L2 ACQUISITION OF NUCLEAR ACCENT

BY

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DISSEPTION

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Abstract

In acquiring a second language (L2), it has been noted that the phonetics and phonology of an L2 can be difficult for learners to acquire and many sound structures from a learner’s first language (L1) are transferred into the L2, resulting in pronunciation patterns that diverge from the native norms. Pervasive transfer can at times be evident even after the speaker has reached high levels of proficiency. However, not all sound structures pose learners an equal amount of difficulty or are equally subject to persistent transfer effects. Various frameworks have been proposed to predict which sounds will be difficult for a learner based on a given L1-L2 combination (e.g. Best, 1994, 1995; Escudero, 2005, 2009; Flege, 1987, 1995). These traditional models generally account for the acquisition of segments only. However, in more recent years, there has been increased attention given to L2 acquisition of prosody in the field. This body of research has been increasing drastically and includes various aspects of the L2 acquisition of prosody, including the acquisition of prosodic structures from the word level (e.g. Face, 2005; Guion et al., 2004; Nguyen et al., 2008; Zubizarreta et al., 2013) up until the phrase level (e.g. Rasier & Hiligsmann, 2009; van Maastricht et al., 2016; Zubizarreta & Nava, 2011) and considers both the acquisition of the phonological (e.g. van Maastricht et al., 2016; Zubizarreta, 2014) and phonetic (e.g. He et al., 2011) aspects of prosody. Today, thanks to the expanding number of studies available on the L2 acquisition of prosody, a better understanding of this process is beginning to emerge. While frameworks have been proposed in order to predict the relative difficulty of prosodic structures (Albin, 2015; Mennen, 2015; So & Best, 2014; Zubizarreta & Nava, 2011), a broader understanding of the acquisition of L2 prosody still must be achieved before we have a complete picture on the development of L2 prosody. This is no easy task, as prosody, compared to segments, is more intricately intertwined with the meaning of words or utterances. Additionally, prosodic events are often more difficult to measure. Because prosody is so multi-faceted, there are still many research questions needing to be addressed in this field.

The studies in this thesis examine the phonological acquisition of prosody at the level of the phrase. Specifically, L2 acquisition of nuclear accent (NA) placement is investigated in order to better understand which contexts of NA placement and shift in an L2 are more difficult to acquire and why. Two experiments are presented, which examine both L2 English and L2 Spanish. These two languages are interesting to compare as the grammatical rules behind NA placement vary predictably in the two languages. English is categorized as a prosodically plastic language (Vallduví, 1991) as it exhibits flexible NA placement. Generally, NA in English occurs on the
rightmost content word, but can move leftwards under certain conditions. Spanish, on the other hand, is often referred to as a non-plastic language. NA in Spanish tends to occur more invariably on the rightmost content word. Traditional theories on Spanish grammar posit that the nuclear accent is not as flexible as in English and can only move leftwards to mark contrastive focus (e.g. Zubizarreta, 1998). Instead of employing prosodic means, Spanish relies on word order inversions to mark some of the distinctions English marks prosodically. By including these two languages, these two studies are able to examine how L1 speakers of a non-plastic language acquire a plastic grammar, how speakers of a plastic language acquire a non-plastic language, and how the acquisition of non-plastic prosody develops in relation to the acquisition of word order inversions.

In order to address these questions, two semi-parallel experiments were conducted. The first, referred to as the English Experiment, tests L1 speakers of Spanish who are acquiring English as an L2. The second, known as the Spanish Experiment, examines L1 speakers of English learning L2 Spanish. The English Experiment includes an Oral Production Task, in which nuclear accent shift is elicited in various contexts, including in compounds, utterances with a final indefinite pronoun, utterances with contrastive focus on a non-final word, and in broad focus intransitives. These various contexts of NA shift, many of which intersect with other domains of grammar, are included in order to examine which factors make acquisition of NA shift more difficult or which areas may be more susceptible to transfer. The Spanish Experiment includes both a Word Order Task and an Oral Production Task. The Word Order Task is designed to test learners’ preference of VS word order in context of narrow focus and broad focus intransitives. These same contexts were included in the Oral Production Task in order to examine whether learners are transferring any of the predicted L1 prosodic patterns into their L2.

Results indicate that it is more difficult for the L1-Spanish/L2-English speakers to acquire a plastic prosodic system than it is for the L1-English/L2-Spanish speakers to acquire a non-plastic prosodic system. In L2 English, learners were most accurate at producing NA shift in compounds. NA shift to mark contrastive focus was produced with the second highest level of accuracy, with contexts of NA shift for utterance-final indefinite pronouns and in intransitives as seemingly the most difficult to acquire. Both transfer and difficulty of acquiring phenomena at the interfaces are explored as potential explanations for these patterns. The L2 speakers of Spanish, in comparison, produced prosodic patterns similar to the L1 speaker group in both narrow focus and broad focus constructions. There were no effects of proficiency, suggesting learners were able to learn Spanish prosody relatively quickly. The syntactic acquisition of word order inversions, on the other hand, were less target-like with learners showing an overwhelming preference for SV word orders, regardless of the context.

Findings from these studies have theoretical implications for the trajectory of acquisition of prosody at the phrase level and for the role of transfer versus universals of acquisition. Additionally, the findings from the Spanish Experiment present implications for the relationship between the acquisition of syntax and phonology. Such theoretical implications are discussed in relation to the findings of these two studies and the existing frameworks are evaluated in light of this new data.
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1 Introduction

1.1 Second Language Learning

Many people, at one point or another in their life, embark on the journey of learning a second language (L2). The motivation behind choosing to study a second language varies widely from individual to individual. Some start studying a second language because they are required to for school or university. Others take a more active interest in a different country or culture and decide to study the language(s) of this country in order to learn more and possibly visit. Yet others learn a language for career options or advancement. Then there are those who may find themselves in a situation where they have migrated to another country and would like to be able to communicate more easily in their new surroundings. There are many more reasons why someone may choose to study a language later in life, and just how the reasoning behind learning an L2 can vary so can the method. While many start learning a language face-to-face in a classroom, others may begin using some sort of language learning software or phone app. There are also those whose primary exposure is more naturalistic and they learn it in context, from friends or family members.

In addition to the reasoning and method of learning an L2, there are a multitude of other factors that can differ from learner to learner, including the age of acquisition, amount of exposure to the target language, level of motivation of the speaker, and many, many others. One consequence of this amount of variation is that the L2 learners tend to vary greatly in how far they progress in learning their L2 and how target-like they eventually become. While there are those learners who, by all appearances, seem very target-like, a large portion of L2 learners deviate from native (L1) speakers in their ability to produce, perceive or understand their L2. This observation has prompted many researchers to examine why learner language differs so from the target variety.

While the above-mentioned factors concerning the characteristics of the individual learners and the pedagogical methods have been found to play a role in L2 acquisition, it has also been noticed that factors relating to the linguistic properties of both the L1 and L2 can influence L2 speech production and language acquisition. All L2 learners will start the learning process with at least one L1 that they already have had years of experience with. This L1 (or the various L1’s) will inevitably affect the L2 and its development. Any given L2 will likely differ from a speaker’s L1 in many ways, but there will also be certain similarities. Both the similarities and differences can either speed or hinder the rate of learning as both can be transferred from the L1 into the L2.

Similarities can result in positive or facilitative transfer (e.g. Jarvis & Pavlenko, 2008; Ringbom
Transfer refers to the process of bringing properties from the L1 into the L2. Positive transfer refers to the phenomenon in which the transferred properties match those in the L2 thereby helping the learner. Differences in the L1 from the L2, on the other hand, can result in negative or intrusive transfer, in which L1 characteristics that do not match the L2 are nonetheless brought into L2 comprehension or production (e.g. Hammerly, 1991).

While transfer undoubtedly plays an important role in L2 learning, there are other factors at play which can affect either the process of transfer or L2 learning itself. For example, while it seems that transferring similar elements from the L1 into the L2 should be relatively straightforward, this is not always the case. For example, it has been shown that structures that speakers perceive as being too marked or too specific to the L1 will resist transfer, even if this marked structure exists in the L2 (Kellerman, 1979).

Additionally, there are certain universal tendencies that can affect L2 acquisition that are not related to transfer. For example, it has been shown that it easier to for learners to acquire less marked structures, especially when the more marked counterparts of the unmarked L2 structures occur in the L1 (e.g. Eckman, 1977, 2004).

Finally, there have also been observed trajectories of acquisition, where learners tend to acquire certain structures (whether they can be transferred from the L1 or not) before they acquire others (e.g. Dulay et al., 1982; Goldschneider & DeKeyser, 2001).

Researchers have long been interested in the role of both cross-linguistic influence (or transfer) and universal principles on L2 acquisition. Most studies have focused on examining the acquisition of one domain of language in order to answer these questions. The areas of syntax, morphology, semantics, pragmatics, phonology, as well as their interfaces have all have countless bodies of research devoted to them. Despite this, there are still areas in which the role of transfer and universal principles are not well understood. This study will focus on the L2 acquisition of prosody, which is one area of research that has been neglected until more recently.

1.2 L2 Acquisition of Phonology

One of the linguistic domains in L2 acquisition that consistently seems to retain characteristics from the L1, and that often identifies learners as non-native speakers even to linguistically naïve listeners is the area of phonetics and phonology. Just like other domains of language, the acquisitions of the phonetics and phonology of both segmental and suprasegmental sounds can be subject to both transfer and universal learning principles. Many of the theories of L2 phonological acquisition try to predict which sound structures will pose more difficulties for learners. These theories include (among others) Flege’s Speech Learning Model (Flege, 1995, 2003), Best’s (1994, 1995) Perceptual Adaptation Model and the Second Language Perception Model (Escudero, 2005, 2009). All these models base their predictions for level of difficulty in the acquisition of phonemes or phonemic contrasts on similarities and differences in the L1 and L2, and there are large bodies of research presenting findings supporting each of these. While the models make different predictions, they all
point towards the relevance of similarities or differences in playing a role in the difficulty (or lack thereof) in acquiring segments in an L2.

