Tonal and durational correlates of accent in contexts of downstep in Lekeitio Basque

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In this paper we examine the realization of accentual prominence in downstep contexts (i.e. after another accented word) in the Northern Bizkaian Basque dialect of Lekeitio. Previous work has suggested that pitch is the primary correlate of accent in this language. In this paper, we test the hypothesis that in contexts where pitch differences are likely to be reduced or perhaps eliminated, duration will be recruited to convey accentual prominence. The results show that pitch-accents are reduced but not eliminated following other accents, including the context after a word with narrow focus. The reduced pitch excursions found in this context appear to reliably and consistently indicate the position of the accent. On the other hand, the participants in this study did not consistently employ duration to enhance the prominence of accented syllables (a durational effect was found for two out of five speakers). Given the robustness of the pitch cue in this language (always a fall from the accented syllable), even in contexts of downstep, other phonetic correlates of accent will be redundant, to the extent that they are used.

1 Introduction

In Lekeitio Basque, like in other Northern Bizkaian Basque dialects, accent is lexically contrastive. There is a fundamental distinction between lexically accented and lexically unaccented words. In Lekeitio, lexically accented words bear prominence on the penultimate syllable (although there is also a small, morphologically-restricted, class of words with antepenultimate accent). Lexically unaccented words, on the other hand, do not have prominence on any syllable, unless they occur in final position within a focalized phrase, in which case they receive an accent on their last syllable (Hualde, Elordieta & Elordieta 1994, Elordieta 1997, Hualde 1999).[1]

This accentual contrast plays a lexical role. First of all, a few stems contrast in accentual properties. Thus unaccented /baso/ 'forest' forms a minimal pair with accented /báso/ 'drinking glass'.[2] More importantly, in most inflected forms of nominals with lexically unaccented stems (which are the majority), the singular is unaccented and the plural is

[1] In other Northern Bizkaian varieties the position of accents is subject to different rules (see Hualde 1999).

[2] The lexical accent shifts to the penultimate syllable in inflected forms; e.g. *bi báso* 'two glasses', *basúa* 'the glass', *basóra* 'to the glass', *basorákо* 'for the glass', *basorakúa* 'the one for the glass'.

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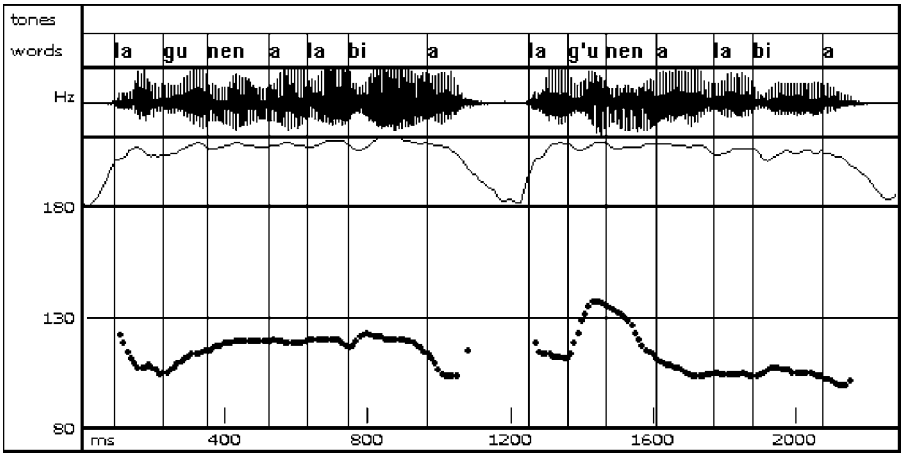

Figure 1 a. lagunen alabià 'the friend's (sg) daughter'
b. lagúnen alabià 'the friends' (pl) daughter'
These F0 contours illustrate the lexical contrast between accented and unaccented words. The singular form *lagunen* 'friend-GENsg' (left) is unaccented. The plural form *lagúnen* 'friend-GENpl' (right) is lexically accented and bears a H*L pitch accent. Notice also that the pitch excursion corresponding to the phrasal or 'derived' accent on the word *alabia* 'daughter' is considerably reduced in the rightside example (b), where it is preceded by another accent. This is the phenomenon known as downstep.

accented. In some morphological cases, such as the ergative, the genitive and the dative, the endings are segmentally identical in the singular and the plural and the only difference is the accentual one.

Lexically accented and unaccented words are distinguished by their tonal pattern both in phrase-final and non-final position. As shown in figure 1, in non-final position, the difference is between the presence and the absence of a H*L pitch accent. In figure 1a, in the phrase *lagunen alabia* 'the friend's (sg) daughter', the unaccented word *lagunen* 'friend-GENsg' does not have any accentual prominence, whereas in figure 1b, *lagúnen alabia* 'the friends' (pl) daughter', the corresponding plural form *lagúnen* 'friend GENpl' bears a H*L pitch accent associated with its penultimate syllable.[3]

In phrase-final position in broadly focalized (including isolated) phrases, lexically accented and lexically unaccented words are distinguished by the location of the accent. Thus, in figure 2a, the lexically unaccented singular form *lagunarì* 'friend DATsg' has an accent on its last syllable (which, for convenience, in orthographic representation we indicate with a different diacritic than the one we are using for lexical accent), whereas in figure 2b, the plural lexically accented form *lagunári* 'friend DATpl' bears an accent on the penultimate syllable.

Previous experimental research suggests that F0 is the main and perhaps the only phonetic correlate of accent in Lekeitio and neighboring Basque dialects, at least in neutral declarative sentences (Elordieta & Hualde 2001, Hualde, Smiljanic & Cole to appear). Generally, F0 provides a robust cue for the lexical accentual distinction in Lekeitio Basque: presence vs. absence of an accent or position of the accent, depending on phrasal context, as shown in figure 1 and figure 2. It should be noted that, like Tokyo Japanese, and unlike languages such as English and Spanish, Northern Bizkaian Basque makes use of a single pitch accent, H*L

[3] The examples in this introductory section were produced by the first-named author, who is a native speaker of Lekeitio Basque.

