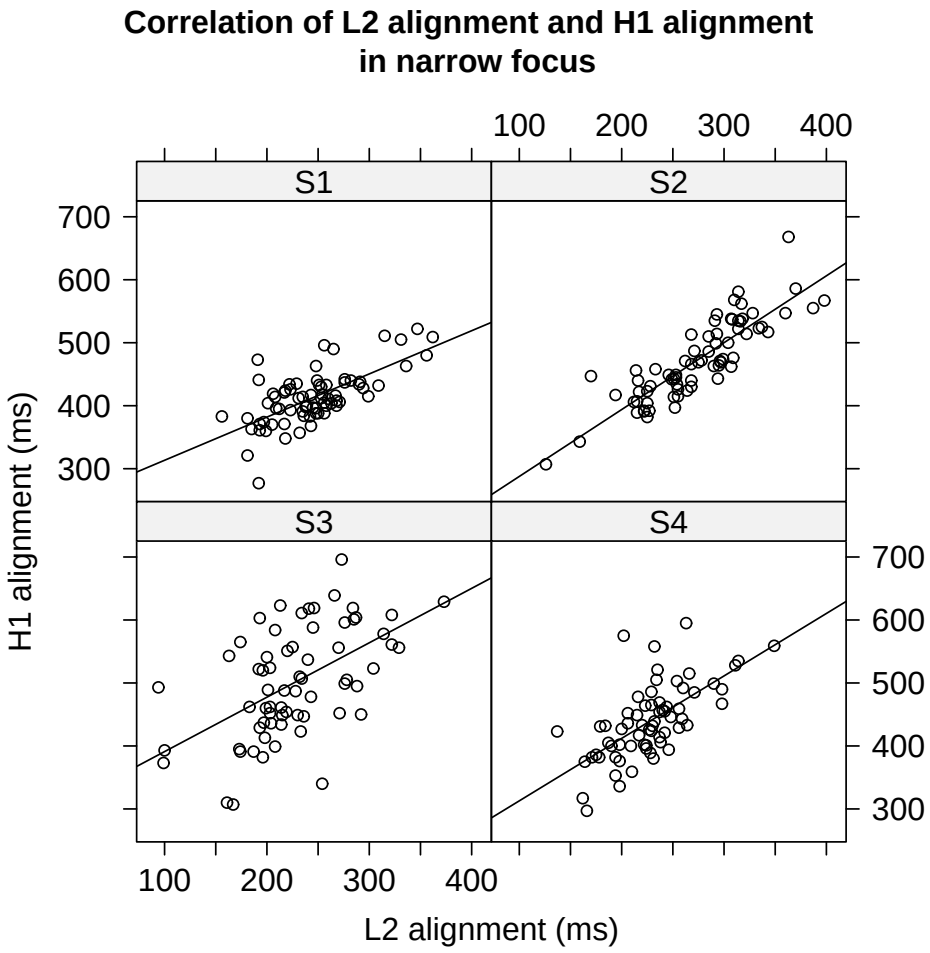


Figure 3.15: Correlation of L2 and H1 alignment for all speakers. (H1 alignment is measured to the onset of the target word.) The linear regression best-fit lines are shown for each speaker. Spearman's rank correlation coefficients for for S1-S4, respectively, were ρ = 0.61, p = 3.1e-8 (S1); ρ = 0.88, p < 2.2e-16 (S2); ρ = 0.53, p = 5.7e-6 (S3); ρ = 0.67, p < 2.2e-16, (S4).

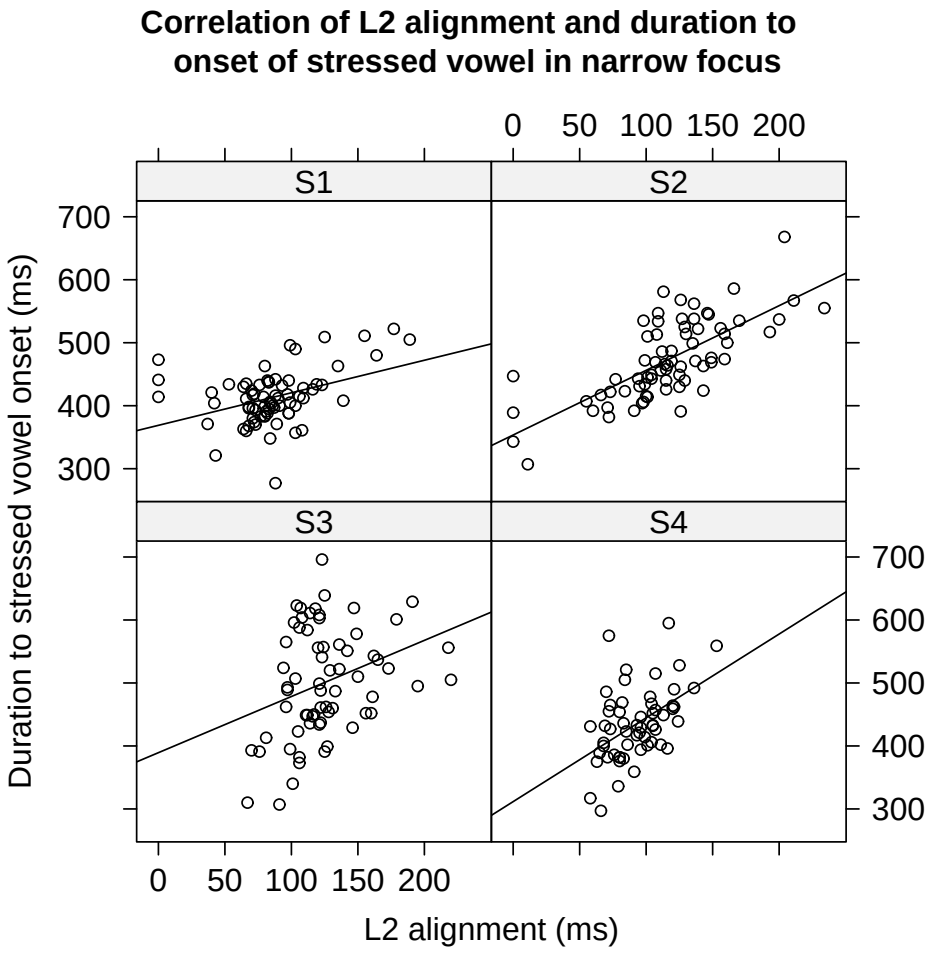


Figure 3.16: Correlation of L2 and duration to onset of stressed vowel in target word for all speakers. The linear regression best-fit lines are shown for each speaker. Spearman's rank correlation coefficients for for S1-S4, respectively, were ρ = 0.61, p = 2.3e-8 (S1); ρ = 0.88, p < 2.2e-16 (S2); ρ = 0.54, p = 5.2e-6 (S3); ρ = 0.68, p < 2.2e-16 (S4).

In summary, L2 in narrow focus could be equally accurately described as being aligned to a fixed duration following H1, the pitch peak in the focused target word, or as being aligned to a fixed duration following the onset of the stressed vowel in the target word. This suggests that L2 is not a boundary tone and L2 is not aligned to the right edge of the focal domain, contrary to predictions based on Godjevac (2000a, 2005), Radanović-Kocić (1988, 1996), Smiljanic (2004).