Most of the models and theories predicting patterns of L2 phonological acquisition have largely only considered the acquisition of segments (and specifically focused on perception of segments for the most part). Both the production and perception of segments is relatively easy to measure when compared to that of suprasegmentals. However, by neglecting the sub-domain of prosody, we would be missing a large part of the story of L2 acquisition of phonology. Luckily, however, this has been changing and more recently, there have been many studies devoted to understanding L2 acquisition of prosody and suprasegmentals.

There are a variety of linguistic properties that fall under the umbrella term of prosody. There are the various acoustic manifestations of prosody, which can be expressed through properties such as duration, intensity, pitch, and pitch movement, among others. What likely differentiates prosody most from segmentals is the close relationship prosody has to its function, which is often semantic or pragmatic in nature. Prosodic phenomena are relevant at varying levels of speech. It can be relevant at the word level in expressing lexical tone, or in marking word stress. It is also relevant at the phrasal level, where it can mark pragmatic meanings, information structure or sentence type.

Because prosody is so important in expressing a variety of meanings, it is an important aspect for any learner to acquire in an L2. It also seems to present learners difficulty, as even high proficiency learners often will produce non-target-like prosodic patterns (e.g. Mennen, 2004, 2015). As there are so many aspects to prosody (i.e. its phonetic realization, the fact it is relevant at both the word and phrase level, and its form-function link), studies have usually been able to concentrate on only one of these. A complete picture of the L2 acquisition of prosody is yet to emerge for us to better understand this process. The studies in this dissertation are designed to focus on examining acquisition of phrase-level prosody specifically, by looking at the acquisition of nuclear accent across different constructions. This will broaden our understanding of the trajectory of L2 acquisition of prosody in this domain.

1.3 Goals and Outline of this Dissertation

The goal of the studies in this dissertation is to learn more about the L2 acquisition of prosody and the role of cross-linguistic influence on the difficulty level of the acquisition of various prosodic structures at the level of the phrase. Two experiments are described in this dissertation. There is an English Experiment, which tests the production of nuclear accent placement and shift in various constructions by both L1 and L2 speakers. There is also a Spanish Experiment, which examines how both L1 and L2 speakers use either word order inversions or nuclear accent shift to mark a word as prominent. Testing the acquisition of phrase-level prominence in both L1-English/L2-Spanish and L1-Spanish/L2-English speakers will hopefully shed some light on some unanswered questions and contribute to the body of literature on L2 acquisition of prosody.

This dissertation is organized as follows: The following chapter (Chapter 2) will review the
relevant previous studies and literature and how the research questions relate to what we already know. Chapter 3 will present the methodology and results for the English Experiment and Chapter 4 will present the methodology and results for the Spanish Experiment. Finally, the concluding chapter, Chapter 5, will summarize the results from both experiments and will discuss any future directions and limitations from the present study.
2 Literature Review

2.1 Expression of Prominence

Across languages, speakers have the need to draw attention to certain pieces of information. They do this by forming utterances which are then communicated to an audience, be that a single listener, a large group of people, or even possibly communicated simply to the speaker themselves. However, not every word in an utterance has equal weight. Some information may be judged by the speaker to be already known to the listener, while other components may be new or unexpected. Such factors can affect the realization of an utterance. Specifically, speakers may try to highlight the parts of an utterance that they feel is most important or that they feel is new or even unexpected to help aid in the listener’s comprehension of what they are saying. To do this, they give these elements prominence. Elements of an utterance that are old information or highly predictable are often not afforded the same type of prominence.

While this has been observed to be a universal trend, the method of expressing prominence across different languages can vary. Some languages can do this morphologically, while other languages do this syntactically, changing the surface order of the words of an utterance. Finally, some languages express prominence prosodically by increasing acoustic measures of prominent words, such as the intensity, duration or pitch. Languages that mark prominence prosodically often prefer for the most important word to be marked by what is often referred to as the nuclear accent (NA). The nuclear accent can be defined as the final prominence in an utterance, and it often plays a role in indicating the focus structure of an utterance (Ladd, 2008). Nuclear accent has also been referred to as the Designated Terminal Element (Liberman & Prince, 1977) or sentence stress (Ladd, 2008; Schmerling, 1976).

To describe these observed differences, scholars have generally divided languages into two groups. Those that encode prominence syntactically and those that encode it prosodically. Vallduví (1991) proposed the terms plastic versus non-plastic languages to describe this typological difference between languages. In plastic languages, prosodic prominence is used to mark information structure. English, Dutch and other Germanic languages are recognized as plastic languages since they can move the nuclear accent of an utterance to mark the focused element. In non-plastic languages, the nuclear accent occurs more invariably in the same location and instead of marking information structure prosodically, speakers use word order inversions. Romance languages, such as Spanish, are typical examples of non-plastic languages.
We will now take a closer look at the similarities and differences in both the Spanish and English expression of prominence.

2.1.1 Syntactic Prominence: Spanish

Languages that can express prominence through word order inversions are also referred to as free word order languages or scrambling languages. Oftentimes these languages are characterized by complex verbal and/or nominal morphology which indicates the grammatical relations of each component. Because of this, word order is less important in determining grammatical relations and instead can be used for discourse or pragmatic functions. Many languages have been classified as word order languages, including Hungarian, the Slavic languages and some of the Romance languages, such as Spanish. All of these languages can change word order for pragmatic purposes. Oftentimes this flexibility is made possible by a rich morphological inventory in which person and number are indicated on the verb, and the verbal arguments are indicated through case.

While Spanish, along with many of the other Romance languages, has largely lost the complex case marking system that was found in its ancestor (i.e. Latin), it still maintains a level of verbal morphological complexity. This verbal complexity helps listeners keep track of the grammatical relations along with other factors such as animacy. Animate nouns are more likely to be subjects and inanimate nouns are more likely to be objects, a generalization which also helps listeners keep track of the relationships between referents (e.g. Payne, 1997). This is illustrated in the example in (1) below. Both arguments occur after the verb. Despite this, the final noun can easily be interpreted as a subject (in this case focused). The animacy of the subject and inanimacy of the object are helpful cues in helping listeners keep track of the verbal argument. If an animate argument is a direct object, it is marked as such with a preposition-like object marker (Leonetti, 2004; Payne, 1997), as illustrated in (2) below. All of these factors work together to free up word order to be used for purposes other than indicating argument relations. Instead, word order is used to mark distinctions such as focus and in intransitives.

(1) Hizo la pizza Mariana
made the pizza Mariana
'Mariana made the pizza'

(2) El hombre vio a la mujer
the man saw DO marker the woman
'The man saw the woman'

2.1.2 Prosodic Prominence: English

English lacks the flexibility seen in free word order languages such as Spanish. There are no case markers and the verbal morphology is relatively poor with person marking being indicated only to a small extent. Instead, English must rely on its canonical SVO word order to mark grammatical
relations. It is likely for this reason that English relies more heavily on prosodic means to mark elements as prominent.

Constructions that depart from the canonical SVO word order do occur in English. We see this especially in cleft constructions such as "It was the apple Mary ate" when putting focus on the direct object 'apple'. However, word order inversions are not nearly as common in English as they are in scrambling languages and they are not as ready a strategy in making elements prominent. Instead, speakers often resort to prosodic means in order to make an element prominent and to highlight its importance. It has long been noted that English phonology provides a complex system of assigning prosodic prominence. Specifically, the placement of the nuclear accent of an utterance is often computed through a series of complex rules that are often subject to certain exceptions.

The NA is considered to be an important aspect of English phonological grammar. It is the last accent in an utterance and its job is to mark the focus structure. To mark utterances as broad focus, it occurs on the final content word. However, NA placement has actually been observed to be quite variable. It can shift leftwards to mark narrow focus, although there are many examples of when it must shift leftwards in broad focus contexts as well (Ladd, 2008).

These exceptions and rules will be further described and exemplified in Section 2.2.2, but for now it is important to note that the NA is often used to give an element prominence, and that it often occurs on elements that are new or focused, thus giving them more prominence. In English, prosody serves the same (or similar) function as word order inversions in Spanish.

In this type of prosodic system, the NA placement is seen as exhibiting flexibility or plasticity and is likely where Vallduví drew inspiration for his term. This system is said to contrast directly (and for some exclusively) with the non-plastic system found in Spanish. Languages are said to be able to use either syntax or prosody for the marking of prominence

2.1.3 Plastic versus Non-Plastic: a Binary Divide?

Approaches dividing languages into two types (those marking prominence syntactically versus prosodically) assume a modular view of language, and they make predictions that it would be uncommon for languages to use both prosodic and syntactic means at the same time when lending prominence to an element. However, empirical evidence is starting to bring this claim into question. Luchkina (2016) investigates the use of both prosodic and syntactic cues in Russian, a language that can employ either prosodic or syntactic means for prominence. She argues for a 'dual-route' model of prominence expression. According to this model, when both prosodic and syntactic cues are available, their use is highly interrelated and not separated from each other as suggested in previous models.

Other researchers have shown that it may be more possible to use both prosodic and syntactic means to mark focus in some languages than previously thought. Face and D’Imperio (2005) explicitly question the division between plastic and non-plastic languages as a binary division and argue that it should be seen as more of a continuum. Drawing on evidence from previous studies,

1 Or morphology, but this is, to my knowledge, not included in this division, nor is it relevant to this study
they argue that both Spanish and Italian, two languages typically seen as non-plastic languages, can indeed mark focus intonationally. This evidence is used to suggest that the distinction between these two types of languages is not as rigid as originally proposed and that there needs to be more room to account for the variability seen in Spanish and Italian in marking focus.

2.1.4 Implications for L2 Acquisition

A theory accounting for the various ways languages express prominence is interesting in and of itself as it contributes more to our understanding of typology and cross-linguistic differences. However, it also presents interesting implications for L2 acquisition. Linguistic models often assume a modular view of language, in which the syntax and phonology are separate entities, which apply their own rules at different steps in the production process, though they must ultimately interface with each other. This tradition has characterized research in SLA as well. Up to this point, few, if any, comprehensive L2 acquisition models that include all language modules have been proposed. Instead, the tradition of viewing language as a series of modules has encouraged researchers to investigate the acquisition of each module individually (Gut, 2009). Rarely have researchers examined acquisition cross-modularly. In theory, one could expect different levels of performance in each module if this were the case. However, when there is a close relationship between them, such as that between prosody and syntax, one has to question whether there are more closely related than previously assumed and the effect of this on L2 acquisition. It also presents a good context in which to be able to compare the acquisition of different parts of the language, in this case we can compare L2 acquisition of syntax versus prosody in marking the same distinctions and gain a better picture of whether one is more difficult than the other.