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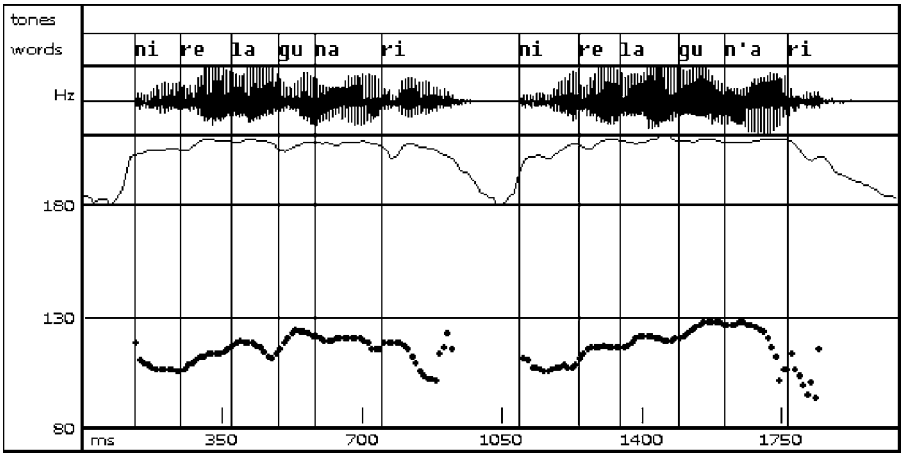

Figure 2 a. nire lagunarì 'to my friend'
b. nire lagunári 'to my friends'
These two contours in this figure illustrate the lexical accentual contrast in phrase-final position. The plural form *lagunári* (right) has a lexical H*L accent on its penultimate syllable. The lexically-unaccented singular form *lagunarì* (left) has a falling contour on its last syllable, corresponding to a phrasal or 'derived' accent.

(that is, a high tone associated with the accented syllable followed by a low tone).[4] There is thus a specific pitch contour associated with accented syllables.

The ability of F0 to convey a lexical contrast would appear to be compromised in certain contexts, however. As is pointed out in Hualde, Elordieta, Gaminde & Smiljanic (2002) and Hualde, Smiljanic & Cole (to appear), accentual peaks are systematically downstepped after another accent. By downstep we mean the lowering or reduction of an accentual peak following another accent. In Northern Bizkaian Basque, in a phrase containing more than one accented word, the second accent of the phrase is always considerably lower than the first one, because the preceding accent induces downstep. Consequently, the relative size of an accentual excursion in a given position will depend on whether or not it is preceded by another accent. This phenomenon is illustrated in figure 1, where as can be seen, the derived accent on *alabià* 'the daughter' is much more reduced in the (b) example, where it is preceded by accented *lagúnen* 'of the friends', than in the (a) example, where the preceding word is unaccented *lagunen* 'of the friend'. Figure 3 further illustrates downstep-induced reduction of both lexical and derived accent following the lexically-accented word *Mirénen* 'of Miren'.

This downstep phenomenon raises some important questions: is the reduced pitch excursion in this context enough of a cue to convey lexical contrasts in a robust manner? Are other cues (duration, amplitude) employed in this particular context to compensate for the reduced size of the pitch excursions? Knowing whether or not non-tonal features are employed would be crucial evidence for understanding the nature of the phenomenon we are calling accent in this language. Relevantly, Beckman (1986) distinguishes two types of accent

[4] There are two different uses of the expression 'pitch accent' in the literature. First of all, as mentioned in the text, the label 'pitch-accent language' has been used to refer to accent languages with lexically specified pitch contours (as opposed to other accent languages where all pitch contours are pragmatically determined). Secondly, in certain analyses of intonation (e.g. Pierrehumbert 1980, Beckman & Pierrehumbert 1986), a pitch accent is an F0 contour phonologically associated with a lexically prominent syllable. In this sense we can say that in English the stressed syllable of a given word in an utterance may be associated with one of several possible pitch accents or with no pitch accent at all. Lekeitio Basque is a pitch-accent language in which lexically accented words always bear a H*L pitch accent.

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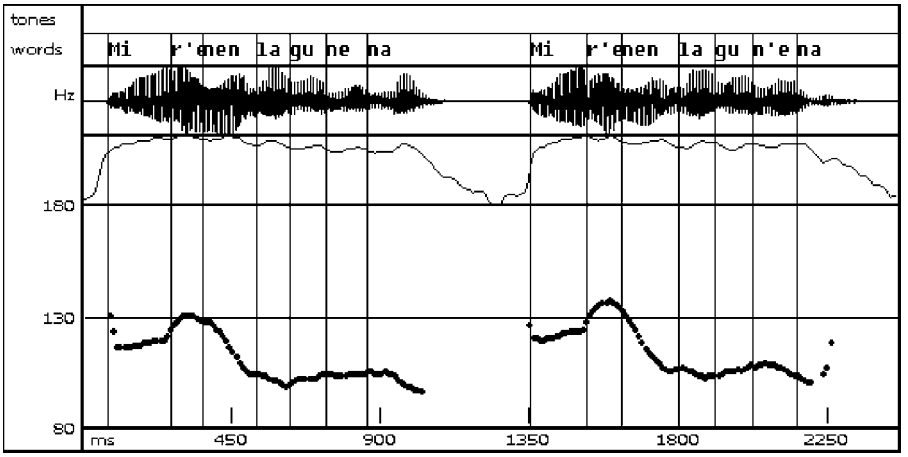

Figure 3 a. Mirénen lagunenà 'the one of Miren's friend'
b. Mirénen lagunéna 'the one of Miren's friends'
These two contours illustrate reduction (downstep) of both derived (left) and lexical accents (right) after another accent. Notice that the pitch excursion on the second word of the phrase (*lagunenà*/*lagunéna*) is smaller than the one corresponding to the lexical accent of the first word (*Mirénen*).

languages: stress accent languages and non-stress accent languages. Accentual prominence is phonetically different in these two types of language. In stress-accent languages, accentual prominence is conveyed by a number of phonetic correlates, including pitch, duration and intensity. An example of stress-accent language is English. In non-stress accent languages, on the other hand, pitch is the only correlate of accent. Beckman's example is Tokyo Japanese. The relation between accent and pitch is also different in the two types of language. Whereas in a language like English stressed syllables may be associated with different pitch shapes, depending on the intonational context, in Tokyo Japanese the accented syllable of a word always carries the same pitch contour, a falling (H*L) contour. (In other Japanese dialects there is a lexically-determined contrast in accentual pitch contours.) In some prosodic respects (accented/unaccented distinction, tonal patterns) the similarity between Northern Bizkaian Basque and Tokyo Japanese is striking (as already noticed in Hualde 1988, 1991). From a typological point of view, it is thus interesting to determine whether this similarity extends to phonetic details in the realization of prominence.