Because we found that the H1 peak in the target word in narrow focus was aligned at a fixed duration after the onset of the stressed vowel in the target word, it is clear why alignment of L2 to either H1 or the onset of the stressed vowel is similarly suitable for explaining the variance in the data for L2 alignment. The alignment of all three tonal/segmental landmarks, H1, L2, and the onset of the stressed vowel in the target word is tied together.

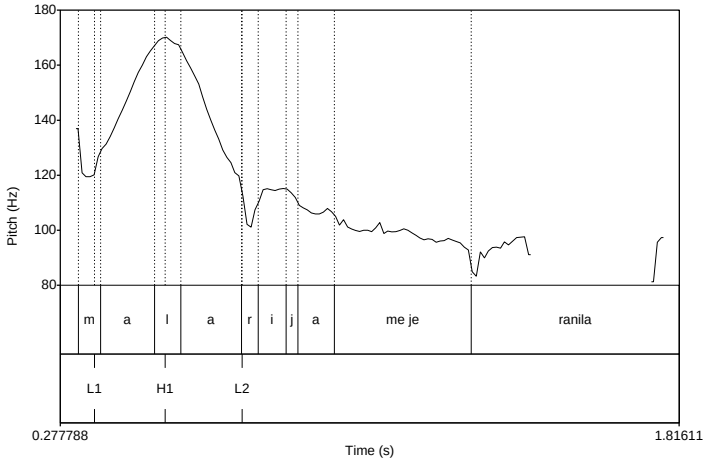
3.2.3 L2 alignment and noninitially stressed words

The main stimuli set for Experiment 2 consisted of initially stressed target words to maximize the distance between the stressed syllable and the end of the word. This allowed us the luxury of a sufficient expanse of time in the signal to explore L2 alignment and to distinguish between L2 alignment to end of the word and L2 alignment to some other landmark prior to the end of the word.

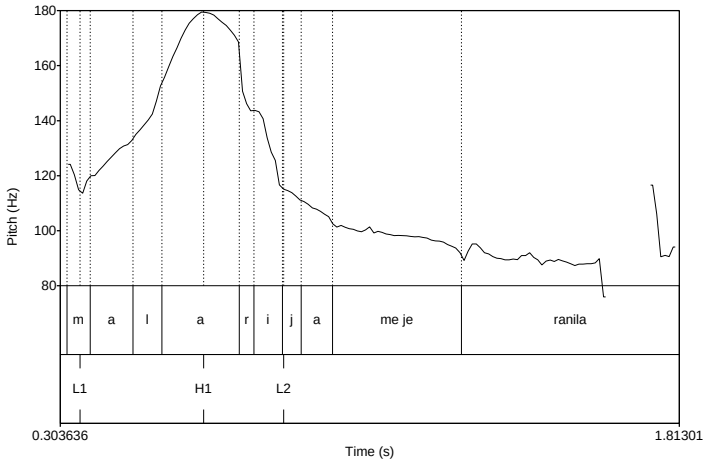
Another way we varied a small portion of the stimuli for Experiment 2 was in the position of stress in the target word. This allowed us to preliminarily investigate if L2 would also shift with shifts in the position of stress; we would not expect this to be the case if L2 was aligned to the word boundary. We could also discriminate between H1 being aligned to the onset of the target word and the onset of the stressed syllable, which was impossible to do with initially stressed words.

Results showed that for all speakers, L2 shifted later with noninitial compared to

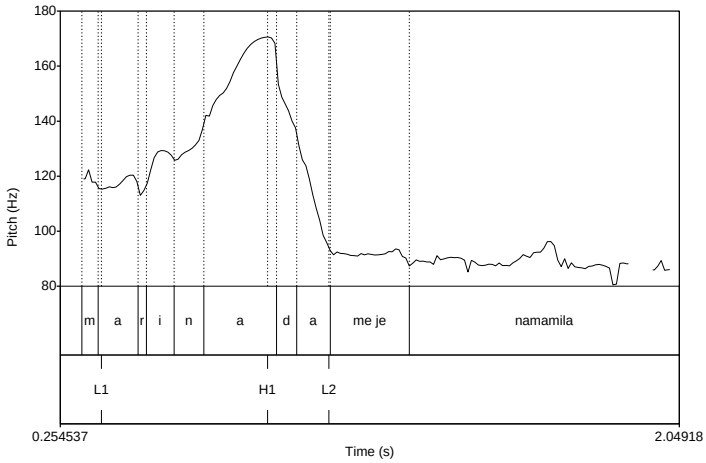
initial stress. For instance, in Figure 3.2.3, H1 and L2 shifted later as the stressed syllable moved from the 1st (*ˈmalarija*) to the 2nd (*maˈlarija*) to the 3rd syllable (*mariˈnada*) of the target word. This is further supporting evidence that L2, the focal phrase accent in narrow focus on the target word, is not aligned to the end of the target word. Rather, L2 is sensitive to the location of the stressed syllable in the target word, as previously suggested by the high correlation between L2 alignment and H1 alignment, cf. Figure 3.2.2.2 (recall that H1 itself was found to occur a fixed duration after the onset of the stressed vowel in narrow focus, cf. Section 3.2.2.1) and between L2 alignment and the duration to onset of stressed vowel, cf. Figure 3.2.2.2.



(a) *ˈmalarija*, 1st syllable stress



(b) *maˈlarija* , 2nd syllable stress



(c) *mariˈnada*, 3rd syllable stress

Figure 3.17: Alignment of H1 and L2 shifts later as position of stress in 4 syllable words shifts from the 1st to 2nd to 3rd syllable.

3.3 Summary of Experiment 2

In summary, we confirmed by varying target word lengths in Experiment 2 that the low tonal target L2 following the narrowly focused target word was not right-aligned to the edge of the focal domain, as we had originally hypothesized based on Radanović-Kocić (1988, 1996), Godjevac (2000b, 2005), and Smiljanic (2004). In fact, L2 is not a boundary tone nor a phrase accent aligned to the right edge of the focal domain, but a focal phrase accent that follows H1, the pitch peak in the focused target word, as well as the onset of the stressed vowel in the target word, at a speaker-dependent fixed duration. H1 itself in narrow focus follows the onset of the stressed vowel in the target word at a fixed duration, so the alignment of H1, L2, and the onset of the stressed vowel in the target word is all tied together. We discuss an alternative analysis, that of L2 as a tone in a pitch accent on the target word, in Section 4.2 below.

In broad focus, L2 generally fell at the boundary between the target word and following clitic string, as hypothesized, and H1 was aligned at a fixed duration from the onset of the stressed syllable.

CHAPTER 4

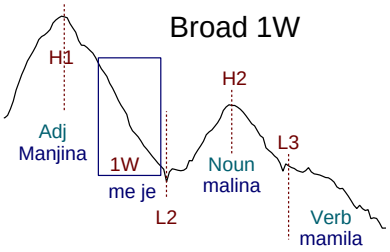
General discussion and conclusions

In this chapter, we summarize and discuss the findings from our two studies. In Section 4.1, we summarize our results on the prosodic realization of narrow focus, and in Section 4.2 we discuss the implications of our findings on the tonal alignment of the low tone following the focused element and durations in the adjective for accounts of 2P clitic placement. In Section 4.3, we discuss the interaction of the alternation in 2P clitic placement and tonal alignment. Finally, Section 4.4 concludes the thesis.