2.2 Nuclear Accent Placement in English and Spanish

While English and Spanish use different strategies to make an element prominent, these two languages still share certain similarities. Both are considered to be intonational languages. Intonational languages are usually distinguished from tonal languages. Tonal languages include languages such as Thai or Chinese, which use pitch to establish lexical meaning. Intonational languages, on the other hand, use pitch (and other prosodic cues) in order to mark discourse and pragmatic functions (such as distinguishing between statements and questions for example).

While Spanish and English share the commonality of using pitch for pragmatic purposes, it has been observed that English uses prosody to a larger extent than Spanish in order to mark prominence and the rules in assigning the main prominence, or NA, tend to be more complex.

We will now take a look at an overview of the phenomena that will be under investigation in this study. We will look at the realization of certain distinctions in both languages. After this overview, the assumed grammatical algorithms responsible for NA assignment will be expounded on in more detail. The constructions that follow have been chosen as they represent a variety of contexts which elicit either NA shift or word order inversions, which will allow us to begin teasing
apart factors that may make the acquisition of one construction either easier or more difficult than another.

2.2.1 An Overview

2.2.1.1 Focus

Focused elements tend to be given prominence, and this is the case in both English and Spanish. For sentences with a narrow focus, a distinction can be made between informational focus and contrastive focus. Informational focus is generally the new piece of information in an answer to a WH-question. For example, it answers the 'who' in 'Who ate the cake?' or the 'what' in 'What did Rebecca eat?'. Contrastive focus, on the other hand, changes a background assumption a speaker may have. The word 'cake' in a sentence such as 'Rebecca ate the cake' would stand in contrastive focus if the preceding question was something along the lines of 'Did Rebecca eat the pie?'. That is, it is correcting the original understanding of pie being eaten to that of cake being eaten.

English marks both informational and contrastive focus prosodically. See (3)a-d for an illustration (NA marked by capitals):

(3) What happened?
   (a) Finn SNEEZED.
    What did Finn do?
   (b) Finn SNEEZED.
    Who sneezed?
   (c) FINN sneezed.
    Jeff sneezed?
   (d) FINN sneezed.

In (3)(a), a broad-focus utterance, we see NA on the final element. The same prosodic structure can also mark narrow focus on the final element (in this case, the verb) as is illustrated in (3)b. In contrast, the examples in (3)c and (3)d, representing both informational and contrastive focus contexts respectively, exhibit a shift in the prosodic structure in which NA is retracted leftwards and is instead assigned to the subject.

Spanish is similar to English in that the default location of the nuclear accent is on the final word of the utterance. This is illustrated in a broad focus context in (4) below.

(4) ¿Qué pasó? Finn ESTORNUDÓ.
    'What happened?' 'Finn sneezed.'

Speakers have a couple options to mark narrow focus and Spanish is reported to mark informational focus differently than it does contrastive focus. Both informational focus and contrastive
focus can be indicated through word order inversions. If the subject is focused then it can move to the end of an utterance and will accordingly be accented. This is illustrated in (5)a for informational focus and (5)b for contrastive focus.

(5) ¿Quién estornudó? (Who sneezed?)
(a) Estornudó FINN.
(Finn sneezed)
¿Jeff estornudó?
(b) Estornudó FINN.

Contrastive focus may be also be realized prosodically, as shown in (6). The option of augmenting a non-final syntactic element, such as the subject, is traditionally said to be available only in the marking of contrastive focus and not for informational focus (e.g. Zubizarreta, 1998).

(6) ¿Jeff estornudó?
FINN estornudó.

While this is traditionally how the theoretical literature has described the marking of informational focus, it is worth noting that this view is currently being challenged by more recent experimental work (e.g. Calhoun et al., 2018; Hoot & Leal, 2020). This will be discussed in more detail in Section 2.2.4.

2.2.1.2 Broad Focus Intransitives

Nuclear accent shift has been noted to occur in broad focus intransitives in English. Simple intransitives are characterized by variability of NA placement. For example, a simple intransitive sentence such as A tiger died has been shown to be produced as both (a) 'A TIGER died' and (b) 'a tiger DIED' by native speakers of English. The reasons as to why such alternations may exist will be discussed more in Section 2.2.2.2.

Spanish also exhibits variability in simple intransitives. However, this variability is syntactic in nature. The grammatical mechanisms underlying this alternation will be described more in Section 2.2.3, but to summarize, it is generally the type of verb which will affect whether the canonical word order is inverted or not. This variation is illustrated in (7) and (8) below.

(7) Apareció un tigre
appeared a tiger
'A tiger appeared.'

(8) Un tigre rugió
a tiger roared
'A tiger roared.'
2.2.1.3 Compounds

English compounds have been observed to exhibit variable word stress. Most compounds are stressed on the leftmost element. This is not an exception-less rule, however, and there is a lexical contrast between compounds with primary stress on the first component and with primary stress on the last component (Liberman & Sproat, 1992; Plag et al., 2008). For instance, the compounds in (9) are produced with lefthand stress whereas the compounds in (10) are produced with rightmost stress.

(9) APPLE cake; COMPUTER store; GREEN Street
(10) apple PIE; computer SCIENCE; Green AVENUE

Compounds with lefthand stress can result in non-final NA as NA is aligned with the primary stress of the final content word of an utterance.

The tendency for compound nouns to be stressed on the first syllable also can produce minimal pair distinctions between compound nouns and adjective + noun phrases. For example, plants are grown in a GREENhouse whereas you may find a green HOUSE in any given neighborhood. That is, greenhouse as a compound is produced with lefthand stress and the noun phrase green house is distinguished from the compound with the stress occurring on the final, rightmost element.

There is some variability in Spanish compounds as well, but it does not result in the same distinctions we see for English. Instead, there is a difference between compounds with stress on the rightmost word only, versus compounds with stress on both the first and second word (Hualde, 2007; Rao, 2015). The patterns are exemplified below (Hualde, 2007, p. 69):

(11) Two stresses: HOMBRE LOBO (werewolf)
(12) Right stress only: bocaCALLE (street entrance)

Spanish compounds tend to be stressed on the rightmost element, regardless of which pattern they follow, which differs from the English patterns in which it is possible to have stress on the left word only, resulting in non-final nuclear accent and the reduction or deaccenting of the right-edged word.

2.2.1.4 Indefinite Pronouns

Nuclear accent is not assigned to indefinite pronouns in English. Therefore, NA must shift leftwards to the second to last content word in broad focus utterances ending in an indefinite pronoun. This pattern contrasts with utterances ending in a regular NP, in which NA will occur on the final content word. This contrast is illustrated in (13) below:

(13) (a) Victoria drank WATER.
(b) Victoria DRANK something.
As can be seen from these examples, the NA shifts to the verb, a non-phrase final element, when followed by an indefinite pronoun (Ladd, 2008).

This contrast is missing in Spanish. Instead, the nuclear accent is assigned to the end of an utterance regardless whether it ends in an ordinary NP or indefinite pronoun. This is illustrated in the following examples:

(14) Victoria bebió AGUA
Victoria drank water
'Victoria drank water'

(15) Victoria bebió ALGO
Victoria drank something
'Victoria drank something'

English and Spanish vary predictably in these constructions. English requires NA shift, whereas Spanish prefers either word order inversion, or lacks the distinction entirely, such as in the case of utterance-final indefinite pronouns or in compounds. Because the two languages vary predictably, it is interesting to compare the trajectory of L2 acquisition for each of the constructions. Since NA shift in many of these contexts is lacking in Spanish, it can be predicted that acquiring this in L2 English will pose learners difficulty. Likewise, L1 speakers of English would be expected to have difficulty acquiring word inversions to mark these distinctions in L2 Spanish.

2.2.2 Nuclear Accent Placement in English

Various theories have been proposed to model the cross-linguistic similarities and differences found in prosodic systems of different languages, such as those just described for Spanish and English. There are various prosodic phenomena these models must capture, and these variations occur different levels of the prosodic hierarchy. We find differences in prominence at the word level, and differences in phonological phrasing and placement of prominence within that phrasing. Finally, we also see differences in nuclear accent placement and flexibility. Prosodic differences such as these can be accounted for by positing a set of rules or algorithms determining prominence assignment.

This study will assume prominence is assigned to a metrical grid, as proposed by Liberman (1975) and Liberman & Prince (1977). According to this model, a speaker first selects lexical words to describe the thought they hope to communicate. Then, through the syntactic grammar, the speaker places these words into a meaningful utterance. After this, the metrical grid applies to the resulting syntactic string, assigning phonological prominence to the elements. This is done by assigning alternating strong-weak nodes. Nodes that are assigned as ‘strong’ are realized as stressed or prominent. Through this process, prominence is assigned at different levels. Firstly, both strong and weak nodes are assigned at the word level. After this, they are assigned at the phrase level, until there is one main (or nuclear) prominence at the level of the entire utterance. The result is a hierarchical structure of prominences. This is illustrated in the tree in (16) below,
which is provided in Liberman’s (1975) dissertation (p. 117). It illustrates prominence assignment in a phrase (an English teacher). As can be seen, each syllable is assigned as either a weak (w) or strong (s) node. The letter B indicates a non-terminal boundary, C refers to the content the boundary joins to, and R refers to the root of the tree, when there are no other relations to join. Then each word is also assigned as either strong or weak. As the hierarchy progresses, there is only one main prominence (which in this case is the word teacher as a whole).

(16)

This study will furthermore assume the rules for NA assignment and shift as proposed by Zubizarreta (1998, 2014) and Zubizarreta & Nava (2011), which apply to this metrical structure. This differs slightly from other approaches that have been proposed in the literature. Some approaches have proposed that NA assignment rules are computed directly onto the syntax (e.g. Cinque, 1993). Other approaches assign NA based on rules that apply to prosodic phrases (e.g. Féry et al., 2016; Kratzer & Selkirk, 2007). This approach is somewhat in between these two, as it takes syntactic structure into account while assigning NA to a phonological structure.