In this paper, we examine the phonetic correlates of accentual prominence in words immediately following another accented word and thus showing a reduced, downstepped accentual peak. We consider both F0 and duration. The reason for concentrating on this phrasal context is that we believe that if duration is used at all as an accentual correlate in Lekeitio Basque (unlike in Tokyo Japanese) this should be most obvious in contexts where the size of F0 excursions is reduced.

Our hypothesis, based on our linguistic intuitions and knowledge of the language (as well as some informal perceptual testing), is that lexical distinctions that rely on accentuation contrasts are usually maintained in all contexts in Lekeitio Basque. That is, for instance, the singular/plural contrast is not neutralized in contexts of downstep. What remains to be established is the acoustic cue(s) responsible for the maintenance of this contrast. It could be that the reason why meaning is preserved in downstep contexts is that pitch excursions are reduced but not completely deleted, providing enough of a cue for the identification of prosodic prominence on certain syllables. The other possibility is that, as the role of F0 is

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reduced, perhaps other cues such as duration and amplitude will be recruited to express the lexical accentual contrast.

In the specific examples in figure 3, the peak on the second word is, as expected, very noticeably reduced with respect to the first peak of the utterance, but it can still be seen to be aligned with different syllables in the two examples (/-na/ in figure 3a and /-ne-/ in figure 3b). It is sensible to ask whether the alignment of the reduced tonal gesture on the second word is sufficient to preserve contrasts in meaning (the singular/plural contrast in these examples). Furthermore, whereas in the examples in figure 3 the downstepped accentual excursions are only reduced and not deleted, in principle one could find deaccentuation in similar tokens. Further investigation may reveal complete elimination, and not just reduction, of F0 excursions in such contexts, especially after a word with narrow focus, as has been shown to happen in English, Japanese and other languages (Ladd 1996: 175–179, Pierrehumbert & Beckman 1988).

As mentioned above, results from previous experimental work have suggested that accented syllables are not durationally enhanced in Lekeitio (Elordieta & Hualde 2001) and neighboring Basque varieties (Hualde, Smiljanic & Cole to appear). These studies included mostly target words with unreduced pitch-accents; that is, not preceded by another accented word. A lack of durational correlates of accentual prominence is consistent with Beckman's (1986) findings for Tokyo Japanese and with the typology that Beckman establishes in that work.

In this paper we report on an experiment whose goal is to determine the effect of F0 and duration as accentual correlates in downstep contexts in Lekeitio Basque. As indicated above, one may reasonably assume that if duration is used as an accentual correlate in Lekeitio Basque, this will become evident by examining the expression of accent in the downstep context. That is, if Lekeitio Basque has the possibility of using features other than F0 to convey prosodic prominence, we may expect to find evidence for this in downstep contexts, if any. We also explore whether F0 and duration are used in a uniform manner under different focus conditions. We leave open the possibility that in addition to F0 and/or duration other cues not investigated here such as amplitude and spectral differences may be used to indicate accentual prominence.

2 Experimental methods

2.1 Subjects

The data for this study were provided by 5 native speakers of Lekeitio Basque, all female, between the ages of 29 and 40. All subjects are bilingual in Spanish, as currently there are no adult monolingual speakers of Lekeitio Basque.

2.2 Materials

In this paper we restrict our investigation to the following 10 sentences (5 minimal pairs contrasting singular and plural):[5]

(1)	Mirénen	lagunenà/lagunéna	pintxa	dot.
	Miren-GEN	friend-GENsg/friend-GENpl	paint	I-have-it
	W1	W2	V	AUX
	[mirénen laɣunená/laɣunéna pintʃaɾot]			
	'I have painted the one of Miren's friend/friends.'			

[5] Representations in brackets are broad phonetic transcriptions of typical renditions.

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(2) Kabanáko atunenà/atunéna saldu dot.
[kaβanáko atunená/atunéna saldurot]
'I have sold the one of the packing plant's tuna/tunas.'
(3) Ondarrúko gixonenà/gixonéna topa dot.
[ondarúko ɣiʃonená/ɣiʃonéna toparot]
'I have found the one of the man/men from Ondarroa.'
(4) Molláko lasunenà/lasunéna kendu dot.
[moʎáko lasunená/lasunéna kenduɾot]
'I have taken out the one of the rockfish (sg/pl) from the pier.'
(5) Karmélen betunenà/betunéna sartu da.
[karmélen betunená/betunéna sartuɾa]
'The one of Karmele's shoe polish (sg/pl) got old.'

In all examples, W1 is lexically accented and W2 is singular in half of the sentences and plural in the other half. All measurements are taken from the last two syllables of W2. For all examples, we have chosen stems ending in /-n/ bearing either the unaccented ending /en-a/ 'GENsg+DETsg' or the accented ending /-én-a/ 'GENpl+DETsg'. In this way we obtain contrastive sequences [-nená] and [-néna], where the two syllables of interest are both very similar and not difficult to segment accurately. Other case endings that are segmentally identical but accentually contrastive for singular and plural, such as ergative *-ak* and dative *-ari*, do not have these advantages and present difficulties for the relevant measurements.

The target sentences were provided with a preceding context intended to elicit one of three pragmatic conditions: Focus on both W1 and W2 (i.e. both W1 and W2 contain new information = 'broad focus'), narrow corrective focus on W1 and narrow corrective focus on W2, as illustrated in the examples in (6).

(6) a. Broad focus (BF)
Context: *Nóren kotxia pintxa dosu?* 'Whose car did you paint?'
Mirénen lagunenà pintxa dot. 'I painted the one of Miren's friend.'
Mirénen lagunéna pintxa dot. 'I painted the one of Miren's friends.'
b. Narrow corrective focus on W1 (NFW1)
Context: *Kóldon lagunenà pintxa dosu?* 'Did you paint the one of Koldo's friend?'
Es, MIRÉNEN lagunenà pintxa dot. 'No, I painted the one of MIREN's friend.'
Es, MIRÉNEN lagunéna pintxa dot. 'No, I painted the one of MIREN's friends.'
c. Narrow corrective focus on W2 (NFW2)
Context: *Mirénen alabienà pintxa dosu?* 'Did you paint the one of Miren's daughter?'
Es, Mirénen LAGUNENÀ pintxa dot. 'No, I painted the one of Miren's FRIEND.'
Es, Mirénen LAGUNÉNA pintxa dot. 'No, I painted the one of Miren's FRIENDS.'