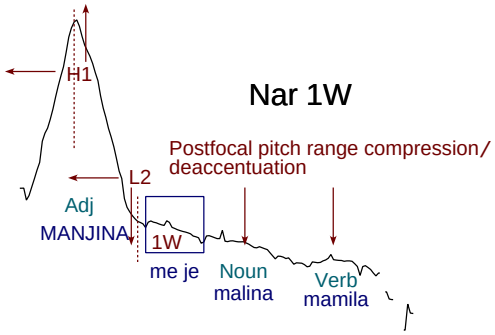
4.1 The realization of narrow focus

In Experiments 1 and 2, we were able to replicate many of Smiljanic (2004)'s results for the prosodic realization of narrow focus. We found that, in narrow focus on the adjective compared to broad focus, speakers lengthened the stressed vowel in the focused adjective, retracted the pitch peak H1 in the adjective and the low tonal target L2 following the adjective, and, (with normalization), raised the pitch peak H1, and lowered the low tonal target L2. In addition, following L2, speakers typically showed postfocal pitch range compression/deaccentuation. These results are schematized in Figure 4.1.

However, in Experiments 1 and 2, we also found differences from Smiljanic (2004) in the alignment of the retracted tonal targets H1 and L2 in narrow focus on the adjective.



(a) Broad focus, 1W placement



(b) Narrow focus, 1W placement

Figure 4.1: Schematic for the prosodic realization of narrow focus for 1W placement compared to 1W placement in broad focus. H1 is retracted and raised, L2 is retracted and lowered, and postfocal pitch range compression/deaccentuation occurs following L2.

Experiment 1 found that H1 generally did not retract onto the tonic syllable in the focused adjective and Experiment 2 showed that H1 was aligned at a fixed duration after the onset of the stressed vowel in narrow focus. In contrast, Smiljanic (2004) found that, for Zagreb Croatian speakers, in disyllabic, initially stressed target words, H1 shifted from the posttonic syllable in broad focus to the tonic syllable in narrow focus. Smiljanic therefore proposed that Zagreb speakers have pragmatic rather than lexical pitch accents: L*+H in broad focus and L+H* in narrow focus. Although data from Experiment 2 in Figure 4.1 shows that H1 in narrow focus was sometimes aligned onto the tonic syllable, this was not consistent across all word lengths for all speakers. Moreover, Figure 4.1 shows that it is for shorter words, up to 2 syllables, that H1 seems to be aligned onto the tonic syllables, but for longer words, H1 alignment shifts later. Thus, our results are not consistent with a strict timing of L+H* pragmatic pitch accent in narrow focus with the H aligned onto the tonic syllable for Zagreb Croatian speakers. Nevertheless, our speakers showed the same alignment contrast between narrow and broad focus for the pitch accents on the focused word reported by Smiljanic (2004): the pitch peak was retracted in narrow focus.

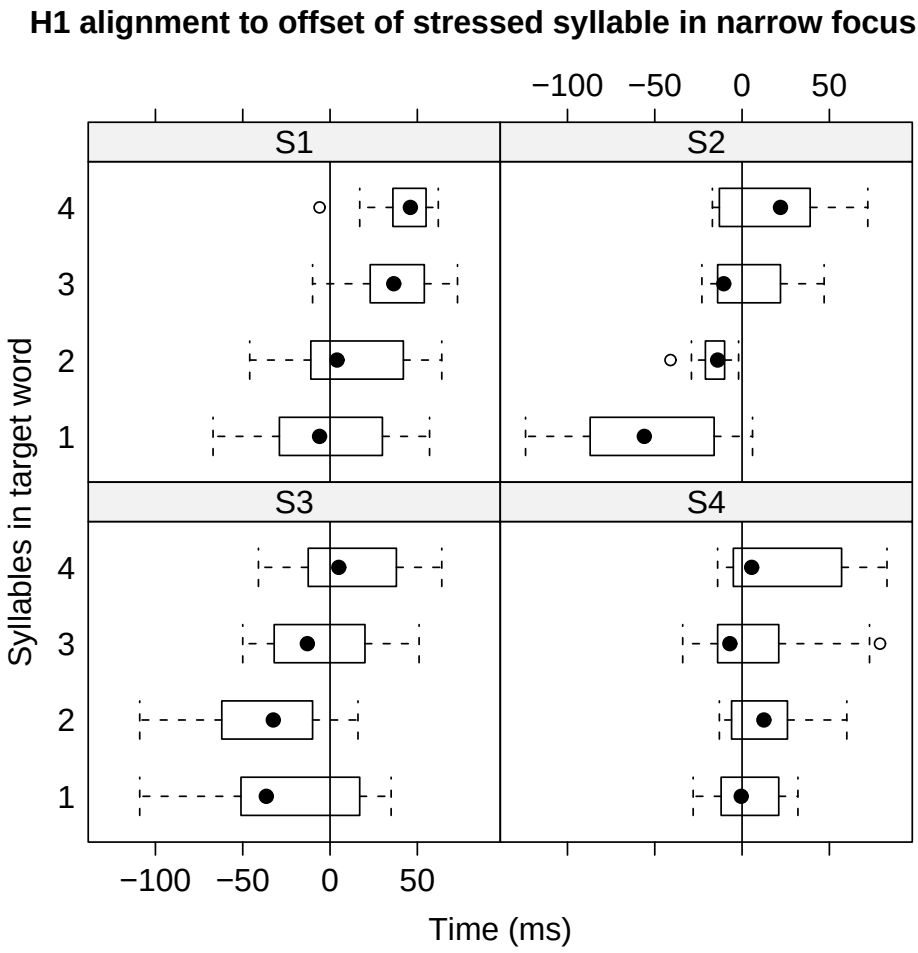


Figure 4.2: Alignment of H1 to the offset of the stressed syllable in narrow focus across word lengths for all speakers in Experiment 2. The vertical line (x=0) marks the point of alignment, the offset of the stressed syllable. H1 is not always aligned to the tonic syllable.

4.2 Tonal alignment of L2, adjective durations, and 1W placement

Moreover, while Radanović-Kocić (1988, 1996), Godjevac (2000a, 200b, 2005) and Smiljanic (2004) proposed that L2 in narrow focus was aligned to the right edge of the focused word, preceding the clitic string, we found that this was not the case: L2 alignment was in fact not dependent on word length. (For two syllable words, which were the target word length used in Smiljanic 2004, L2 did occur near the word boundary for our speakers.) Rather, Experiment 2 showed that L2 alignment in narrow focus was strongly linearly correlated with H1 alignment and the onset of the stressed vowel. Both Smiljanic (2004) and Godjevac (2005) suggested that L2 could be a phrase accent, and we propose that L2 is indeed a focal phrase accent which trails the H1 peak and onset of the stressed vowel at a fixed duration rather than being aligned to the right edge of the focused word.

An alternative analysis of the tight alignment between L2, H1, and the onset of the stressed vowel is that L2 is part of a pitch accent on the target word. While it was outside of the scope of our study to investigate the alignment of L1, the low tone at the beginning of the target word, Smiljanic (2004) proposed bitonal pitch accents in Zagreb Croatian, L*+H in broad focus and L+H* in narrow focus. Since in focus, L2, the low tone at the end of the target word, is also tied to the alignment of the H, then a possibility is that in narrow focus, a word has a tritonal pitch accent, for instance, L+H*+L, (without commitment to which tones are starred). However, tritonal pitch accents are rarely proposed in the autosegmental-metrical theory of intonation (Grice 1995, Libman 2008, de Moraes 2007), so we call L2 a focal phrase accent to be in line with the analyses from Smiljanic and Godjevac. Revisions of intonational theory and further intonational research in BCS may provide evidence to prefer one analysis over the other.