Zubizarreta’s (1998, 2014) and Zubizarreta & Nava’s (2011) proposals have been specifically designed to account for the cross-linguistic prosodic differences found between Spanish and English, which is why they are being assumed in this study. There are various rules and well-formedness conditions that account for NA placement, NA shift as well as the interaction of NA placement and word order inversions in these two languages. These rules and conditions will be described in more detail for each construction under investigation in the following sections.

2.2.2.1 Nuclear Accent Placement Algorithm

The first rule that will be discussed is the basic rule that determines nuclear accent placement when there are no other discursive factors influencing its placement, such as narrow focus. In other words, it is the algorithm that assigns NA in broad focus constructions. This accentual pattern has also been referred to as the ‘default’ accent (e.g. Kratzer & Selkirk, 2007). Zubizarreta (2014) refers to broad focus utterances as unmarked utterances, as they are not influenced by discourse factors. Constructions generated by discourse rules, on the other hand, are referred to as marked constructions. Unmarked constructions that are included in this study include broad focus intransitives and phrases ending in compound nouns. We will discuss prominence assigning algorithms for unmarked constructions before discussing rules assigning prominence in marked utterances.
According to the approach found in Zubizarreta (1998) and updated in Zubizarreta & Nava (2011), nuclear accent is generally referred to as nuclear stress (or NS). Two algorithms are proposed as part of one rule that assigns NS to an element in English in unmarked constructions. This is known as the Nuclear Stress Rule (NSR), which is formulated in (17) below (Zubizarreta & Nava, 2011, p. 656). $S$ refers to the metrically strong constituent.

(17) Given two metrical sister nodes A and B:

(i) If A is a head and B is its argument, assign S to B. (*Specific-NSR*)

Otherwise

(ii) Assign S to the rightmost constituent node in the phrase (*General-NSR*)

To summarize, nuclear accent is assigned to the argument of a head if given two sister nodes. If, however, the structure is not in a sisterhood relationship, then the linear structure determines placement and NA occurs on the rightmost element.

The tree in (18) represents a metrical structure in which there is a head-argument relationship between two sister nodes (from Zubizarreta & Nava, 2011, p.656). Because this relationship is present, the subject, as the argument to the head is assigned the nuclear stress.

\[(18)\]

\[
\begin{array}{c}
N_S \\
\text{(a) dog} \quad (\text{is}) \quad \text{barking}
\end{array}
\]

This can be compared to the tree in (19), which illustrates a metrical tree in which the sisterhood relationship between the metrical nodes disappears (from Zubizarreta & Nava, 2011, p.656). Since this relationship is gone in this example, the first rule cannot apply, invoking the 'otherwise' condition. This leads to a nuclear stress assignment on the final element, which in this case, is the verb.

\[(19)\]

\[
\begin{array}{c}
N_W \\
T_S \\
\text{(a) dog} \quad \text{is} \quad \text{barking}
\end{array}
\]

This two-tiered rule describes the placement of NA in English utterances and, as can be seen from the above examples, can explain its variable placement. However, it brings up the question as to why these two metrical structures are different, even though the sentences appear to be the same. This variation has been observed in English intransitives and is attributed to syntactic and/or pragmatic factors. This alternation will be described more in Section 2.2.2.2 below.
2.2.2.2 Nuclear Accent Placement in Intransitive Sentences

One factor that has been cited as an important source of variation of NA placement in intransitives is verb type. There are two types of intransitive verbs: unaccusatives and unergatives. The difference between these verb types can be defined syntactically. Unaccusative verbs are said to have an internal argument, and not an external one (Levin et al., 1995). They are often non-agentive verbs, including types of verbs denoting appearance (e.g. appear, arrive) or change of state (e.g. melt, freeze). Unergative verbs, on the other hand, have an external as opposed to internal argument. They include verbs with more agentive type actions, such as talk or yell.

Intransitives in English are characterized by flexible NA placement. It has been observed that NA sometimes occurs on the subject and other times occurs on the verb. As shown in the section above, Zubizarreta & Nava (2011) propose a two-tiered grammatical algorithm that can account for both instances of NA placement. This algorithm takes into account whether the metrical hierarchy is in a sisterhood relationship, and if so, it assigns NA based on argument-head relations. However, this algorithm alone is not enough to account for the variation. We also need to explain why there can be two different underlying structures for the same sentence. In the rest of this section, I will first discuss the assumed algorithm behind NA assignment in intransitives, focusing specifically on the reason it is possible to have two metrical trees. This approach is taken from the works of Zubizarreta (1998, 2014) and Zubizarreta & Nava (2011). Nextly, I will discuss an overview of the models that have been proposed to account for NA assignment in intransitives and discuss the specific syntactic and pragmatic factors that have been held responsible in influencing NA placement. These models will be discussed in relation to how the correct metrical tree (and therefore accent placement) is selected for any given utterance.

Zubizarreta’s Node Invisibility

Zubizarreta’s (1998, 2014) and Zubizarreta & Nava’s (2011) explanation of the existence of two different metrical structures, which result in two different accentual patterns, relies on their assumption that, in English, phonological material has the ability to be invisible to the computation of nuclear accent placement. Phonological material that has the ability to be invisible includes functional nodes, such as tense nodes. The tense node can be seen in the tree in (19) where it is included in the metrical structure and thus included when computing NA placement. It is invisibile, however, in the tree in (18). When this node is invisible we have a metrical sister relationship, which leads to an invocation of the first part of the rule which then results in NA on the subject. When this tense node is visible, however, there is no sister relationship and the second part, or ‘otherwise’ condition, of the rule must apply thereby placing the accent on the verb.

The ability of tense nodes to be invisible forms an important part of Zubizarreta’s and Zubizarreta and Nava’s model. They claim this ability is closely related with the ability of functional, tense words, such as the copula to be, to be reduced. Therefore, we see that nodes can be invisible in the Germanic languages, which allow for the reduction of such function words. In contrast, tense nodes cannot be invisible in the Romance languages, which do not allow for reduced copulas. This
will be described more in detail for Spanish in the sections below.

The ability of tense nodes to be invisible explains the existence of the two structures seen in the
trees in both (18) and (19) thus accounting for the existence of two different accentual patterns.
However, we still need to explain how a speaker knows when to use which structure. Zubizarreta &
Nava claim that both structures are available to the speaker when producing an utterance. After
they are formed, the speaker will choose one of the forms based on syntactic and/or pragmatic
factors. What these factors are exactly is under debate and will be investigated more closely in
this study.

Pragmatic and Syntactic Factors in Accent Assignment

Researchers have investigated the question as to what factors are responsible for the variability
of NA placement in intransitives. This has not been an easy question to answer, which has led to
an ongoing debate. Traditionally, there have been two main theoretical approaches in modeling the
variability found in NA placement in intransitives. The first of these is the syntactic approach (e.g.
Irwin, 2012; Kahnemuyipour, 2004, 2009; Kratzer & Selkirk, 2007). According to this approach,
NA patterns are a result of syntactic processes, which are affected by the differences in syntactic
status between unaccusative and unergative verbs. While the specifics may vary from model to
model, it is generally assumed that nuclear accent assignment is closely intertwined with the syntax.
This syntax-prosody relationship is relevant in the assignment of 'default' (or unmarked) nuclear
accent. Syntax is not held responsible for NA assignment affected by discourse factors, such as
focus. For an example of one such approach, Irwin (2012) claims that sentences are formed through
cyclical syntactic phases. Phases consist of putting lexical items together to form coherent phrases
according to a language’s grammar (Chomsky, 1999). Once a phase is complete, a phonological
phrase is formed, and NA is assigned to that domain. After this, the process may start again, as it
is cyclical. According to Irwin, simple unaccusative intransitive sentences are formed through only
a single phase, which leads to accent assignment on the subject only. Unergative intransitives with,
on the other hand, can either be formed through one or two phases, which allows for up to two
domains for accent assignment, which can explain why there is variable accent placement in these
constructions with accent either on the verb or subject. The number of phases, which equates to
the number of phonological phrases, which itself corresponds to the number of accent assignment
domains, is determined by syntactic properties of the verb and its argument. The different syntactic
properties of unaccusatives and unergatives lead to the difference in NA placement. While the
various models will differ in certain regards, they all trace the differences in NA assignment back to
the syntactic properties of the different verb types and how these form syntactic phrases, thereby
forming phonological phrases onto which an accent is obligatorily assigned.

An alternative to the syntactic approach has attributed variable accentual patterns solely to
information structure factors. According to this school of thought, syntactic factors such as verb
type are irrelevant in NA assignment. A notable and early example of this approach can be found
by Bolinger (1954, 1972), who claims that nuclear accent is assigned based on informational or
semantic weight only and has nothing to do with the underlying syntactic structure. The more informative the speaker judges a word to be, the more likely this word is to carry the nuclear accent. Bolinger (1954) refers to the part of a sentence that receives NA as the information point of an utterance. This is the part of the sentence identified by the speaker to be the most informative, unpredictable or unexpected acts as the information point. In English, the goal of prosody, including NA assignment, is to highlight this information point.

Schmerling (1976) was one of the earlier works to attribute variable NA placement in intransitives to both syntactic and information status features. According to her account, accent placement is dependent on whether the subject can be construed as a topic, and if so it is less likely to be accented.

Firstly, she notes the observation that arguments are more likely to be accented than their predicates. This gives a structural explanation as to why we see accented subjects in intransitives: because they are arguments of the verbal predicate. She then discusses that this default pattern is overridden in topic-comment type sentences. To illustrate, she provides the famous examples of the reporting of two presidential deaths, which occurred with differing accentual patterns. These were examples that she reported hearing herself that occurred in the speech of the people informing her of these deaths:

(20) Truman DIED
(21) JOHNSON died.

She notes the different contexts in which these statements were made. When Truman died, he had been sick and in the news, so his name was already a topic under discussion. Johnson’s death, on the other hand, happened very suddenly, and was a surprise to everyone. Therefore, he had not been a topic under discussion.