Each of the 10 sentences in (1)–(5) was thus elicited under three different pragmatic conditions. In all cases the word from which measurements are taken is in a focalized phrase. In the broad focus (BF) condition, the whole phrase containing W1 and W2 is under focus. In the other two pragmatic conditions only either W1 or W2 is under focus, whereas the other word is repeated ('given') information.

At this point, we need to briefly discuss focalization in Basque. In Basque, question words and phrases that constitute the answer to a pronominal question must occur in the position immediately before the verb. This is the focus position. Even in broad focus utterances the syntactic phrase immediately before the verb is normally interpreted as providing the pragmatically most relevant information in the sentence. If the last word in a syntactic phrase in the preverbal focus position is lexically unaccented, it receives an accent on its last syllable, which we have been indicating with a grave accent mark in our examples (this is unless the verb itself is focalized). A consequence of this is that every sentence contains at least one accent, even if all words are lexically unaccented. This phrase-final accent on a lexically unaccented word in focus position is called a 'derived accent' in Jun & Elordieta (1997).

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A phrase-final derived accent is also given to unaccented words or phrases pronounced in isolation, as in the example in figure 2a. In addition to this 'broad focus', individual words in the preverbal phrase bearing either a lexical or a derived accent can receive narrow focus, as exemplified in (6) above.

As noted in the introduction, pitch accents are reduced after another accent in the phrase; that is, in the phrasal context that we examine here. In previous work this has been shown to be the case in broad focus utterances. The contrastiveness of pitch excursions would be even more compromised, in principle, in utterances where a preceding word bears narrow corrective focus (i.e. in the NFW1 utterances), since generally we expect peaks after an accented word with narrow focus to be even more reduced than in neutral utterances, and possibly completely deleted. Deaccenting after narrow focus is a common phenomenon, attested in English, Japanese and other languages (Ladd 1996, Beckman & Pierrehumbert 1986, Pierrehumbert & Beckman 1988). On the other hand, the expectation is that there will be less downstep and perhaps suspension of the downstep effect when the word bears contrastive focus (i.e. in the NFW2 context).

2.3 Elicitation procedures

For the elicitation of the data, each of the target sentences together with one of its contexts was written on a separate index card, both in Spanish and in Lekeitio Basque. The plural forms were provided with a written acute accent mark in the Basque text. Narrow focus was indicated by capitalization. A Spanish translation was provided together with the Basque as a way to ensure accuracy in the interpretation, since Lekeitio Basque is not normally used in writing and the only difference between singular and plural in the experimental sentences is accentual. Using Standard Basque (which does not possess the accentual contrasts that we are interested in testing) would have introduced a clear risk of interdialectal interference. Oral interaction before and during the experiment between experimenter and subjects was all in Lekeitio Basque.

The index cards were presented to the subject in random order (cards were shuffled). For each card presentation, the experimenter first read the triggering context aloud in Basque and then the subject read the target sentence. After all cards in the set had been read, the cards were reshuffled and read again for a total of three repetitions of the set in different orders. This procedure produced 90 utterances per subject (10 sentences $\times$ 3 pragmatic contexts $\times$ 3 repetitions).

Subjects were allowed to repeat sentences immediately after providing an erroneous token if they believed that they had made a mistake.

All the recordings took place in Lekeitio, in the subjects' familiar surroundings and under quiet conditions. We used a Sony minidisc digital recorder with a Geminis head-mounted microphone.

2.4 Measurements

The data were transferred to a personal computer for analysis with the commercially available program PitchWorks by Sciconrd. We measured both F0 and syllable duration in every token utterance. In a few cases, F0 measurements could not be taken because of tracking errors. F0 was measured at a point about the middle of the vowel in each of the two syllables /ne-na/ in W2. If the syllable had a clear pitch peak, the value of the peak was taken, otherwise we took a value in the middle of the vowel. Although the appropriate location for F0 measurement could not be as precisely determined in syllables without a peak, it is unlikely that choice of a different point within the span considered would have produced significantly different results. For all tokens we also measured the duration in ms of the two syllables in the sequence /nena/

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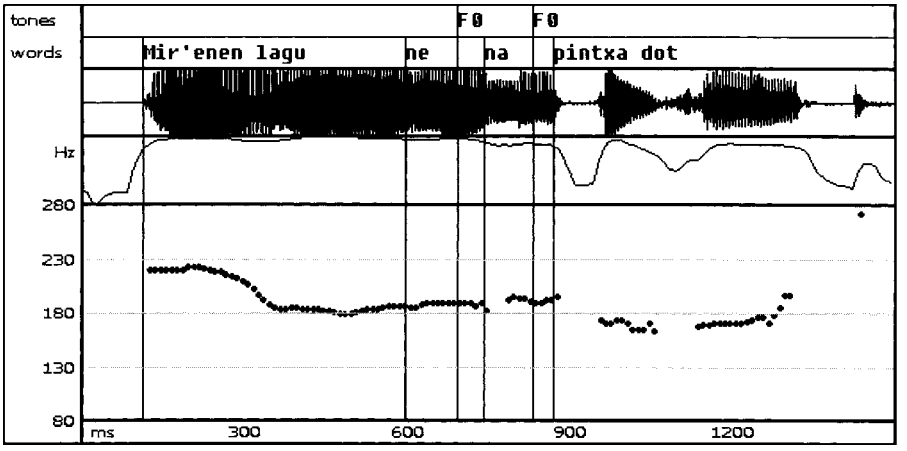

Figure 4 Broad focus singular example: *Mirénen lagunenà pintxa dot* 'I painted the one of Miren's friend' (Spkr2) illustrating F0 and duration measurements. Spectrograms (not shown) were used in conjunction with this display.

using soundwaves and spectrograms. An example is provided in figure 4 (spectrogram not included).

3 Results

3.1 F0

To the extent that the accentual contrast is preserved, we expect the higher value to correspond to the second syllable in singular tokens [ne-ná] and to the first syllable in plural tokens [né-na].

The results for all speakers are presented in table 1 in the appendix and also in scatter plots showing all tokens for each speaker separately (figure 5). In the plots, numbers along the x axis correspond to the F0 value in Hz in the syllable /ne/ and values along the y axis to F0 value within the syllable /na/. White symbols represent singular tokens and black symbols, plural tokens. Symbol shapes refer to focus condition. As can be seen, for all five subjects singular and plural tokens form segregated clouds with the expected distribution: i.e. for plural tokens x is generally higher than y (below the diagonal), that is, there is a drop in pitch from /ne/ to /na/, whereas singular tokens are near the diagonal, indicating equal values for both syllables, or slightly above, indicating a somewhat higher value for the syllable /na/.

