

Prosodic Transfer in L2 Speech: Evidence from Phrasal Prominence and Rhythm

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Abstract

The current study examines focus and Nuclear Pitch Accent in the second language (L2) speech of Spanish speakers of English. We begin with a discussion of the distinct algorithms said to account for Nuclear Stress (NS) at work in Spanish and English. We then match the theoretical claims with experimental data on the placement of Nuclear Accent for various focus constructions from native speakers of English, followed by a contrasting set of data from L2 speakers. However, the L2 speakers are not a homogenous group, and indeed the production behavior across proficiency groups gives rise to the hypothesis that the acquisition of nuclear pitch accent is hierarchical in nature: learners acquire anaphoric de-accenting before nuclear stress. We conclude with a discussion of further data that supports the notion that phrasal prosodic patterns might be related to some fundamental rhythmic difference between the two languages.

1. Cross-linguistic differences in NS

This paper intends to contribute to our understanding of certain aspects of prosodic transfer in SLA, an area that has only recently begun to be a focus of serious research (cf. Goad & White 2006; Tremblay 2007). More specifically, we look at native Spanish speakers as they progress towards native-like production of Nuclear Stress (NS) in English (their L2), and how this progression toward prosodic representation might be informed by underlying rhythmic/metrical patterns at work in each language.

Based on evidence from second language (L2) speech, we argue that the computation of nuclear pitch accent in English arises from the complex interplay of several distinct algorithms. At the heart of this computation is the Nuclear Stress Rule. Due to the pervasive phenomenon of “transfer” of the grammatical properties of the first language (L1) into L2 speech, the latter can constitute a window into the mental representation of the two systems in contact.

1.1. Nuclear Stress: Algorithms at work

In Spanish (or more generally in the Romance languages), main phrasal prominence (or NS) aligns with the last word of the Intonational Phrase (IntP) in wide-focus contexts (Zubizarreta 1998, Sosa 1999).¹ As is well known, this is not always the case in English (or more generally in the Germanic languages). The Germanic NS algorithm in (1) applies to a metrical structure, which is a proper set of the syntactic structure.

¹ This is not true of emphatic or contrastive stress, which can even target a subpart of a word.

- (1) Given two sister nodes A and B in a binary metrical structure, if B is selected by A, then assign NS to B. Otherwise, assign NS to the rightmost node.²

The application of the NS algorithm gives rise to a metrical grid, which can then be further manipulated by other rhythmic related-rules (as in Halle & Vergnaud 1987)

We can appreciate the difference between the Germanic NSR and the Romance NSR in the unaccusative and transitive compound data sets. The rule given in (1) correctly captures the patterns given below. In transitive structures, NS falls on the object, whether or not the object has been incorporated into the verb, i.e. whether the order of elements is VO or OV. (The parentheses indicate the metrical structure, italics the metrically invisible constituents, and the underline the word that bears NS.)

- (2) a. Every summer, (Mary (watches birds)).
(SVO)
b. Every summer, (Mary (*goes* (bird-watching))).
(SOV)

Unaccusative structures provide further support for the Germanic – Romance distinction. In such structures, the subject and the verb are metrical sisters and the subject is the argument in the selectional relation, and therefore the most prominent:

- (3) a. The magician disappeared.
b. The mail arrived.

It is to be noted that in the unaccusatives structures, the presence of an adverb to the left or to the right of the verb pulls the NS to the right. This follows from the fact that the adverb and the verb are sister nodes in the metrical tree but they are not selectionally related.³

- (4) a. (A dog (mysteriously disappeared)).
b. (A dog (disappeared mysteriously)).

(Gussenhoven 1984)

² This is a reformulation of the NSR algorithm in Zubizarreta 1998. In Zubizarreta (1995, 1998) an attempt is made to unify the two parts of the rule by appealing to an abstract notion of “order” that subsumes both selectional ordering and constituent ordering. It was furthermore proposed that only the constituent ordering computation is relevant for Romance.