In any case, because our experiments show that L2 is in fact not a right aligned

boundary tone but a focal phrase accent trailing the pitch peak and onset of the stressed vowel in the focused word at a fixed duration, regardless of clitic placement, we have no evidence for Radanović-Kućić's prosodic break marking the right edge of the focal domain; we also cannot provide prosodic evidence for a split construction account of 1W clitic placement, assuming a (naive) direct mapping from syntactic to prosodic boundaries. These negative findings are also supported by our durational studies in the adjective, when we compared the durations of the last segment, last syllable, and word for the adjective across clitic placements and focus conditions. We were unable to find any consistent trends of phrase-final lengthening in the adjective across speakers to support a prosodic break after the adjective in 1W placement compared to 1C placement, or even in narrow compared to broad focus.

4.3 The effect of clitic placement on tonal alignment

While our hypothesis regarding L2 alignment was incorrect, our hypothesis that 1C and 1W clitic placements would have different prosodic realizations was partially borne out.

In narrow focus, we hypothesized that we might observe a tradeoff in focal marking from prosody in syntax. Since 1W clitic placement word order alone could already mark focus, we hypothesized that in narrow focus, 1W placement might show less or no prosodic marking of focus, compared to 1C placement. If this were the case, then our Croatian speakers would be behaving like Spanish speakers, who use either word order or intonational cues, but not both simultaneously, to mark narrow focus (Face and D'Imperio 2005). However, if 1W showed no difference in prosodic marking of focus compared to 1C placement, then our Croatian speakers would be behaving like Italian speakers, who do use word order and intonation simultaneously to mark narrow focus (Face and D'Imperio 2005).

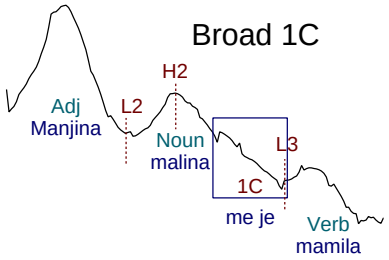
In fact, we found no differences in the prosodic realization of 1W and 1C placements in narrow focus. Regardless of clitic placement, the adjective peak H1 followed the onset of the stressed vowel at a fixed duration and L2 followed H1 at a fixed duration: H1 and L2 were globally retracted in narrow focus and insensitive to clitic placement. Thus, Zagreb Croatian speakers patterned like Italian speakers rather than Spanish speakers in using both intonation and word order cues to mark narrow focus (Face and D'Imperio 2005).

While we found no differences between prosodic realizations for 1C and 1W clitic placements in narrow focus, we did find that 1C and 1W clitic placements had different prosodic realizations in broad focus.

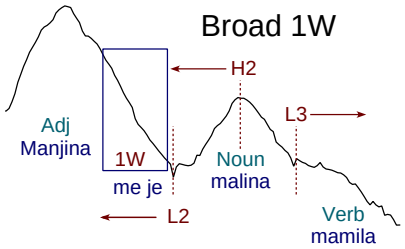
Clitic placement interacted with prosodic parameters in some ways that could be accounted for due to purely phonetic reasons. Vowel duration for the initial stressed vowel in the adjective was longer for 1C position for two speakers, S2 and S4. 1W placement could effectively lengthen the adjective by the presence of the clitic string following the adjective. Therefore, vowel duration could be shorter in 1W placement because the adjective in 1W has shorter segmental durations, as a longer word. In broad focus, the peak height of H2, in the noun, was lower for all speakers except S4 for 1W placement compared to 1C placement, and L2 was lower for all speakers. The lower F_0 can be explained due to the presence of phonetic material preceding the noun due to the clitic string, which causes more declination to occur before H2 and L2 in 1W than 1C placement.

But clitic placement also interacted with tonal alignment in ways that could not be accounted by purely phonetic reasons. For S1 and S4, the lack of a significant difference in broad focus between the peak height of H2 or the ratio of the peak heights of H1 and H2 for 1C and 1W clitic placements shows that H2 was higher for 1W placement than 1C placement, after taking declination into account. Moreover, in

broad focus, 1W placement showed, compared to 1C placement, earlier alignment of H2 (subject noun peak) with respect to the onset of the noun, earlier alignment of L2 (valley between adjective and subject noun) with respect to the onset of the subject noun, and later alignment of L3 (valley between subject DP and verb) with respect to the midpoint of the initial consonant in the verb, as schematized below in Figure4.3.



(a) Broad focus, 1C placement



(b) Broad focus, 1W placement

Figure 4.3: Schematic for earlier alignment of H2 and L2 and later alignment of L3 in 1W placement compared to 1C placement in broad focus. The arrows in the lower figure for 1W placement schematize that H2 and L2 for 1W were retracted relative to H2 and L2 for 1C and that L3 for 1W was later relative to L3 for 1C placement. H2 and L2 alignment were measured relative to the onset of the noun; L3 alignment was measured relative to the midpoint of the initial consonant in the verb.

These alignment facts could be explained with (1) a word length account, (2), an analysis of the clitic string as being in transition from enclitic to proclitic, and (3)

retraction of a pitch accent compared to 1C placement. We discuss the plausibility of each account below.

Word length account Because in 1C placement, the noun is effectively longer due to the clitic string following the noun, e.g. [[N]$_{PWd}$ **clitic**]$_{PWd}$, we could explain the earlier alignment of L2 and H2 in 1W placement because the noun is effectively shorter for 1W placement. If the noun is effectively shorter, then L2, if part of a L*+H pitch accent on the noun, and H2, if a trailing tone in a L*+H pitch accent on the noun (Smiljanic 2004), would have less time to be realized. However, if this were the case, we would also expect an earlier alignment of H1 for 1W placement: since the adjective would be followed by a clitic string in 1W placement and not 1C placement, the adjective would be effectively shorter for 1W placement , e.g. [[Adj]$_{PWd}$ **clitic**]$_{PWd}$. Yet, we did not observe any effect of clitic placement on H1 alignment in broad focus, so the word length account does not seem tenable.

Proclitic analysis account A major reason why L2 alignment occurred earlier for 1W placement in broad focus was because of tokens where L2 occurred in the clitic string, even before the onset of the noun, see Figure 2.3b for an example pitch track and Figure 2.3.4.2 for alignment data from all speakers. If L2 is a word boundary tone, as proposed by Godjevac (2000a, 2005), this could suggest that the clitic string in 1W placement, preceding the noun, could be considered the left edge of the noun and receive the word boundary tone, as has been suggested for proclitics (Godjevac 2000a). This analysis is also consistent with the earlier alignment of L3 in 1C placement, in which the clitic string follows the noun—in this case, the clitic string could act as the left edge of the following verb.

However, for speakers S2 and S3, L2 for 1W placement was generally aligned to the clitic string-noun boundary or later, see Figure 2.3.4.2, although these speakers

did have tokens where L2 occurred on the clitic string. For these speakers, L2 for 1C placement was generally aligned in the first vowel of the noun, and L2 for 1W placement earlier in the vowel or in the initial consonant of the noun rather than the clitic string; that is, for these speakers, L2 was retracted, but not onto the clitic string. An analysis that would account for the data for S2 and S3 as well could reference a general retraction of L2, rather than retraction of L2 to the clitic string at the left edge of the noun, or, it could be the case that speakers can optionally locate the left-aligned word boundary tone on a preceding 2P clitic string, but need not.