A repeated-measures ANOVA performed on the means of the difference in pitch between the syllables /ne/ and /na/ in each token indicated that the pitch differences were reliably greater for plural compared to singular, $F(1,4) = 19.58$, $p < .02$, and consistently varied as a function of focus with most of the effect being associated with a greater difference for NFW2, $F(2,8) = 18.44$, $p = .001$. The comparison between BF and NFW1 conditions was not significant. Singular-plural and focus type also interacted, such that the greater difference for the NFW2 condition was exaggerated in the plural, $F(2,8) = 16.43$, $p < .002$.

To sum up the results of this section, F0 is a significant cue of both accentual contrasts and focus type. Plural forms (accented on the penultimate) show earlier peaks than singular forms (which receive final accent in our sentences). This is manifested by a consistent drop in pitch from the penultimate to the final syllable in /-néna/ in the penultimately-accented plural forms, whereas the final-accented singular forms have much smaller differences in pitch between these two syllables.

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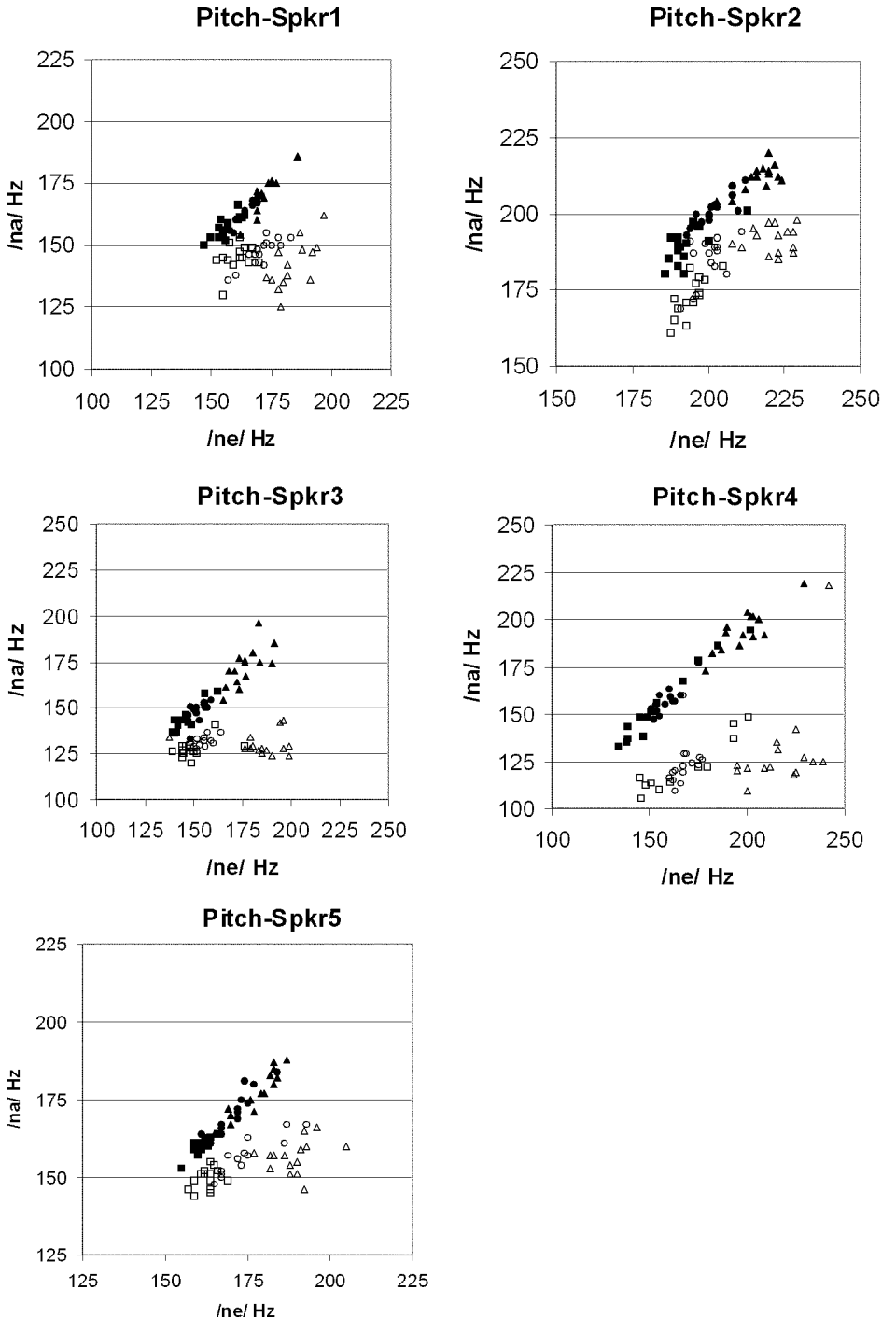

Figure 5 F0 results for all 5 speakers. Each point represents one measured utterance. Black symbols correspond to singular tokens (sg) and white symbols to plural tokens (pl). Circles = BF, squares = NFW1, triangles = NFW2.

BF = broad focus, NFW1 = narrow focus on word 1 of phrase, i.e. the target word is in postfocus; NFW2 = narrow focus on word 2, i.e. the target word has narrow focus; /ne/Hz = F0 value of syllable /ne/ (x-axis); /na/Hz = F0 value of syllable /na/ (y-axis). Because of the way axes portions have been chosen, points along the diagonal represent equal value for both syllables.

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Regarding focus, in the environment considered in this study, following another accented word, narrow focus on the target word is conveyed by higher F0 values (i.e. less downstep of its accent).

3.2 Duration

If duration is a correlate of accentual prominence, the syllable /na/ would be longer than /ne/ in singular forms and the opposite would be true in plural forms.

Duration results are presented in table 2 in the appendix (means and standard deviations for all speakers and conditions) and scatter plots showing all tokens for each speaker separately (figure 6). In the plots, numbers along the x axis correspond to the duration in ms of the syllable /ne/ and values along the y axis to the duration of the syllable /na/.

A repeated-measures ANOVA on the means of the difference in duration between the syllables /ne/ and /na/ for all speakers and conditions did not produce statistically significant results for singular-plural, $F(1,4) = 1.73$, n.s., or for focus type, $F(2,8) = 4.14$, n.s.