³ The paradigm in (4), confirmed by our experimental data, shows that the placement of NS on the subject in the unaccusative examples in (3) cannot be computed in terms of the subject’s trace; see in particular (4a).

NS is rightmost within the Intonational Phrase in Spanish. Spanish being a language with relative free word order (with preverbal and postverbal subjects), if the word order is VS, NS falls on the S and if the word order is SV, NS falls on V, as in examples (6) and (7). See Nava forthcoming for more details.

- (6) a. Desapareció un niño. (VS)
 b. Llegó el correo.
- (7) a. Un bebé está llorando. (SV)
 b. El niño sonrió.

1.2. Anaphoric De-accenting

The other phenomenon that distinguishes the two languages is the existence of a post-nuclear Anaphoric De-accenting in English illustrated below, which is absent in Spanish. In (8a), the object having been mentioned in the context question, the stress shifts on to the verb in the answer. In (8b), the PP having been mentioned in the context question, the NS shifts on to the Object.

- (8) a. Why are you buying that old stamp?
 Because I collect stamps.
- b. Why are these notebooks missing their covers?
 Because I'm drawing pictures on the covers.

Anaphoric De-accenting is independent from the parametrization of the NSR.⁴ Reinhart 2006 has convincingly argued that Anaphoric De-accenting applies to the output of the NSR. Post-nuclear de-accenting in (2b) and (3) is due to a general convention which states that the material that follows NS within the same prosodic phrase is de-accented. On the other hand, post-nuclear de-accenting in (8) is due to a late, post-nuclear rule that shifts prominence to the left by deleting the pitch accent associated with the anaphoric constituent.

1.3. Hypotheses and predictions

Acquiring the Germanic Nuclear Stress Rule for a L2 speaker requires reformulating their native NS algorithm, whereas acquiring anaphoric de-accenting does not require reformulation of any native rule. Given these considerations, it is reasonable to put forth the hypotheses in (9), and the related predictions in (10).

Hypotheses:

- (9) a. Span L1/Eng L2 speakers who have not acquired the Germanic NSR will compute the NS solely on the basis of the Romance NSR.
 b. Span L1/Eng L2 speakers who have not acquired the Germanic NSR may have acquired the Anaphoric De-accenting Rule.
 c. Span L1/Eng L2 speakers who have acquired NSR will have acquired the Anaphoric De-accenting rule.

Predictions:

- (10) a. Learners will produce target-like prosodic structures for SVO, but un-target-like prosodic

structures for SOV and unaccusative SV. In the latter two cases, learners will assign NS to V.

b. The same learners may produce target-like de-accented DPs with NS on V in SVO structures with an anaphoric object and NS on the direct object in SVOPP structures with an anaphoric P-object.

c. Learners who produce target-like prosodic patterns for SOV structures and target-like unaccusative SV prosodic patterns will also produce target-like anaphoric de-accenting patterns for SVO (anaphoric object) and SVOPP (anaphoric PP) structures.

We pose a further question based on the above hypotheses: can the difference in phrasal prosodic patterns defined by the Germanic NSR as compared to the one that operates in Spanish be related to some fundamental rhythmic difference between the two languages? We explore the possibility that indeed, the stress-timed (English) vs. syllable-timed (Spanish) isochrony (e.g. Dauer 1983, 1987) is intimately tied to the phrasal prominence pattern. This predicts the following correlations in the L2 prosodic production:

- (11) Spanish learners of English that have acquired the Germanic NSR should have shifted from syllable to stress timing.

In order to test our claims, two distinct production experiments were designed that compared the production of 14 English Native Controls (ENC) and 10 L1 Spanish learners of English. Four participants of the latter group tested at the high proficiency level, and the remaining six at the intermediate proficiency level as determined by a Cloze test.

2. Study I

The first experiment was designed to mirror a conversational, question and answer format, in order to empirically determine the intonation patterns associated with common sentence types in English. The experimenter and the participant read from a script while the participant's responses were recorded. All sound files were analyzed using PitchWorks software program.