The analysis of 2P clitics as proclitics is in contradiction to their traditional description as enclitics, but there is some evidence that 2P clitics may be transitioning from enclitics to proclitics. It has been discussed in the literature that auxiliary clitics can occur after a pause following a heavy constituent (Bennett 1986, Bošković 2001, Percus 1993, Schütze 1994), cf. the example (20) in Chapter 1.

We can better understand this potential transition in prosodic attachment by situating BCS clitics alongside clitics in sister languages, shown below in Table 4.3 (Franks 1998, Franks and King 2000, Pancheva 2005).[1] In the table, we describe the prosodic attachment and distribution of clitics in South Slavic languages. BCS clitics cannot appear in absolute initial position and must appear in second position. The restriction that clitics cannot appear in absolute initial position is known as the Tobler-Mussafia law, while the restriction that clitics appear in second position is known as the Wackernagel law (Ćavar 1999), so BCS obeys both the Tobler-Mussafia law and the Wackernagel law.

However, Zagreb Croatian could be influenced by Slovenian because of the proximity of Zagreb to Slovenia. Slovenian can have 2P clitics in sentence initial position, violating the Tobler-Mussafia law, indicating that Slovenian 2P clitics are "prosodi-

[1] Some of this data is still controversial, e.g. the prosodic attachment of Bulgarian clitics.

Language	prosodic attach-ment	Wackernagel?	verb-adjacent?	1W?	Tobler-Mussafia?
BCS	enclitic	✓	✗	✓	✓
Slovenian	neutral	✓	✗	✗	✗
Bulgarian	neutral	✗	✓	N/A	✓
Macedonian	neutral	✗	✓	N/A	✗

Table 4.1: Distribution of clitics in South Slavic languages, showing prosodic attachment, if Wackernagel's law is obeyed or if the clitics are verb-adjacent, if Wackernagel clitics can undergo 1W placement, and if Tobler-Mussafia's law is obeyed.

cally netural, able to function as either proclitic or enclitic" (Franks and King 2000). In addition, diachronic evidence from Bulgarian and Macedonian shows that these languages used to be 2P clitic languages, but have become languages with verb-adjacent clitics, i.e. the clitics are syntactically proclitic to the verb (Pancheva 2005). Perhaps the low targets retracted to the clitic string in our data are indication of a gradual change in BCS from a 2P clitic system to one like in modern Bulgarian and Macedonian.

Pitch accent retraction account The proclitic analysis presented above doesn't seem to account for the pitch peak retraction we also observed in H2, the noun peak, unless the pitch peak is sensitive to the location of the preceding low tone, i.e. as L2 gets retracted, H2 gets pulled along. Our study does not provide data to address whether L2 in broad focus is a word boundary tone (Godjevac 2000a, 2005) or part of a bitonal L*+H pitch accent (Smiljanic 2004), or, even if L2 is a word boundary tone, if H2 alignment is dependent on L2. If we assume Smiljanic 2004's analysis, though, together, the earlier alignment of L2 and H2 in broad focus show an earlier pitch accent in the noun for 1W placement in broad focus. This analysis can account for why S3 and S2, like S1 and S4, also showed L2 retraction although L2 for these speakers occurred generally after the clitic string in the noun, without appealing to speaker variation as for the proclitic analysis. This pitch accent retraction account does not provide a straightforward

explanation for L3 alignment being earlier for 1C placement, though.

In Section 4.1, we showed that narrow focus on the adjective is associated with retraction of the pitch peak in the adjective. Thus, the retraction of the pitch accent on the noun could indicate focus on the noun in broad focus for 1W placement. In Basque, focus can be signaled by a single cue as subtle as pitch peak retraction (Elordieta 2007). S1 and S4 also had noun peak heights higher than expected by declination, and pitch peak raising is a characteristic focal marking, cf. Section 2.3.3.1. What would it mean for there to be focus on the noun under broad focus discourse conditions? There could be a couple possibilities: (1) 1W placement is not felicitous under broad focus conditions and the speakers were producing very unnatural utterances (2) 1W placement is inherently associated with focus and focus on the noun indicated focus marked on the head of the DP.

Could 1W placement simply not be felicitous under broad focus conditions? For some speakers, this is certainly the case, such as for Radanović-Kocić, cf. (19) in Chapter 1. Speaker S2 in our study made a systematic production error where he produced narrow focus on the noun in seven tokens in broad focus, 1W placement stimuli. However, all our speakers found 1W placement acceptable in broad focus; S4 even preferred 1W placement in broad focus to 1C. Also, our speakers spoke Zagreb Croatian. Corpus studies show that while the 1W placement has been dying out in Standard Serbian, 1W placement is more frequent in Standard Croatian, and 1W placement is considered more proper in Standard Croatian and used in broad focus discourse contexts (Alexander 2006, 2008).

If 1W placement was felicitous for our speakers under broad focus discourse conditions and our speakers were prosodically marking focus on the noun in 1W placement, why the noun and not the adjective? BCS linguists such as Bošković, Radanović-Kocić, and Zec mentioned adjective focus as the most natural or only context where

1W placement was acceptable, cf. Section 1.3.1. It seems that the 1W placement, in addition to being used in discourse contexts where the adjective is being focused, can also be used for discourse contexts where the noun is focused. Our speakers reported these contexts as natural for 1W placement.

In addition, Bošković (2001) suggests that a focus position is available not only preceding, but also following the auxiliary 2P clitic, as in a contrastive focus paradigm with complex city names, e.g. *Gornji Vakuf*, with a first name *Gornji* and last name *Vakuf*, in (1). In (1a), the focus position preceding the auxiliary is activated because the first name, *Gornji* is being contrastively focused and it precedes the 2P clitic in 1W position. In (1b), the focus position following the auxiliary is activated because the last name, *Topola*, in *Bačka Topola*, is being contrastively focused and it follows the 2P clitic in 1W position. In (1c), Bošković (2001) suggests that it is not possible to contrastively focus the entire DP, i.e. the entire city name, when a 1W clitic is splitting the first and last name, while it is possible to do so with a 1C clitic following the entire city name, as in (1d).

(1) Focus positions preceding and following the auxiliary

a. *U GORNJI **su** Vakuf došli, ne DONJI*
in Gornji are Vakuf arrived not Donji
'In Gornji Vakuf they arrived, not Donji (Vakuf)'

b. *U Bačku **su** TOPOLU došli, ne PALANKU*
in Bačka are Topola arrived not Palanka
'In Bačka Topola they arrived, not (Bačka) Palanka'

c. **U NOVI **su** SAD došli, ne ZRENJANIN.*
in Novi are Sad arrived not Zrenjanin
'In Novi Sad they arrived, not Zrenjanin.'

d. *U NOVI SAD **su** došli, ne ZRENJANIN.*
in Novi Sad are arrived, not Zrenjanin
'In Novi Sad they arrived, not Zrenjanin.'