Given the amount of variability among subjects that was observed (reflected in the scatter plots), an ANOVA was also performed on the data on durational differences for each speaker separately. This analysis showed a main effect of singular-plural for two subjects, Spkr1, $F(1,84) = 50.92$, $p < .0001$, and Spkr4, $F(1,84) = 12.24$, $p < .001$. For these two subjects, the accented syllable has significantly greater duration than the unaccented syllable (i.e. in the plural the accented syllable /ne/ is longer and in the singular the accented syllable /na/ is longer). For the other three speakers, there was no such effect. An effect of focus type was found only for Spkr1, $F(2,84) = 6.77$, $p < .002$ with a significant difference between the two narrow focus contexts NFW1 and NFW2.

Whereas all speakers showed a uniform behavior regarding the use of pitch to convey accentual contrast, this uniformity across speakers was not found with respect to durational differences. In general, then, duration is not a consistent correlate of accent in Lekeitio Basque. Nevertheless, some speakers do appear to give accented syllables greater duration.

4 Discussion

Our data have shown that in the Northern Bizkaian Basque dialect of Lekeitio, F0 functions as a consistent correlate of accentual prominence in all contexts, including the post-focal context. In Northern Bizkaian Basque, the presence of an accent systematically triggers the downstepping or reduction of a following accent (Hualde, Elordieta, Gaminde & Smiljanic 2002), but our results demonstrate that this does not lead to the neutralization of pitch-accentual contrasts. Even after narrow focus, a context where deaccenting is commonly found in some other languages, F0 excursions are only reduced, but not completely eliminated. The post-accentual reduction of pitch range does not cause neutralization, not even in post-focal position. In this, Lekeitio Basque may differ from Japanese, where it is less clear that contrasts are preserved in the post-focal context (Maekawa 1994. For a comparison of focus realization in Japanese and Bermeo Basque see Ito 2002).

We suggested at the beginning of this paper that perhaps in contexts where pitch excursions are reduced, accented syllables would be lengthened to compensate for the smaller size of the pitch movements. This does not appear to be the case; at least not for all speakers. Pitch-accents (i.e. tonal shapes associated with lexically-accented syllables) are consistently present and are probably sufficiently salient to convey lexical contrasts in accentuation by themselves, without any other phonetic features being needed for the enhancement of the lexical contrast. Two of the speakers in our study, nevertheless, did show a consistent correlation between

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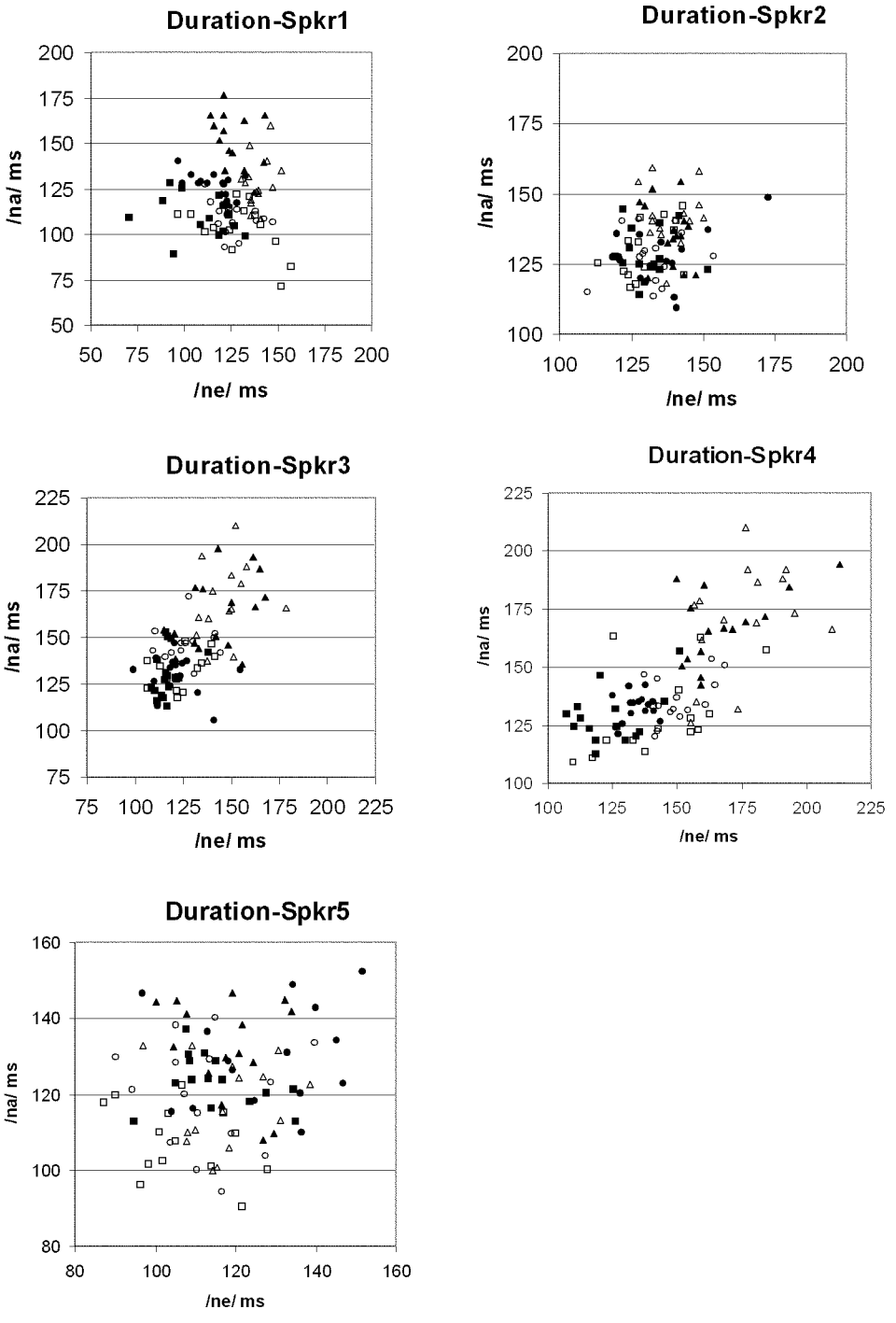

Figure 6 Duration results for all five speakers. Each point represents one measured utterance. Black symbols correspond to singular tokens (sg) and white symbols to plural tokens (pl). Circles = BF, squares = NFW1, triangles = NFW2.