The sentence in (21) has an accented subject due to structural factors. Johnson is the argument of the verbal predicate die. In this case, there are no discourse factors that would override the structural ones, the default pattern applies and the accent is placed on the subject. In contrast, as we see in (20), since Truman was already featured in the national discourse, this statement becomes a topic-comment type statement. Therefore, the default accent pattern that would be assigned through structural factors is overridden and the verb is accented.

Allerton & Cruttenden (1979) also lend support to the viewpoint that neither syntactic nor IS factors are solely responsible for NA assignment. They suggest that, structurally, accent will be assigned to the verb. However, they posit different verbal categories, defined by their semantics, that will elicit accent on the subject. For example, they list the category of empty verbs as a type of verb class that will elicit subject accent. These verbs are highly predictable given the context. Sentences such as The KETTLE is boiling is reported to be an example of one such verb type, since a kettle is capable of little else besides bringing water to a boil.

It is clear that syntactic features cannot be solely responsible for NA placement in intransitives and that information status or pragmatic features must be included in any model predicting accent
placement. However, it is not yet agreed upon as to whether pragmatic factors can account solely for accentual variation, or whether syntactic factors, such as verb type do play a role. Additionally, it is yet unclear what type of pragmatic factors play a role. As stated earlier, it has been suggested that factors, such as topicality, predictability or expectedness may play a role. However, the amount of experimental research to support any claim is still limited leaving researchers questioning to what extent these factors influence NA placement. Many of the earlier works described above modeled accent assignment based purely on intuitive data. Since then, however, more research has been devoted to testing these claims experimentally. These studies have been devoted to examining which syntactic or pragmatic features could be responsible in NA assignment.

Hirsch & Wagner (2011) conducted three experiments to examine the role of both topicality and verb type on NA placement. These three experiments were all recording experiments, in which participants read sentences, which were then acoustically measured to evidence accent placement. The first experiment consisted of sentences with both unaccusative and unergative verbs. The researchers controlled for how much the target sentence contributed to the discourse (i.e. they were controlled for in terms of expectedness and predictability). The researchers also held the relative contribution of subject and predicate to the meaning of the target sentence constant. Once this was controlled for, they found variation of NA placement across items. However, they did not find systematic differences between the two verb types.

For the second experiment, only unaccusative verbs of appearance and disappearance were tested. The reasoning was that for verbs of disappearance, the subject will be a topic since, to be able to disappear, the subject must already have been established in discourse. When something appears, on the other hand, it is often being introduced into the discourse for the first time, and is therefore less likely to be a topic. They find that subject accent is much more likely in verbs of appearance, whereas verbal accent is much more likely in verbs of disappearance. The researchers use these findings to evidence the importance of topicality in NA assignment.

Finally, for the third experiment, both unaccusative and unergative verbs were used. In this case, verbs were held steady and subject type was manipulated by whether the subject was human or non-human (but still animate). The assumption behind this was that human subjects are more likely to be construed as topical than non-human subjects. Indeed, the researchers found that there was a higher tendency for the verb to be accented with a human subject as compared to with a non-human subject regardless of verb type. These findings again support the importance of topicality in accent assignment.

Overall, Hirsch and Wagner evidence the importance of topicality in accent placement in intransitives. They also claim that once certain IS or pragmatic factors, such as topicality, are properly controlled for thereby being factored out, that there is no effect of verb type, especially since they found no differences between accentual patterns in unaccusative versus unergative intransitives.

Despite these findings, there is still a large body of research that supports the stance that verb type is a crucial factor in determining NA placement.

Irwin (2011), tested the effect of verb type experimentally. Her findings indicated that there
is a difference between accent assignment in unaccusatives versus unergatives. In this experiment, native speakers of English read broad focus intransitive sentences which were manipulated for verb type. NA placement was evidenced quantitatively, through measurements of F0, intensity and duration. It was found that unaccusative verbs were more likely to be produced with accented subjects, while unergative verbs were found to have a higher likelihood of verbal accent. Additionally, Irwin found more variability within unergative verbs than in unaccusative verbs indicating that these constructions were produced with either subject or verbal accent. This study contradicts the findings from Hirsch & Wagner (2011) by showing that there is a difference according to verb type. It also highlights the question as to what causes the variation in accent placement in unergatives.

Zubizarreta & Nava’s (2011) proposal also claims that the intransitive verb type plays a crucial role in determining NA placement in addition to certain pragmatic factors. Their approach is sketched at the beginning of this section and illustrates the importance of syntactic structure in NA assignment. As stated earlier, a metrical tree is generated. These metrical trees may have visible or invisible tense nodes. Depending on the structure of the tree, nuclear accent is assigned to either the verb or subject. This leaves open the question as to how speakers know which structure to use. Zubizarreta and Nava also appeal to the notion of topicality. They agree that statements with accented verbs are topic-comment type statements. They claim that verb type is crucial in distinguishing the type of statements, for only unergatives can be topic-comment statements. Due to the inherent semantic properties of unaccusatives, the claim goes, subjects of these verbs lack the ability to be topicalized and therefore accent on the subject is the only possible outcome in unaccusatives. Unergatives, on the other hand, have the option of being topic-comment statements. The decision for unergatives is based on the surrounding discourse context. If a statement can be construed as a topic-comment type statement tense nodes will be visible and verbal accented will be implemented. Elsewise, tense nodes will be invisible and the accented will be placed on the subject. Relevant pragmatic factors proposed to affect topicality are predictability and expectedness. The more unpredictable a predicate is, the stronger the likelihood is that the subject is a topic, and the more likely the accent is to fall on the verb.

Zubizarreta and Nava tested this experimentally to an extent. A group of native speakers of English read simple intransitives out loud which were contextualized with a preceding question. A set of 12 unergative verbs and a set of 12 unaccusative verbs were included. NA was evidenced through perceptual annotation completed by two coders (with disagreements solved by a third) as opposed to more quantitative measures. It was found that native speakers produced unaccusative structures with subject accent 97% of the time. Subject accent was produced 42% of the time in unergatives, with the remaining 58% of unergative utterances being produced with verbal accent. Zubizarreta & Nava use these findings to support their claims, noting that there is little variability in unaccusatives, whereas variability is high in unergatives. However, they did not test whether the factors they proposed to be responsible for NA placement variability in unergatives, such as

\[2\] Zubizarreta & Nava (2011) rather specifically mention the distinction between thetic and categorical statements, but they relate categorical type statements to topic-comment statements discussed in other works.
predictability or expectedness, was responsible for this variation found in unergatives.

Verhoeven & Kügler (2015) present an experiment in which they more closely investigated NA placement in both passives (which are assumed to have the same underlying structure as unaccusatives) and unergatives in German while controlling for predictability. In this case ‘predictability’ is defined by the frequency of how often two words (specifically a verb and its subject) occur together. This was calculated using available corpora. For example, the statement *A baby cried* is much more predictable than *An employee cried*. This is due to real world knowledge about how babies behave, but is also evidenced by how frequently words such as *baby* and *cry* occur together as compared to *employee* and *cry*.

Verhoeven and Kügler carried out two acceptability judgment tasks, one in which participants were asked to rate the acceptability of passive/unaccusative statements, and the other in which participants were asked to rate the acceptability of unergative statements. Stimuli were recorded and manipulated for accent placement, so participants heard statements with NA on both the subject and verb in both of these experiments. Findings indicated that predictability was an important factor in NA placement. In highly predictable statements, sentences with accent on the subject were rated as much more acceptable than those with verbal accent. Likewise, highly unpredictable sentences were judged as more felicitous when occurring with verbal accent as opposed to subject accent. However, this effect was found only for unergatives and not found in the passive/unaccusative experiment. The findings of differences in responses between verb types led the researchers to support an approach in which both syntactic categories, such as verb type, and pragmatic phenomena, such as predictability, are important in modeling NA placement in intransitives and can affect accent placement.

To summarize, the presence of two accentual patterns in intransitive sentences can be accounted for in the grammar by proposing two different metrical structures to which one two-tiered NA-assignment algorithm applies. The availability of these two structures rests on the ability of nodes in the metrical structure to be either visible or invisible. This ability has been proposed to be correlated with the ability in a language for tense words, such as copulas, to be reduced (Zubizarreta & Nava, 2011). Outside of the grammatical algorithm assigning NA, it is also important to look at the factors that will prompt speakers to choose one accentual pattern over the other (or, according to this approach, one metrical structure over the other). These factors have been cited to be pragmatic in nature. Researchers have found that factors such as expectedness, predictability or topicality can influence accent placement. However, questions remain as to what pragmatic factors are responsible and whether syntactic factors, such as verb type play any role.

### 2.2.2.3 Nuclear Accent Placement in Compounds

The difference between the accentual patterns in compounds and phrases (such as *GREENhouse* versus *green HOUSE*) has generally been explained through different stress assignment mechanisms. Phrase-level stress is assigned through the NSR, which places NA on the last element in the phrase, whereas word-level stress is assigned through the Compound Stress Rule (Chomsky & Halle, 1968).
This rule states that nouns receive left-hand stress, unless the rightmost element is branching. This results in left-hand primary stress in binary compounds.

However, primary stress assignment in compounds is not exceptionless and it has been observed that some compounds have stress on the right-most constituent. For example, while the compound *APPLE cake* follows the typical compound stress pattern, the compound *apple PIE* does not, with stress falling on the final, rightmost element.

To explain this alternating pattern, we can look at the underlying structure of phrases and compounds for some answers, as it has been proposed that compounds with right-hand stress have a different underlying structure than those with left-hand stress (Liberman & Sproat, 1992).

Jackendoff (1977) originally proposed four different pre-nominal modifier positions, which are illustrated in (22) below:

\[
\begin{array}{cccccc}
4 & 3 & 2 & 1 & 0 \\
\text{the three delicious chocolate bars}
\end{array}
\]

Position 4 is said to contain articles, demonstratives or possessives. Position 3 contains quantifiers or numerals. Positions 2 and 1 are more relevant for this study. Position 2 contains modifying adjectives and position 1 contains a modifying nominal that combines with the ultimate noun (in position 0) to form a compound. Then, according to Liberman & Sproat (1992), the head noun of the phrase is represented as N\(^0\). Any component in position 1 is said to combine with the head noun as an adjunction to N\(^0\). On the other hand, adjectives that occur in position 2 are said to be daughters of N\(^1\). The NSR is said to apply to N\(^1\) structures, whereas N\(^0\) structures invoke the application of the CSR.