2.1.1. Stimuli

The stimuli used for the question and answer experiment were designed using a Latin Square Design. Targets and fillers were balanced across sets. The information structure categories included wide-focus (transitive, unaccusative, unergative), VP-focus, subject focus, anaphoric de-accenting (objects, prepositional phrases, pronouns), adverb placement, and compound constructions. Only a subset of the data will be reported on here.

2.2. Results of Study I

The results (summarized in Tables 1 through 4) confirm the hypothesis that L2ers begin calculating NS in their L2 based on the L1 algorithm. In the case of unaccusatives SV (see 3), L2ers placed NS on the verb in 84% of the tokens in the case of SV unaccusatives and in 60% of the tokens in the OV compound (see 2b), as predicted by their L1 NS algorithm

⁴ While French is like Spanish with respect to its NS algorithm, the two languages differ in that French (but not Spanish) has Anaphoric de-accenting. See Ronat 1982, Zubizarreta 1998. This supports the view that Anaphoric de-accenting is independent of the NS algorithm.

which assigns NS right-most in these cases – in contrast to the Germanic NSR; (see Tables 1 and 2).

Table 1. Unaccusative Structures

| Unaccusative ⁵ | Prosodic Pattern [<u>S</u> v] ⁶ | Prosodic Pattern [S ADV <u>V</u>] | Prosodic Pattern [S V <u>ADV</u>] |
|---------------------------|---|---------------------------------------|---------------------------------------|
| ENC | 80% | 70% | 89% |
| L2 | 16% | 100% | 83% |

Table 2. Transitive Compound Structures

| Transitive Compound | Prosodic Pattern [S [<u>O</u> v]] |
|---------------------|-------------------------------------|
| ENC | 93% |
| L2 | 40% |

A difference between native controls and L2ers with respect to Anaphoric de-accenting, was also found (see Table 3 below). The predictions laid out as part of the discussion in Section 1.2. do hold in the case of ENCs, who performed as expected by deleting the pitch accent associated with the anaphoric constituent, as the result of a late, post-nuclear rule. However, not all L2ers have acquired this distinction.

Table 3. Anaphoric De-accenting

| Transitives | Prosodic Pattern [S [<u>V</u> o]] | Prosodic Pattern [S [V <u>O</u> pp]] |
|-------------|--|--|
| ENC | 81% | 80% |
| L2 | 35% | 21% |

We conducted a within-subject analysis to test (9b), which predicted that an order effect could be observed with regards to de-accenting and correct NS application. The results are summarized below in Table 4. High proficiency speakers do Anaphoric de-accenting and produce Germanic NS patterns. As predicted, there are intermediate speakers who apply Anaphoric de-accenting but lack Germanic NS – but crucially the opposite order is not found.

Table 4. Proficiency and Acquisition of Prosodic Patterns

| Number of L2 Speakers | Target-like NS pattern | Target-like Anaphoric De-accenting |
|-----------------------|------------------------|------------------------------------|
| 6 | - | - |
| 2 | - | + |
| 2 | + | + |
| (0) | + | - |

3. Study II

3.1. Rhythmic classification

The descriptive classification of languages according to isochronic preferences has enjoyed long-standing debate. The

⁵ These tokens represent a conflation of three unaccusative categories: change of location, change of state, and presentational.

⁶ Underline and bolding mark NS placement; lower case letters mark de-accenting.

original categorical stress-timed vs. syllable-timed classification proposed by Pike (1946) was challenged by a variety of researchers aiming to improve on the accuracy of the nature of the measurements. Dauer's (1983) approach was particularly well-received in its proposal that the relevant differences for language classification are syllable structure inventory, vowel reduction, and word level stress. Pike (1946) suggested that characteristics of this nature were side effects of *isochrony*, described in terms of the stress vs. syllable timed distinction, whereas Dauer argues that these characteristics are the defining features, and that languages can be thought of as standing in a scalar relationship to one another, lying along a continuum.

The rhythmic classification discussion is pertinent for the current investigation as we pursue the notion that the underlying rhythmic organization of the language has repercussions at the phrasal level, and that the difference observed between ENC and L2 speech for NS production is tied to timing at the rhythmic level.