BF = broad focus, NFW1 = narrow focus on word 1 of phrase, i.e. the target word is in postfocus; NFW2 = narrow focus on word 2, i.e. the target word has narrow focus; /ne/ms = duration in ms of syllable /ne/ (x-axis); /na/ms = duration in ms of syllable /na/ (y-axis). Because of the way axes portions have been chosen, points along the diagonal represent equal value for both syllables.

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duration and position of the accent (i.e. the accented syllable is identifiable because of its greater duration). This durational effect was not found for the other three speakers. Some Lekeitio speakers, then, do make use of duration, in addition to pitch, to enhance accented syllables. Further investigation is still needed to determine to what extent this is an idiolectal trait among Lekeitio speakers.

These results are consistent with those of another experiment reported in Elordieta & Hualde (2001). In that experiment, segmentally identical accented and unaccented syllables in the same context where compared across utterances. That is, the experimental materials consisted of matched pairs of sentences of the type *txa**ku**rren dxatekúa da* [tʃakuren dʒatekúara] 'it is the dog's (sg) food' – *txa**kú**rren dxatekúa da* 'it is the dogs' (pl) food', where the bolded syllables were measured for duration. Like in the present study, the experiment included sentences with broad focus and other sentences where the target syllable was either within a word under focus or in post-focal position. Unlike in the present study, in broad focus sentences the target word was in sentence initial (W1) position in most of the examples (20 out of 30) and, thus, free from the effects of downstep. In broad focus sentences, no significant difference in duration was found between accented and unaccented syllables. This was also the case in the other conditions, except that under narrow focus one of the six speakers in that experiment showed a significant increase in duration in accented syllables. The speaker showing this behavior was the same one that has been identified in this paper as Spkr1. It thus seems at this point in our investigation that the use of duration as a correlate of accentual prominence is an idiolectal trait in Lekeitio Basque. Such individual variation is not unexpected in a situation of bilingualism. In the present study the majority of the speakers did not enhance accented syllables durationally.

To sum up, in this paper we have investigated two possible correlates of accent in Lekeitio Basque: pitch and duration. Pitch appears to be used in a systematic and consistent manner by all Lekeitio Basque speakers to identify the accented syllable. In contrast with other European languages like English and Spanish, which employ a variety of pitch accents and also allow tonal deaccenting of deemphasized items, in Northern Bizkaian Basque accented syllables are always associated with a H*L tonal contour. We have seen that this pitch-accent is never suppressed, although it may be greatly downstepped. The fall in pitch from the accented syllable is a systematic feature that consistently allows the identification of the position of the accent in every case in pitch contours and presumably also in perception. What this means is that other potential correlates of accentual prominence, to the extent that they are at all employed, are somewhat redundant in Lekeitio Basque (and perhaps, more generally, in Northern Bizkaian Basque), unlike in many other European languages. Nevertheless, the results regarding duration also allow to state that at least some Lekeitio speakers make use of duration as an accentual correlate, in addition to pitch. This durational effect of accent was found in the data from two of our five speakers. At this point in the investigation of the dialect, we conclude that whereas pitch is a consistent correlate of accent, the use of duration to convey accentual prominence may be an aspect where variation among speakers is found in the speech community.

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Appendix

Table 1 F0 (Hz): Means (standard deviations) for all speakers and all conditions for both syllables in the ending /-nena/.

BF = broad focus utterances, NFW1 = narrow focus on first word (target word after focus), NFW2 = narrow focus on second word (target word in focus), N = number of token utterances.

F0	Mean (stdev) /ne/ Hz	Mean (stdev) /na/ Hz	N	Difference /ne/−/na/ ms
Spkr1-sg BF	164.13 (4.4)	162.8 (5.3)	15	1.33 (1.3)
Spkr1-sg NFW1	156.06 (4.4)	157.06 (4.2)	15	−1 (2.7)
Spkr1-sg NFW2	171.07 (6)	169.23 (7.9)	15	1.93 (3.3)
Spkr 1-sgALL	*163.76 (7.9)*	*163 (7.7)*	*45*	*.76 (2.8)*
Spkr1-pl BF	170.86 (6.8)	147.13 (5.5)	15	23.73 (5.5)
Spkr1-pl NFW1	160.8 (4.9)	145.26 (5.31)	15	15.53 (6.11)
Spkr1-pl NFW2	184.07 (7.2)	142.67 (9.7)	15	41.4 (7.2)
Spkr 1-pl ALL	*171.91 (11.8)*	*145.02 (7.2)*	*45*	*26.89 (12.3)*
Spkr2-sg BF	201.40 (5.8)	200.80 (5)	15	.60 (2.7)
Spkr2-sg NFW1	192.93 (6.6)	189.33 (5.9)	15	3.60 (2.7)
Spkr2-sg NFW2	217 (5.7)	211.87 (4.2)	15	5.13 (3.9)
Spkr2-sgALL	*203.78 (11.7)*	*200.67 (10.5)*	*45*	*3.11 (4.3)*
Spkr2-pl BF	200.07 (5.1)	184.53 (7.7)	15	15.53 (6.3)
Spkr2-pl NFW1	194.43 (4.6)	172.71 (6.7)	14	21.71 (4.4)
Spkr2-pl NFW2	221.33 (6.4)	191.60 (4.3)	15	29.73 (7.4)
Spkr 2-pl ALL	*205.52 (12.8)*	*183.18 (10.01)*	*44*	*22.34 (8.5)*
Spkr3-sg BF	151.26 (4.3)	147.33 (5.3)	15	3.93 (4.3)
Spkr3-sg NFW1	146.57 (6.9)	144.5 (7.2)	14	2.07 (2.9)
Spkr3-sg NFW2	176.33 (7.9)	172.3 (10.6)	15	4.03 (7.6)
Spkr3-sg ALL	*158.31 (14.7)*	*154.94 (14.9)*	*44*	*3.37 (5.3)*
Spkr3-pl BF	155.15 (4)	131.38 (3.2)	13	23.76 (3.1)
Spkr3-pl NFW1	149.69 (9.4)	127.53 (4.9)	13	22.15 (8.7)
Spkr3-pl NFW2	184.33 (15.1)	130 (5.8)	15	54.33 (16.6)
Spkr3-pl ALL	*164.09 (18.9)*	*129.65 (4.9)*	*41*	*34.43 (18.8)*
Spkr4-sg BF	158.77 (6.7)	157.69 (7)	13	1.08 (3.7)
Spkr4-sg NFW1	155.57 (19.8)	154.64 (19.4)	14	.93 (3.8)
Spkr4-sg NFW2	197.2 (12.7)	193.47 (11)	15	3.73 (6.6)
Spkr4-sg ALL	*171.43 (23.9)*	*169.45 (22.5)*	*42*	*1.98 (5)*
Spkr4-pl BF	167.5 (5.5)	123.04 (12)	14	44.46 (11.6)
Spkr4-pl NFW1	168 (21.1)	122.18 (14.6)	11	45.82 (9)
Spkr4-pl NFW2	217.33 (15.4)	130.4 (25.4)	15	86.93 (21.8)
Spkr4-pl ALL	*186.33 (28.3)*	*125.56 (18.7)*	*40*	*60.75 (25.6)*
Spkr5-sg BF	169.93 (6.4)	170.2 (7.3)	15	−.66 (2.6)
Spkr5-sg NFW1	161.26 (2.5)	160 (2.6)	15	1.4 (1.4)
Spkr5-sg NFW2	177 (7)	176.33 (7.7)	15	.667 (2.6)
Spkr5-sg ALL	*169.4 (8.5)*	*168.86 (9.1)*	*45*	*.489 (2.4)*
Spkr5-pl BF	174.06 (8.3)	156.66 (5.9)	15	17.4 (3.9)
Spkr5-pl NFW1	162.73 (3)	149.66 (3.2)	15	13.06 (3.6)
Spkr5-pl NFW2	189 (6.7)	156.6 (5.2)	15	32.4 (7.3)
Spkr5-pl ALL	*175.26 (12.5)*	*154.31 (5.8)*	*45*	*20.9 (9.8)*