Because there is a distinction between adjectives in position 2 and modifying nominals in position 1, it is important to consider the composition of the compounds. Adjective-noun sequences are often phrasal structures. In this case, the NSR applies and the noun is stressed. However, there are some obvious exceptions to this, such as in the compounds *white board* or *greenhouse*. It is argued that adjective-noun sequences can become lexicalized to form new compounds. Furthermore, there are differing degrees of lexicalization. Liberman and Sproat argue that when a phrase first becomes lexicalized, it keeps its original N\(^1\) structure. As N\(^1\) structures, these compounds also retain their original stress pattern, with primary stress occurring on the rightmost element. This type of compound can be represented by the word *red oak*. *Red oak* can be argued to be a compound as it is a fixed expression referring to a very specific type of tree (as opposed to modifying a tree with a color descriptor). However, the stress falls on the right-most element ‘oak’, which is indicative of an underlying N\(^1\) structure. Eventually, the word boundary between two compounded elements may be lost, and in this case, the structure is analyzed as an N\(^0\) unit allowing the CSR to apply to obtain left-hand stress. This is seen in the *greenhouse* example, where we have left-hand stress and the word is even written as a single unit.

In addition to adjective-noun compounds, there are noun-noun compounds. Liberman & Sproat (1992) report that only up to about 25% of noun-noun compounds have primary stress on the final, rightmost word. They suggest this could be a result of speakers analyzing the first element in such
compounds as an adjective. In this case the modifier is generated in position 2 of the proposed nominal structure above, which would result in an $N^1$ structure as opposed to an $N^0$ structure, thus eliciting stress on the rightmost element. An example of this is gold medal, where stress falls on the final element and gold is likely analyzed as an adjective.

Understanding this underlying structure can help us understand why there may be differing stress patterns in compounds. Compounds analyzed as $N^0$ structures are produced with left-hand stress, whereas those analyzed as $N^1$ structures will have right-hand stress. This, however, brings up the question of how speakers can know which structure any given compound has. Researchers have tried to establish generalizations to predict which compounds will be analyzed as $N^0$ versus $N^1$ structures. Scholars have generally either put forth a structural explanation or a semantic explanation.

Giegerich (2004) argues for a structural hypothesis. According to his analysis, noun-noun sequences that are either argument-head or complement-head structures are compounds, and therefore have left-hand stress. Some examples of argument-head compounds that he cites are watchmaker or soap dispenser. He cites battlefield or seatbelt as complement-head type structures. Noun-noun structures that are attribute-head, on the other hand, are argued to be phrasal in nature. These sequences are stressed on the right-hand element. Examples of this are steel bridge or glass case. Basically, they are comprised of phrases in which the head (final) noun is constructed of the material of the preceding noun (e.g. a steel bridge is a bridge made of steel). Any exceptions to this, Giegerich argues, are driven by lexicalization processes. He claims that phrases can be lexicalized into compounds, and the further into the lexicalization process they are, the more likely they are to have left-hand stress.

In contrast to this, Liberman & Sproat (1992) put forth a semantic hypothesis. They claim that compounds are assigned left-hand stress in most cases. Those with right-hand stress are said to represent a group of systematic exceptions to this rule. Furthermore, the compounds that receive right-hand stress belong to specific groups that can be described semantically. For example, it was claimed that compounds for which the first noun referred to a period or point in time, such as morning edition, form a group of right-hand stressed compounds. While various other semantic groups were proposed to form coherent groups of exceptionally right-hand stressed pronouns, Liberman and Sproat do admit that it is difficult to account for all exceptions.

Plag et al. (2008) test these hypotheses experimentally. They find more support for the semantic hypothesis. Positing certain semantic groups proposed to be responsible for right-hand stress was found to explain patterns of right-hand stress placement, more so than the structure of such nouns. Furthermore, Plag and colleagues also find support for the influence of lexicalization on compound stress patterns. They operationalize this concept through both frequency and writing conventions. More highly lexicalized compounds are assumed to be more frequent, and more likely to be written as one word as opposed to two. Support is found for this hypothesis. More frequently occurring noun-noun combinations are found to be more likely to be written as one word, and found to be more likely to have stress on the left-hand element, regardless of semantic or structural category.
As can be seen from the studies above, the classification of compounds into those with right-hand stress and left-hand stress is not entirely straightforward. Many factors are relevant, including a compound’s frequency, its lexicalization status and semantic group. It is interesting to think what implications this has for learners acquiring compound stress patterns. Firstly, when words are undergoing a lexicalization process that can change the pronunciation (in this case the stress pattern), then this implies that there may be variability in that word’s production by native speakers as this is a sound change in progress. This leads to a more highly variable input for L2 learners, which could make these patterns difficult to acquire. Moreover, both lexicalization and semantic factors affect each word individually, making it difficult to draw broad generalizations. When this is the case then the stress pattern for each compound, especially the exceptions, must be learned on a word-by-word basis, making the acquisition of this pattern potentially even more challenging.

2.2.2.4 Nuclear Accent Placement in Utterances ending in Indefinite Pronouns

Indefinite pronouns (specifically non-negative indefinite pronouns) in English tend not to be accented. Structural accounts of accent placement generally posit that these words form a separate lexical class and the absence of accentuation is therefore a lexical property of the words in this word class, similar to what is seen in English pronouns (Ladd, 2008).

2.2.2.5 Nuclear Accent Placement in Narrow Focus

As mentioned in Zubizarreta and Nava’s (2011) hypothesis discussed in Section 2.2.2.2, English has the ability to render certain phonological material, such as tense-bearing metrical nodes, invisible. This analysis accounts for the variability of NA placement in intransitives. These are not the only circumstances under which material can be rendered invisible in English, however. Anaphoric and otherwise given or de-accented components can also be invisible when assigning utterance-level prominence. This assumption can be used to explain NA shift in narrow focus constructions. The proposed rules for both types of narrow focus will be described in more detail in the paragraphs below.

In the case of narrow, informational focus, Zubizarreta & Nava (2011) assume NA is first assigned via the two-tiered algorithm proposed in Section 2.2.2.1 above. After this application, two additional rules can take effect if the correct environment is provided. The first rule is known as Anaphoric deaccenting or A-deaccenting. This rule states that old or given information in an English utterance cannot be accented and therefore loses any accent it may have been assigned through the application of the NSR. A-deaccenting then triggers a second rule known as Nuclear Stress Shift or NS-Shift. Since the nuclear accent cannot be assigned to de-accented material, it must shift leftwards until it can be realized on non-deaccented material. This rule is stated to be a consequence of A-deaccenting. Since each phrase must contain a main prominence, if any material is deaccented, the NA simply shifts to the sister node of the deaccented material until it occurs on new information, which coincides with the focus of the utterance.
**Contrastive Focus** In order to account for contrastive focus, Zubizarreta (1998) proposes a well-formedness principle which states that the main prominence of an utterance must contain the focused element. She proposes the *Focus Prominence Rule* or *FPR* to capture this observation, which is stated in (23) below (p. 21). [F+] refers to a focused element and [F-] refers to a non-focused element.

(23) Given two sister categories Ci (marked [F+]) and Cj (marked [F-]) Ci is more prominent than Cj

Focus is assigned in the syntax and the FPR requires that a focused constituent be realized as prosodically prominent in order to obtain a grammatical utterance. Zubizarreta points out that the NSR and the FPR can clash. This can happen, for example, if the focused element is not at the end of an utterance. To avoid a clash of these two principles, which would result in an uninterpretable utterance, Zubizarreta (1998, 2014) proposes a special Emphatic/Contrastive Stress Rule, which states that an element with contrastive stress must receive the main prominence. According to this rule, stress is assigned freely to the contrastive element, regardless of its position in the utterance. This is a distinct rule from the NSR and applies independently. It could be noted that much of Zubizarreta’s works (e.g. 1998, 2014) focus on the distinction between wide focus and narrow informational focus. Contrastive focus has been given less attention and therefore the rules of assigning NA in cases of contrastive focus could be considered less developed.

Proposing a separate rule for contrastive focus versus narrow, informational focus is not entirely straightforward and whether these constitute two distinct, grammatical categories is a question in and of itself. Examining the underlying phonological structure of the two show more similarities than differences. They are both marked by pitch accents and can be followed be de-accenting when followed by old information. Indeed, because of these structural similarities, many scholars have treated both as the same, abstract category (e.g. Kahnemuyipour, 2004; Ladd, 2008). However, there is some evidence that the two are grammatically distinct from each other. Katz and Selkirk (2011) examine the phonetic realization of discourse-new versus contrastively focused items in their study. Phonetic distinctions between these two categories are found in the dimensions of duration, pitch scaling and intensity. Katz and Selkirk claim that the differences in phonetic realization point towards differences in the underlying syntactic structure, where focus is marked. This grammatical difference is then manifested phonologically which results in differing phonetic interpretations. As such, this study will also treat these two types of focus as two distinct grammatical categories.

### 2.2.3 Nuclear Accent Placement and Word Order in Spanish

Traditionally, Spanish NA placement has been described as being less variable with less flexible NA placement than in English. Instead, the nuclear accent occurs more consistently at the rightmost edge of an utterance (Hualde, 2005; Zubizarreta, 1998). The grammatical distinctions that are made in English between different NA placements are either missing in Spanish, or they are encoded through word order. This section will discuss the assumed grammatical mechanisms that drive both
NA placement and the word order inversions in Spanish that are relevant to this study. It will also cover some of the more recent experimental findings in the field, as these findings often challenge the existing theoretical models and therefore are important to consider in order to determine what type of input learners are receiving when acquiring this system in Spanish.

2.2.3.1 Nuclear Accent Placement Algorithm

According the metrically-interpreted approach to NA placement, only the general-NSR rule applies in Spanish, which was formulated in (17) and is re-stated here (Zubizarreta & Nava, 2011, p. 656):

(17) Assign S to the rightmost constituent node in the phrase

The specific-NSR never applies in Spanish since functional nodes are never invisible. Instead, all phonological material is visible in computing the location of NA, leading to a hierarchical metrical structure, which eliminates sisterhood relationships among nodes. This explains why the variability of NA placement that is found in English broad-focus constructions is not found in Spanish.