(Bošković 2001: 17 (17))

This complex city name paradigm (1) above is in accordance with our linguistic consultants' intuitions that the 1W placement is particularly natural if either the word preceding or following the clitic string is under focus. Focal marking on the noun would correspond to activation of the focal position following the clitic string. Since the 1W tokens in broad focus produced in our study were very different from 1W tokens in narrow focus and since they didn't sound focused to native speaker listeners, it is unlikely that the focal marking on the noun in broad focus for 1W placement indicated narrow focus on the noun as in (1b) above. Rather, perhaps the focal marking could be focal marking on the head of the DP, and the 1W placement could be associated with a wider focal domain, the entire subject DP.

4.4 Conclusion

In this thesis, we investigated the interaction of second position clitic placement, focus, and prosody in Zagreb Croatian. We claimed that the 1W clitic placement is inherently associated with focus, based on speaker intuitions and prosodic data. We provided the first prosodic description of 2P clitic placement, showing that the intonational melodies for 1C and 1W placement are the same, but there are quantitative differences in tonal alignment that distinguish the two clitic placements in broad focus. In broad focus, the pitch peak in the noun and the low tonal target between the adjective and the noun are retracted, and the low tonal target between the noun and the verb is later than in 1C. These changes in alignment could reflect inherent focushood of 1W placement, such that in broad focus, the noun has a retracted pitch peak indicative of focus. The tonal alignment differences could also reflect the optional treatment of the 2P clitic string as proclitic and thus able to support a left-aligned L word boundary tone. Thus, these

alignment differences could also indicate that BCS is undergoing a transition in the distribution or attachment of its 2P clitics.

We also investigated the alignment of the low tone following a focused element. Previous literature suggested that a prosodic marker for narrow focus in BCS was a low tone right-aligned to the edge of a focused element, and that this low tone coincided with a prosodic break preceding the clitic string in 1W placement. This was compelling because it suggested a coincidence of a prosodic boundary and a syntactic boundary that would be present if 1W placement was analyzed as a split construction, with a syntactic boundary after the adjective. We found, though, that in fact, this low tone was not right-aligned to the edge of the focused element but was a focal phrase accent that followed the pitch peak in the focused element at a fixed duration. We also found no evidence across speakers for pre-boundary lengthening in the adjective for 1W placement and/or narrow focus. Thus, we were unable to provide evidence for either a prosodic break preceding the clitic string in 1W placement or for a split construction account of 1W placement, under a direct syntax-prosody mapping.

Our findings suggest that 2P clitic alternation in BCS is more restricted than usually presented in the literature: 2P clitic placement does not alternate quite freely between 1C and 1W placement. Exact restrictions on when the 1W placement is felicitous depend on the speaker and dialect, but what is of note from this thesis is that at least one class of restrictions is quite well-defined: pragmatic restrictions exist such that the 1W placement is inherently associated with focus, and these should be further investigated before data from 2P clitic alternation in BCS is used to ground theories of the syntax-phonology interface.

APPENDIX A

Appendix

A.1 Pilot Experiment

In a pilot study with three speakers, we performed an experiment very similar to Experiment 1 but using sentences with the 2P auxiliary clitic **je** and with multiple focal domains. The study design was a 2-way repeated measures 2x5 ANOVA with CLITIC PLACEMENT (1C, 1W) x FOCUS (broad, adjective, noun, DP, double focus on adjective and noun). Sample stimuli are given below in (1) and (2).

(1) a. *Malena lavica **je** našla baricu.*
small lioness AUX.3sg found puddle-DAT
'The small lioness found the puddle.'

b. Malena **je** lavica našla baricu.

(2) a. Broad focus

Što se jučer dogodilo?

'What happened yesterday?'

b. Adjective focus

Je li našla VELIKA lavica baricu?'

Did the BIG lioness find the puddle?'

c. Noun focus

Je li našla malena TIGRICA baricu?'

‘Did the small TIGRESS find the puddle?’

d. DP focus

Je li našla DIV baricu?

‘Did the GIANT find the puddle?’

e. Double focus on adjective and noun

Je li našla VELIKA TIGRICA baricu?’

Did the BIG TIGRESS find the puddle?’

Based on results from this experiment, we found that reliable segmentation of the clitic **je** from the surrounding elements was not possible and that speakers had difficulties with the diversity in focal domain conditions. Moreover, while the split city name paradigm given in (1) in Chapter 1 suggests that it is not possible to have double focus on the adjective and noun in a DP when it is split by a clitic, our speakers had no problem with such sentences. However, there were no consistent differences in the realizations of narrow focus on the noun, DP, or double focus on the adjective and noun. We therefore designed Experiment 1 to use pronominal clitics (**me**, 1sg.ACC) in addition to **je**, so that segmentation would be facilitated and we limited focal domains to broad and adjective focus.

As fillers for this pilot experiment, we also elicited broad and narrow focus production of sentences with sentence-initial subject single-word DPs. These stimuli were for investigating the alignment of the low tonal target following the target word in narrow focus described by Smiljanic 2004, and we included 2-, 3-, and 4- syllable nouns as target words, with all four lexical pitch accents represented among the 2 syllable words . We found that for 3 and 4-syllable words, the low tone described by Smiljanic 2004 did not fall at the end of the target word but earlier, and seemingly at a location independent of word length. To further investigate the alignment of the low tone, we varied word length in target words and elicited broad and narrow focus productions in

carrier sentences in Experiment 2.

A.2 Stimuli

A.2.1 Stimuli for Experiment 1: pronominal and auxiliary clitics

Mami li velika lavina Nenada?	‘Is a big avalanche enticing Nenad?’
MALENA lavina mami Nenada.	‘SMALL avalanche is enticing Nenad.’
Je li Vas velika lavina mamila?	‘Did a big avalanche entice you?’
MALENA lavina me je mamila.	‘SMALL avalanche enticed me.’
Je li Vas velika lavina mamila?	‘Did a big avalanche entice you?’
MALENA me je lavina mamila.	‘SMALL avalanche enticed me.’
Mami li Vas velika lavina danas?	‘Is a big avalanche enticing you today?’
MALENA lavina me mami danas.	‘SMALL avalanche is enticing me today.’
Mami li Vas velika lavina danas?	‘Is a big avalanche enticing you today?’
MALENA me lavina mami danas.	‘SMALL avalanche is enticing me today.’
Mami li Vladina malina Ljiljanu?	‘Is Vlada’s raspberry enticing Ljiljana?’
HANINA malina mami Ljiljanu.	‘HANA’s raspberry is enticing Ljiljana.’
Je li Vas Vladina malina mamila?	‘Did Vlada’s raspberry entice you?’
HANINA malina me je mamila.	‘HANA’s raspberry enticed me.’
Je li Vas Vladina malina mamila?	‘Did Vlada’s raspberry entice you?’
HANINA me je malina mamila.	‘HANA’s raspberry enticed me.’
Mami li Vas Vladina malina danas?	‘Is Vlada’s raspberry enticing you today?’
HANINA malina me mami danas.	‘HANA’s raspberry is enticing me today.’
Mami li Vas Vladina malina danas?	‘Is Vlada’s raspberry enticing you today?’
HANINA me malina mami danas.	‘HANA’s raspberry is enticing me today.’
Mami li Markova malina Nevena?	‘Is Marko’s raspberry enticing Neven?’
SANJINA malina mami Nevena.	‘SANJA’s raspberry is enticing Neven.’