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Table 2 Durations in ms: Means (standard deviations) for all speakers and all conditions for both syllables in the ending /-nena/.

Duration	Mean (stdev) /ne/ ms	Mean (stdev) /na/ ms	N	Difference /ne/—/na/ ms
Spkr1-sg BF	115.44 (10.5)	127.75 (6)	15	—12.3 (14.6)
Spkr1-sg NFW1	109.98 (17.3)	110.12 (10.7)	15	—0.1 (22.4)
Spkr1-sg NFW2	126.21 (9.2)	149.48 (17.2)	15	—23.2 (21.6)
Spkr 1-sg ALL	*117.21 (14.3)*	*129.12 (20.2)*	*45*	*—11.9 (21.6)*
Spkr1-pl BF	126.64 (10.6)	109.05 (8.7)	15	17.5 (15.5)
Spkr1-pl NFW1	128.74 (16.9)	103.6 (14.3)	15	25 (27)
Spkr1-pl NFW2	139.06 (5.9)	128.3 (13.6)	15	10.7 (13.3)
Spkr 1-pl ALL	*131.48 (13.1)*	*113.68 (16.1)*	*45*	*17.8 (20.4)*
Spkr2-sg BF	134.98 (14.3)	127.61 (9.8)	15	7.3 (14.1)
Spkr2-sg NFW1	130.82 (8.4)	128.42 (8.8)	15	2.3 (12.5)
Spkr2-sg NFW2	138.69 (5.9)	135.82 (10.9)	15	2.8 (14.1)
Spkr 2-sg ALL	*134.85 (10.5)*	*130.62 (10.4)*	*45*	*4.2 (13.5)*
Spkr2-pl BF	132.28 (9.8)	127.7 (9.1)	15	4.5 (12.3)
Spkr2-pl NFW1	130.22 (8.9)	130.12 (10)	15	0.1 (9.4)
Spkr2-pl NFW2	138.43 (7.3)	140.78 (10.9)	15	—2.3 (12.7)
Spkr 2-pl ALL	*133.72 (9.2)*	*132.92 (11.4)*	*44*	*0.7 (11.2)*
Spkr3-sg BF	121.56 (13.7)	131.12 (10.7)	15	—9.5 (19.5)
Spkr3-sg NFW1	116.82 (6.7)	129.61 (13.1)	15	—12.7 (12)
Spkr3-sg NFW2	144.38 (3.8)	163.58 (15.6)	15	—19.2 (19.5)
Spkr 3-sg ALL	*127.58 (17.1)*	*141.43 (21.7)*	*45*	*—13.8 (17.5)*
Spkr3-pl BF	125.05 (10.9)	144.15 (11.6)	15	—19.1 (13.9)
Spkr3-pl NFW1	123.08 (12.6)	132.18 (9.2)	15	—9 (11.6)
Spkr3-pl NFW2	144.98 (14.7)	168.55 (20)	15	—23.57 (21)
Spkr 3-pl ALL	*131.04 (15.6)*	*148.2 (20.7)*	*45*	*—17.2 (16.8)*
Spkr4-sg BF	134.59 (5.3)	133.18 (5.7)	15	1.4 (7.6)
Spkr4-sg NFW1	124.23 (13)	128.38 (11.4)	15	—4.1 (13.6)
Spkr4-sg NFW2	167.78 (17.5)	167.78 (15.8)	15	0 (16.11)
Spkr4-sg ALL	*142.2 (22.6)*	*143.11 (21.1)*	*45*	*—.9 (12.8)*
Spkr4-pl BF	149.34 (11.5)	135.53 (10.2)	15	13.8 (10.3)
Spkr4-pl NFW1	143.7 (19.9)	130.17 (18)	15	13.5 (18.9)
Spkr4-pl NFW2	175.5 (16.5)	170.59 (23.7)	15	4.9 (23)
Spkr4-pl ALL	*156.18 (21.2)*	*145.43 (25.4)*	*45*	*10.7 (18.3)*
Spkr5-sg BF	127.15 (16.5)	130.15 (13.21)	15	—3 (19.2)
Spkr5-sg NFW1	115.02 (11)	123.5 (6.9)	15	—8.5 (14.6)
Spkr5-sg NFW2	118.17 (10.4)	132.2 (12.68)	15	—14.1 (18.6)
Spkr5-sg ALL	*120.1 (13.6)*	*128.6 (11.66)*	*45*	*—8.5 (17.8)*
Spkr5-pl BF	112.3 (12.9)	119.71 (14.12)	15	—7.3 (19.9)
Spkr5-pl NFW1	106.3 (12.1)	107.87 (9.5)	14	—1.4 (18.2)
Spkr5-pl NFW2	117.6 (10.8)	117.37 (11.4)	15	0.2 (14.8)
Spkr5-pl ALL	*112.2 (12.6)*	*115.15 (12.7)*	*45*	*—2.9 (17.6)*

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