2.2.3.2 Narrow Focus Constructions

Zubizarreta (1998) assumes the same grammatical difference between the assignment of stress in informational focus structures versus contrastive focus structures for Spanish as she does for English. Prominence assignment for each type of focus will be discussed in more detail in the paragraphs below.

Informational Focus The FPR (stated in (23)), is also assumed to be active in Spanish and cannot be violated in order to achieve a well formed utterance. In the case of Spanish, the output for the NSR can clash with that of the FPR if the focused element is not the final word of an utterance. Whereas English resolves this clash through A-deaccenting and NS-Shift, Spanish is said to resolve this through word order inversions.

First, we examine why there may be a clash between the FPR and NSR. As stated above, the NSR assigns the nuclear accen to the final content word of the utterance in Spanish. The focused element, on the other hand, is free to occur anywhere.

The example in (24) below provides an illustration of what this could look like. In response to the question 'Who left?', the subject Juan in the answer is focused as it is new information. This means that the subject should have the main prominence as per the FPR. However, the NSR will assign the main prominence to the rightmost element, which in this case is the verb when it occurs with standard word order. This is illustrated in (24)a in which we see both the subject and the verb being assigned the main prominence or NA. This is not possible as there can only be one main prominence per utterance in order for it to be grammatical. If, however, the subject is post-posed after the verb, then it can be assigned the nuclear accent as dictated by the NSR, thus also fulfilling the conditions set forth in the FPR. This is shown in (24)b.
¿Quién salió?

'Who left?'

a *JUAN SALIÓ
   Juan left

b Salió JUAN
   left Juan
   'Juan left.'

In order to account for this movement in her framework, Zubizarreta (1998) proposes that utterances in Spanish can undergo what she calls *p-movement*, or *prosodically motivated movement*. The rule is proposed to be a syntactic rule that is prosodically motivated. It consists of copying the focused constituent, moving it to the rightmost edge of the utterance, then deleting its original appearance in the canonical word order it is first derived in. It is said to be prosodically motivated since it is driven by the need to align the focused constituent with the prosodic prominence, or nuclear accent, in the utterance.

**Contrastive Focus** While narrow, informational focus is marked by word order inversion, contrastive focus can be marked either prosodically or syntactically, at least according to Zubizarreta’s model. Zubizarreta claims that the same rule, the Emphatic/Contrastive Stress Rule, that operates in English also operates in Spanish. In both languages, it operates separately from the NSR, assigning prominence to an emphasized or contrastive element when present. In Spanish, to mark this type of focus, it is possible for NA to be assigned to the focused word, even when it occurs non-finally, just as it is in English. However, the prosodic marking of contrastively stressed constituents has also been reported to be a more marked pattern (Hualde, 2005) with speakers preferring to use word order inversion to mark the contrastive element. These two strategies are illustrated in (25)a and b below in which the subject (María) is marked for contrastive focus:

(25) ¿Llamó Anita?

'Did Anita call?'

a marked pattern:
   MARÍA llamó
   María called

b preferred pattern:
   Llamó MARÍA
   called María
   'Maria called'
2.2.3.3 Intransitives

Broad focus intransitives in Spanish are also characterized by variable word order. It has been observed that the variability of word order is affected by verb type. Unaccusative intransitives are more likely to be produced with post-verbal subjects and unergatives occur with pre-verbal subjects (e.g. Hertel, 2003; Lozano, 2006). This is illustrated for unaccusatives in (26) and for unergatives in (27).

(26) Apareció un tigre
appeared a tiger
'A tiger appeared.'

(27) Un tigre rugió
a tiger roared
'A tiger roared.'

While we see inversion from the canonical SV word order in narrow focus as well, the grammatical mechanisms behind word order inversion in broad focus intransitives is proposed to be different. Whereas syntactic movement to mark focus is proposed to be prosodically motivated (that is, its purpose is to align focus with prosodic, NA marking), word order inversions in broad-focus intransitives, are proposed to be the result of syntactic processes, driven by semantic and syntactic properties of unaccusative versus unergative verbs (e.g. Contreras, 1976; Hatcher, 1956; Suñer, 1982). The difference between the two verb types is reflected in the syntactic derivation of an utterance. It is proposed that unaccusative verbs have only an internal argument (no external one). The patient-like subject is base-generated in object position. It can move if need be, such as in languages like English, where the subject must appear before the verb. Or it can stay in place, such as in Spanish, where the subject may occur post-verbally (Burzio, 1986; Levin et al., 1995).

Unergative verbs, on the other hand, are more similar to subjects of transitive verbs. Their argument is generated externally as opposed to internally, and occurs before the verb.

Although it is well established that this difference in word order patterns between the two types of intransitive verbs exists, it has been found to be more variable than originally suggested. Sorace (2000) proposes that unaccusativity is actually a hierarchy in which some verbs are more prototypically unaccusative, others more proto-typically unergative, with the rest falling somewhere in between. Therefore, both lexical properties of the verbs as well as their syntactic properties are thought to determine the realization of intransitive structures.

In terms of prosodic structure, NA in Spanish intransitives is assigned through the general-NSR rule which means it occurs at the end of utterances regardless of whether there is subject inversion or not.
2.2.4 New Findings in Spanish Prosody and Word Order

Both the syntactic models that account for subject inversion in intransitives (e.g. Burzio, 1968; Sunêr, 1982), and Zubizarreta’s (1998) p-movement model to mark focus have been dominant forces in the field. While studies have found some support for the claims made by these models, there have also been findings that suggest the models are inadequate to an extent. Furthermore, researchers have begun examining to what extent there could be dialectal variation, which has not been a consideration addressed in the models thus far. These studies have also had implications for typological divisions separating word order languages from intonational languages discussed in Section 2.1 as it shows the division is not as straightforward as previously proposed.

Hertel (2003) conducted a written production study to examine L2 acquisition of word order inversions. In doing so, she also included a control group of native speakers of Spanish. The target sentences in her study were simple intransitives that were elicited from a preceding context, which was written in English so as to be understandable for the learners. Stimuli were varied by both verb type (unaccusative vs. unergative) and focus (broad vs. narrow, informational). Overall, she found that, for L1 speakers of Spanish, broad focus unaccusatives were more likely to be realized with VS word order than unergatives at 38.83% versus 6.56% respectively. Although this trends towards the expected findings, she noted that unaccusatives were realized with SV to a much more frequent extent than had been predicted.

Similar findings were found in narrow-focus contexts. Sentences with narrow focus on the subject were more likely occur with subject inversion than those in broad focus. In this case, verb type did not make a difference. Unaccusatives with narrow focus were realized as VS 36.42% of the time while unergatives with narrow focus were realized as VS 32.87% of the time. As can be seen, subject inversion occurs, but not as frequently as expected.

Lozano (2006) complemented this study by conducting a contextualized acceptability judgment task. Again, he included both unaccusative and unergative intransitives in broad and narrow (informational) focused contexts. He found support that VS was preferred for unaccusatives over unergatives. He also found that VS was preferred over SV for intransitives with narrow focused subjects. In this case, verb type did not matter as subject inversion occurred across verb types.

Domínguez & Arche (2014) conducted a context-dependent sentence preference task in which they crossed verb type (unaccusative vs. unergative) with focus (narrow vs. broad). They included a native speaker group of 20 Spanish speakers from Spain. In this experiment, participants could choose between the canonical word order (SV), inverted word order (VS) or 'Both’ if participants thought both word orders would be equally acceptable. Findings indicated that participants were more likely to prefer VS word order for broad focus unaccusatives at 63%. This was followed by a preference for 'Both’ (26%) which was followed by a preference for SV only (14%). SV structures tended to be preferred for broad focus unergatives at 58%. This was followed by a preference for VS structures at 23%, which was followed by a preference for 'Both’ (20%). For narrow focus structures, there was a preference found for VS structures and more so for unaccusative verbs than for unergative verbs. For unaccusative verbs, the preference for VS structures was found to be at
71%. This was higher than the preference for VS in broad focus, and also higher than the preference for unergatives in narrow focus, in which preference for VS reached 45%, only slightly ahead of the preference for SV in this context (43%).

Calhoun et al. (2018) was one of the few studies to examine how word order relates to prosody in intransitive constructions by speakers of a specific dialect. They conducted an oral production task that included speakers of Venezuelan Spanish only. By doing so, they were more able to investigate whether NA shift can indeed occur in Spanish, and if so, whether it could be attributed to the dialect under investigation. Participants orally completed a picture description task. Stimuli were varied for verb type (unaccusative versus unergative) and could occur in broad focus, narrow informational focus, or contrastive focus. The narrow focus conditions were crossed with location of focus in that both the subject and verb could be focused. Responses were coded for both word order and for location of NA (which was also evidenced through acoustic measures). Their reported percentages for the type of utterances and the observed production are reported here (Calhoun et al., 2018, p. 18):

Table 2.1: Findings from Calhoun et al. (2018). Nuclear Accent placement indicated by capital letter (S or V)

<table>
<thead>
<tr>
<th>Focus</th>
<th>Verb Type</th>
<th>sV</th>
<th>Sv</th>
<th>vS</th>
</tr>
</thead>
<tbody>
<tr>
<td>broad unerg</td>
<td>88%</td>
<td>8%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>broad unacc</td>
<td>54%</td>
<td>19%</td>
<td>28%</td>
<td></td>
</tr>
<tr>
<td>informational unerg</td>
<td>56%</td>
<td>32%</td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>informational unacc</td>
<td>42%</td>
<td>33%</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>contrastive unerg</td>
<td>24%</td>
<td>50%</td>
<td>26%</td>
<td></td>
</tr>
<tr>
<td>contrastive unacc</td>
<td>18%</td>
<td>57%</td>
<td>26%</td>
<td></td>
</tr>
</tbody>
</table>

As can be seen, the majority of utterances were produced in canonical SV word order. It is more likely for unaccusatives to be realized with VS word order in broad focus than for unergatives. However, this number, at 28% is relatively low. We see some evidence for subject inversion when it is contrastively focused, though this percentage, at 26% is also relatively low. In terms of prosodic marking, NA is most likely to occur on the final element in broad focus constructions. It is slightly more likely to shift to the subject (when SV) under information focus, and even more likely to shift to the subject under contrastive focus.