Je li Vas Markova malina mamila?	‘Did Marko’s raspberry entice you?’
SANJINA malina me je mamila.	‘SANJA’s raspberry enticed me.’
Je li Vas Markova malina mamila?	‘Did Marko’s raspberry entice you?’
SANJINA me je malina mamila.	‘SANJA’s raspberry enticed me.’
Mami li Vas Markova malina danas?	‘Is Marko’s raspberry enticing you today?’
SANJINA malina me mami danas.	‘SANJA’s raspberry is enticing me today.’
Mami li Vas Markova malina danas?	‘Is Marko’s raspberry enticing you today?’
SANJINA me malina mami danas.	‘SANJA’s raspberry is enticing me today.’
Mami li Lukina malina Nikolu?	‘Is Luka’s raspberry enticing Nikola?’
MANJINA malina mami Nikolu.	‘MANJA’s raspberry is enticing Nikola.’
Je li Vas Lukina malina mamila?	‘Did Luka’s raspberry entice you?’
MANJINA malina me je mamila.	‘MANJA’s raspberry enticed me.’
Je li Vas Lukina malina mamila?	‘Did Luka’s raspberry entice you?’
MANJINA me je malina mamila.	‘MANJA’s raspberry enticed me.’
Mami li Vas Lukina malina danas?	‘Is Luka’s raspberry enticing you today?’
MANJINA malina me mami danas.	‘MANJA’s raspberry is enticing me today.’
Mami li Vas Lukina malina danas?	‘Is Luka’s raspberry enticing you today?’
MANJINA me malina mami danas.	‘MANJA’s raspberry is enticing me today.’
Mami li Manjina naranča Nikolu?	‘Is Manja’s raspberry enticing Nikola?’
Manjina MALINA mami Nikolu.	‘Manja’s RASPBERRY is enticing Nikola.’
Je li Vas Manjina naranča mamila?	‘Did Manja’s orange entice you?’
Manjina MALINA me je mamila.	‘Manja’s RASPBERRY enticed me.’
Je li Vas Manjina naranča mamila?	‘Did Manja’s orange entice you?’
Manjina me je MALINA mamila.	‘Manja’s RASPBERRY enticed me.’
Mami li Vas Manjina naranča danas?	‘Is Manja’s orange enticing you today?’
Manjina MALINA me mami danas.	‘Manja’s RASPBERRY is enticing me today.’
Mami li Vas Manjina naranča danas?	‘Is Manja’s orange enticing you today?’
Manjina me MALINA mami danas.	‘Manja’s RASPBERRY is enticing me today.’

A.2.2 Stimuli for Experiment 2: focal phrase accent alignment

A.2.2.1 1 syllable target words

Je li Vas grub momak razljutio?	‘Did the CRUDE lad shock you?’
GOL me je momak razljutio.	‘Naked lad shocked me.’
Je li Vas žito nasladilo ujutro?	‘Did WHEAT delight you in the morning?’
LAN me je nasladio ujutro.	‘Flax delighted me in the morning.’
Je li Vas staklo nasladilo ujutro?	‘Did GLASS delight you in the morning?’
LIM me je nasladio ujutro.	‘Sheet metal delighted me in the morning.’
Je li Vas pingvin naslađivao ujutro?	‘Did PENGUIN delight you in the morning?’
NOJ me je naslađivao ujutro.	‘Ostrich delighted me in the morning.’
Je li Vas njen ralaz raspoložio?	‘Did HER doctor’s report put you in a good mood?’
MOJ me je nalaz raspoložio.	‘My doctor’s report put me in a good mood.’
Je li Vas njegov limun namamio?	‘Did HIS lemon entice you?’
NJEN me je limun namamio.	‘Her lemon enticed me.’

A.2.2.2 2 syllable target words

Je li Vas MARINOV magarac nasmijao?	‘Did Marin’s donkey make you laugh?’
Lanin me je magarac nasmijao.	‘Lana’s donkey made me laugh.’
Je li Vas lisica nasamarila?	‘Did FOX deceive you?’
MAJMUN me je nasamario.	‘Monkey tricked me.’
Je li Vas tata nasamario?	‘Did DAD deceive you?’
MAMA me je nasamarila.	‘Mama deceived me.’
Je li Vas konj našao navečer?	‘Did HORSE find you in the evening?’
MULA me je našla navečer.	‘Mule found me in the evening.’
Je li Vas Karlov limun namamio?	‘Did KARLO’S lemon entice you?’

MANJIN me je limun namamio.	‘Manja’s lemon enticed me.’
Je li Vas Ivanin momak nasmijao?	‘Did IVANA’s boyfriend make you laugh?’
NININ me je momak nasmijao.	‘Nina’s boyfriend made me laugh.’

A.2.2.3 3 syllable target words

Je li Vas lopta naslađivala?	‘Did BALL delight you?’
DOMINO me je naslađivao.	‘Domino delighted me.’
Je li Vas haljina nasmijala?	‘Did DRESS make you laugh?’
MARAMA me je nasmijala.	‘Shawl made me laugh.’
Je li Vas bakalar namamio?	‘Did COD entice you?’
MORUNA me je namamila.	‘Beluga enticed me.’
*Je li Vas Vladina malina mamila?	‘Did Vlada’s raspberry entice you?’
HANINA me je malina mamila.	‘HANA’s raspberry enticed me.’
*Je li Vas Markova malina mamila?	‘Did Marko’s raspberry entice you?’
SANJINA me je malina mamila.	‘SANJA’s raspberry enticed me.’
*Je li Vas velika lavina mamila?	‘Did a big avalanche entice you?’
MALENA me je lavina mamila.	‘SMALL avalanche enticed me.’

A.2.2.4 4 syllable target words

Je li Vas veliki manjak nasmijao?	‘Did BIG deficit make you laugh?’
MINIMALNI me je manjak nasmijao.	‘Minimal deficit made me laugh.’
Je li Vas depresivni momak varao?	‘Did DEPRESSED lad deceive you?’
NEMORALNI me je momak varao.	‘Immoral lad deceived me.’
Je li Vas zgodni mali našao?	‘Did CUTE boy find you?’
NENORMALNI me je mali našao.	‘Abnormal boy found me.’
Je li Vas maksimalni napad prevario?	‘Did MAXIMAL offensive disappoint you?’
NOMINALNI me je napad prevario.	‘Nominal offensive disappointed me.’

*Reused from stimuli set for Experiment 2a

Je li Vas karcinom ranio?	‘Did CANCER leave you stricken?’
MALARIJA me je ranila.	‘Malaria left me stricken.’
Je li Vas metafora nasmijala?	‘Did METAPHOR make you laugh?’
IRONIJA me je nasmijala.	‘Irony made me laugh.’

A.2.2.5 Noninitially stressed words

Je li Vas lopta nasladila danas?	‘Did BALL delight you today?’
BALON me je nasladio danas.	‘Balloon delighted me today.’
Je li Vas odvjetnik nasamario?	‘Did LAWYER deceive you?’
BIRO me je nasamario.	‘Bureau deceived me.’
Je li Vas ikona nasmijala navečer?	‘Did ICON make you laugh in the evening?’
MENI me je nasmijao navečer.	‘Menu made me laugh in the evening.’
Je li Vas kositar namamio?	‘Did TIN entice you?’
ALUMINIJ me je namamio.	‘Aluminum enticed me.’
Je li Vas juha namamila?	‘Did SOUP entice you?’
MARINADA me je namamila.	‘Marinade enticed me.’

A.3 Additional statistical results

Here we present statistical results which did not pattern robustly across speakers or more detailed results.