3.2. Pairwise Variability Index measurements

The motivation for this second experiment is to investigate the prediction put forth in (11). We pursue the idea that progression toward prosodic representation might be informed by underlying rhythmic/metrical patterns at work in each language.

In order to determine if durational variability of vowels and intervocalic intervals can be observed among the speech of ENC and the two proficiency groups, normalized Pairwise Variability Index measurements were taken of vowel durations for all participants (Low & Grabe 2002). Measurements were made on participants' readings of "The North Wind and the Sun" passage.

3.3 Results from Study II

Preliminary data from the Pairwise Variability Index measurements suggest that rhythmic differences between ENCs and L2ers is organized along a continuum: measurements for ENCs cluster around stress-timed values (cf. Low & Grabe 2002), measurements from lower proficiency speakers fall in the range reported for syllable-timed languages (i.e. Spanish), with high proficiency speakers falling in between the two.

4. Discussion and conclusions

Results from experimental data show that there is negative prosodic transfer in the case of NS for a variety of information structure categories in the speech of L2 learners. Prosodic interference in these cases is the result of the application of the L2 learner's native language NS algorithm in the L2. Acquisition of de-accenting precedes acquisition of NS, as no reformulation of the algorithm is required.

As L2 learners progress toward native-like prosodic proficiency at the phrasal level, their path includes an adjustment of the rhythmic/metrical timing – as evidenced by preliminary data from the Pairwise Variability Index measurements.

To conclude, the prosodic interlanguage of L1 Spanish/L2 English speakers supports a modular view of the Germanic Nuclear Stress Algorithm.

5. References

- [1] Dauer, R. 1983. Stress Timing and Syllable Timing Reanalyzed. *Journal of Phonetics* 11: 51-62.
- (1987), Phonetic and Phonological Components of Language Rhythm. In the *Proceedings of Xith ICPHS* (Tallinn, Estonia, USSR), 5: 447-50.
- [2] Halle, M., and J.-R. Vergnaud. 1987. *An essay on stress*. Cambridge, Mass.: MIT Press.
- [3] Goad, H. and L. White. 2006. Ultimate attainment in interlanguage grammars: a prosodic approach. *Second Language Research* 22, 3 243-268
- [4] Gussenhoven, C. 1984. *On the Grammar and Semantics of Sentence Accents* (Dordrecht: Foris).
- [5] Low, E.L. & Grabe, E. 2002. Durational Variability in Speech and the Rhythm Class Hypothesis. In C. Gussenhoven and N. Warner (eds.), *Laboratory Phonology 7* (Berlin and New York: Mouton de Gruyter), 515-46.
- [6] Nava, E. forthcoming. Prosody in L2 Acquisition. In the *Selected Proceedings of Generative Approaches to Second Language Acquisition 9*, University of Iowa, Iowa City, IA. May 18 – 20, 2007: Cascadilla Proceedings Project.
- [7] Pike, K. 1946. *The Intonation of American English*. Second edition. Ann Arbor: University of Michigan Press.
- [8] Ronat, M. 1982. Logical Form and discourse islands. *Journal of Linguistic Research* 2, 33-48.
- [9] Sosa, J. M. 1999. *La entonación del español*. Madrid: Ediciones Cátedra.
- [10] Tremblay, A., & Demuth, K. 2007. Prosodic licensing of determiners in French. In A. Belikova, L. Meroni, & M. Umeda (Eds.), *Proceedings of the Second Biennial Conference on Generative Approaches to Language Acquisition North America* (pp. 426–436). Somerville, MA: Cascadilla Press.
- [11] Zubizarreta, Maria Luisa. 1998. *Prosody, focus, and word order*. Cambridge, Mass.: MIT Press.
- [12] Zubizarreta, M. L. and Vergnaud, J.-R. 2005. Phrasal Stress, Focus, and Syntax. In M. Everaert and H. van Riemsdijk, eds., *The Syntax Companion*. Blackwell.