A.3.1 Duration results

Here are detailed statistical results for the duration comparisons done to look for evidence of phrase-final lengthening, discussed in Section 2.3.2.2. We show the ANOVA results for comparison of the durations of the last segment, the last syllable, and word for the adjective: across clitic placements in broad focus (Table A.3.1), across clitic

placements in narrow focus (Table A.3.1), across focus conditions for 1W placement (Table A.3.1), and across focus conditions for 1C placement (Table A.3.1).

Duration	S1	S2	S3	S4
Last segment	F(1,76) = 8.61, p = 4.4e-3	F(1,67) = 8.25, p = 5.4e-3	F(1,70) = 0.38, p = 0.78, n.s.	F(1,76) = 0.13, p = 2.30, n.s
Last syllable	F(1,76) = 11.45, p = 1.1e-3	F(1,67) = 0.84, p = 0.36, n.s	F(1,70) = 1.26, p = 0.27, n.s	F(1,76) = 0.39, p = 0.53, n.s
Word	F(1,76) = 0.26, p = 0.61, n.s	F(1,67) = 0.20, p = 0.89, n.s	F(1,70) = 10.54, p = 1.8e-3	F(1,76) = 1.72, p = 0.19, n.s

Table A.7: ANOVA results for durations in adjective for CLITIC POSITION in broad focus for all speakers.

Duration	S1	S2	S3	S4
Last segment	F(1,76) = 10.11, p = 2.1e-3	F(1,76) = 14.38, p = 3.0e-4	F(1,74) = 5.95, p = 0.017	F(1,76) = 0.82, p = 0.053, n.s
Last syllable	F(1,76) = 16.00, p = 1.5e-4	F(1,76) = 3.43, p = 0.068, n.s	F(1,74) = 1.19, p = 0.28, n.s	F(1,76) = 0.07, p = 0.79, n.s
Word	F(1,76) = 0.22, p = 0.14, n.s	F(1,76) = 0.66, p = 0.42, n.s	F(1,74) = 2.84, p = 0.096, n.s	F(1,76) = 0.60, p = 0.44, n.s

Table A.8: ANOVA results for durations in adjective for CLITIC POSITION in narrow focus for all speakers.

Duration	S1	S2	S3	S4
Last segment	F(1,76) = 0.24, p = 0.62, n.s	F(1,69) = 2.46, p = 0.12, n.s	F(1,76) = 0.81, p = 0.37, n.s	F(1,76) = 0.59, p = 0.44, n.s
Last syllable	F(1,76) = 0.95, p = 0.33, n.s	F(1,69) = 28.01, p = 1.35e-6	F(1,74) = 1.47, p = 0.23, n.s	F(1,76) = 4.97, p = 0.029
Word	F(1,76) = 9.55, p = 2.8e-3	F(1,69) = 38.81, p = 2.6e-8	F(1,74) = 0.03, p = 0.87, n.s	F(1,76) = 6.92, p = 0.010

Table A.9: ANOVA results for durations in adjective for FOCUS for 1W clitic placement for all speakers.

A.3.2 F_0 of peaks and valleys: Narrow focus

Two-way repeated measures ANOVAs for each speaker and each dependent variable showed main effects of CLITIC POSITION for S2 for F_0 of H2 ($F(1,76) = 4.60$, $p = 0.035$) and F_0 of H1/F_0 of H2 ($F(1,76) = 5.70$, $p = 0.018$), main effects of CLITIC

Duration	S1	S2	S3	S4
Last segment	F(1,76) = 0.02, p = 0.89, n.s	F(1,74) = 1.00, p = 0.32, n.s	F(1,70) = 4.87, p = 0.031	F(1,76) = 10.67, p = 1.6e-3
Last syllable	F(1,76) = 0.86, p = 0.36, n.s	F(1,74) = 12.25, p = 7.9e-4	F(1,70) = 2.23, p = 0.14, n.s	F(1,76) = 10.41, p = 1.9e-3
Word	F(1,76) = 17.07, p = 9.2e-5	F(1,74) = 38.81, p = 2.6e-8	F(1,70) = 3.91, p = 0.052, n.s	F(1,76) = 3.69, p = 0.059, n.s

Table A.10: ANOVA results for durations in adjective for FOCUS for 1C clitic placement for all speakers.

POSITION for S3 for F_0 of H1($F(1,74) = 4.03$, $p = 0.048$), F_0 of L2 ($F(1,74) = 7.21$, $p = 8.9e\text{-}3$), and F_0 of H1/F_0 of H2 ($F(1,74) = 5.86$, $p = 0.02$) and a main effect of CLITIC STRING LENGTH for S1 ($F(1,76) = 8.74$, $p = 4.2e\text{-}3$). S2 also showed a significant interaction between CLITIC POSITION and CLITIC STRING LENGTH for F_0 of H2 ($F(1,76) = 4.50$, $p = 0.035$). Posthoc tests showed that F_0 of H2 was significantly higher for 1C/1 clitic than 1W/1 clitic, $t(27.11) = 4.32$, $p = 1.9e\text{-}4$, and 1W/2 clitic, $t(36.2) = 3.62$, $p = 4e\text{-}3$.

For S2 and S3, the pitch for the tonal targets was higher for 1C clitic position than 1W, and for S1, the pitch was higher for a clitic string length of 1 than 2. These effects are all consistent with less phonetic material preceding the tonal targets in 1C clitic position and a clitic string length of 1 so that less declination has occurred than for 1W clitic position and a clitic string length of 2.

A.3.3 Tonal alignment

A.3.4 H1 alignment, broad and narrow focus

We analyzed H1 alignment within focus conditions, in broad and narrow focus. We reanalyzed H1 alignment for broad focus to the onset of the the stressed syllable and

for narrow focus to the onset of the stressed vowel.[†] There were no significant results for broad focus, other than a main effect of CLITIC POSITION for S3, $F(1,70) = 12.46$, $p = 7.3e\text{-}4$; for S3, H1 was aligned earlier for 1W than 1C clitic position. For narrow focus, S1 showed an interaction of CLITIC POSITION and CLITIC STRING LENGTH $F(1,76) = 9.00$, $p = 3.7e\text{-}3$, and S2 showed a main effect for CLITIC STRING LENGTH, $F(1,76) = 4.49$, $p = 0.037$. For S2, H1 was aligned earlier for a clitic string of length 1, and for S1, H1 was aligned earlier for 1W clitic placement for clitic strings of length 1.

A.3.4.1 L2 alignment, broad focus

In broad focus, as discussed in Chapter 2, Section 2.3.4.2, all speakers showed a main effect for CLITIC POSITION on L2 aligned to the onset of the noun: L2 was aligned earlier for 1W than 1C placements. In addition, S4 showed a main effect of CLITIC STRING LENGTH, $F(1,76) = 4.39$, $p = 0.039$. L2 was aligned earlier for a clitic string length of 1 than 2. This may indicate that L2 alignment is sensitive to a target other than the left edge of the clitic string: if L2 were sensitive to that target, then we wouldn't expect to see a difference in alignment for the two clitic string lengths.

While S1 also showed an interaction CLITIC POSITION x CLITIC STRING LENGTH, $F(1,76) = 4.67$, $p = 0.034$, posthoc tests results were not significant, perhaps indicating insufficient power in the statistical analysis.

[†]These alignment choices are not justified here and are discussed in Chapter 3 in Section 3.2.1.1 and 3.2.2.1.

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