These findings suggest that both NA shift and word order inversions are being used for similar functions, something that is not predicted by the existing theoretical models. It also suggests that the proposed categorical difference between the realization of information and contrastive focus is not as clear cut as suggested. This is most relevant for informational focus which is proposed to only be marked through word order inversions. Finally, the authors also propose that any findings may be due to differences of dialect, as they investigated Venezuelan Spanish specifically.

Kim (2016) conducted both a perception and production task to examine the use of word order inversions and prosody to mark focus in Spanish. For the perception experiment, she conducted a forced-choice task in which participants were asked to reconstruct the previous question based
on the prompt they heard. Prompts were built of transitive verbs that had focus on the subject, which was either expressed *in-situ*, including prosodic cues, or through inversions. Afterwards, participants responded to questions that elicited broad focus or narrow focus on either the subject or verb. She found that neither word order nor prosodic prominence seemed to be important in the perception of focus, since even the filler items, with focus produced on the verb, were gauged to have subject focus. For the production experiment, participants were asked to respond to a question which again, elicited broad focus or narrow focus on either the subject or verb. Kim found that native speakers only used subject inversion in their responses containing subject focus 18.04% of the time. Tokens with canonical word order and subject focus did acoustically show that the subject was realized with more prosodic prominence than for tokens with verbal focus or in broad focus.

Finally, Hoot & Leal (2020) used online measures to better examine the role of word order inversions as a tool to mark focus and its effect in processing. They included one group of native Spanish speakers from Mexico and one from Spain to examine dialectal differences. Participants completed a contextualized forced-choice task in which participants were asked to select the most appropriate sentence to answer a question that elicited narrow focus on the subject. Sentences were varied for direct object type (clitic versus full NP) and for subject position. For the stimuli with clitics, sentences were presented as either Cl-V-S or S-CL-V. For those with full NPs, they were presented as either VSO or VOS. SVO was not presented as this has been shown to be compatible with sentences with narrow focus on the subject in other studies. VSO word order, on the other hand, should not be compatible with such a reading. An example of the stimuli is provided in Table 2.2 below (taken from Hoot & Leal, 2020, p. 14):

Table 2.2: Example stimuli from Hoot and Leal’s (2020) contextualized forced choice task

<table>
<thead>
<tr>
<th>Subject Non-Final</th>
<th>Subject Final</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full DP Object</strong></td>
<td><strong>VSO</strong></td>
</tr>
<tr>
<td></td>
<td><em>Compró el pintor el carro</em></td>
</tr>
<tr>
<td></td>
<td>bought the painter the car</td>
</tr>
<tr>
<td><strong>S-Cl-V</strong></td>
<td><strong>Cl-V-S</strong></td>
</tr>
<tr>
<td><strong>Object Clitic</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>El pintor lo compró</em></td>
</tr>
<tr>
<td></td>
<td>the painter it.ACC bought</td>
</tr>
</tbody>
</table>

The authors found that both groups preferred subject-final constructions. However, there were some dialectal differences. The participants from Spain preferred subject inversion both when the object is presented as a full NP and a clitic. The participant group from Mexico preferred an utterance-final subject only when the object was a full NP. When the object was presented as a clitic this group actually showed a preference for an utterance-initial subject. These findings support the claim that different varieties of Spanish can vary in the marking of focus.

Hoot and Leal additionally conducted a self-paced reading task, which was completed by the same groups of participants. This experiment had a 2x2 design in which word order (VSO vs. VOS) was crossed with focus type (subject versus object). SVO was expected to be more felicitous
in object focus conditions, whereas VOS was predicted to be more felicitous under subject focus. This was predicted to be evidence through shorter processing times. Their findings supported their predictions, in that when the focused element was utterance-final, the sentence was read more quickly.

Overall, through both the forced-choice and self-paced reading tasks, the authors showed that moving a constituent to the end of an utterance in Spanish can be a strategy used to mark it as focused. They also compare this to findings that seemingly contradict this. Namely, that canonical SVO word orders are processed quickly and interpreted with a focused-subject, even though it is not sentence-final, a finding that is not supported by the previous theoretical literature. The authors point to the fact that canonical word order is often faster to process and can be used in any discourse context and still be felicitous. They claim that their findings complement this, by showing that syntactic marking of focus is possible. This is demonstrated by the fact that infelicitous marked word orders are dispreferred and actually processed more slowly. This leads to the conclusion that there are multiple focus-marking strategies in Spanish, both in-situ marking and word order inversions.

As can be seen from the studies above, the grammar of prominence in Spanish is not quite as straightforward as the theoretical literature would predict. On the one hand, we do see that word order inversions can be used to mark narrow focus as well as broad focus unaccusative intransitives. However, according to these findings, it appears that prosodic prominence could play a bigger role than previously expected. We see this largely in focus constructions, and to a small extent so far, it is also observed in broad focus intransitives (Calhoun et al., 2018). Additionally, some of this research suggests dialectal differences, though some findings are found across speakers of different Spanish varieties. Many of these questions must be further investigated. While this is not the main focus of this present work, it is important to keep in mind the variation of the input learners may be receiving in order to better understand both what they need to learn and to explain any output they may be producing.

2.2.5 Research Questions on L1 Spanish and L1 English Prosody

While many of the grammatical distinctions in English discussed above have been established in the literature, there are still some open questions that will be addressed in this study. The area with the most open research questions is the variability of NA placement in broad focus intransitives (Section 2.2.2.2). The rules behind NA assignment in intransitives seem to be particularly complex, and an understanding of all the factors that play a role in these constructions has yet to be achieved.

Both pragmatic and structural/syntactic factors have been proposed to influence NA placement in intransitives, though some researchers discount the role of syntactic features. Some research has evidenced that verb type can be responsible for NA placement variation in that there is more variability found in unergative structures than in unaccusative stuctures (Irwin, 2011; Verhoeven & Kügler, 2015; Zubizarreta & Nava, 2011). These findings are predicted by many of the proposed models, especially those that denote a special role for syntax (e.g. Irwin, 2012; Kratzer & Selkirk, 2007; Irwin, 2011; Verhoeven & Kügler, 2015; Zubizarreta & Nava, 2011). These findings are predicted by many of the proposed models, especially those that denote a special role for syntax (e.g. Irwin, 2012; Kratzer & Selkirk, 2007; Irwin, 2011; Verhoeven & Kügler, 2015; Zubizarreta & Nava, 2011). These findings are predicted by many of the proposed models, especially those that denote a special role for syntax (e.g. Irwin, 2012; Kratzer & Selkirk, 2007; Irwin, 2011; Verhoeven & Kügler, 2015; Zubizarreta & Nava, 2011).
However, other models have predicted that only information status and pragmatic factors are responsible for NA placement (e.g., Bolinger 1954, 1972). Other experimental research has correspondingly supported this approach (Hirsch & Wagner, 2011). The amount of experimental research on this topic could be expanded as the status of verb type in NA assignment is still under debate.

Additionally, the pragmatic factors affecting NA placement need to be more thoroughly investigated. Many sources have suggested that factors such as predictability and expectedness play a role (Bolinger, 1972; Zubizarreta & Nava, 2011). However, this could be more thoroughly tested through experimental means for English. Verhoeven & Kügler (2015) offer us some insight of predictability’s importance in this regard. However, this study needs to be replicated to see if the results hold in English. Furthermore, this was a perception experiment that did not include actual unaccusatives, but substituted passives instead. This study will address this gap by conducting a production experiment in which intransitives are varied both for verb type and expectedness. The research questions this study aims to address are as follows:

RQ1  What effect does verb type have on NA placement in English intransitive clauses?

RQ2  What effect does the pragmatic factor of expectedness have on NA placement in English intransitives?

These questions will be addressed in Chapter 3, which will detail the English Experiment of this study.

The Spanish Experiment conducted in this study focuses more on L2 acquisition of the aforementioned constructions than L1 production. The participants in the native speaker control group come from a diverse range of geographical backgrounds, and thus represent a diverse range of dialects. Moreover, many of the participants have been residing in the U.S. for an extended period of time, using English extensively on a daily basis. In addition to this, many have been teaching Spanish to L1-English speakers and are therefore very accustomed to English-accented speech. All of these factors could have a foreseeable effect on their Spanish. Because of this, this study will not be able to contribute strongly to questions about Spanish prosody in marking information structure. However, the findings from this study will still be able to provide some insight into the type of Spanish that learners are exposed to, especially since data from teachers was collected. A better understanding of the type of Spanish learners are exposed to will lead to a better understanding of L2 speech patterns and L2 development. The following research questions will be examined for the L1 data in this study that will be found in Chapter 4:

RQ3  To what extent do L1 speakers of Spanish use subject inversion in intransitives?

RQ4  To what extent do L1 speakers of Spanish use subject inversion to mark focus, both contrastive and informational?

RQ5  To what extent do L1 speakers of Spanish use prosody to mark focus? Are prosodic means more likely to be used to mark contrastive focus as compared to informational focus?
By examining these questions in L1 Spanish, we can better understand how (or if) L2 learners are converging onto L1 speech patterns, and if not, if there are certain constructions that exhibit more divergence than others.

### 2.3 L2 Acquisition of Prosody

The majority of research in the field of L2 acquisition of phonetics or phonology has focused on the acquisition of segments (e.g. Best, 1994; Flege, 1995, 2003, and many more). However, recently there has been an increase in the studies on L2 acquisition of prosodic structures and this has undoubtedly been a quickly growing field.

Prosodic units can be more difficult to measure than segments, which could explain why more research has first been devoted to segmental acquisition. Additionally, the function of prosodic units could be argued to be of more importance than for segments, which adds another layer of complexity. Despite the integral role prosodic units play in adding meaning to an utterance, their function is not always clear or well understood. Moreover, there is no 1 to 1 mapping between a prosodic unit and its function. Instead, an underlying function can often be expressed through more than one prosodic form. Similarly, many prosodic forms can often convey more than one function (Ladd, 2008). One result of the complexity of prosodic units, is that there are many aspects of prosody that the learner must acquire, and therefore many aspects of L2 acquisition that the researcher can investigate. For example, prosodic systems may consist of different hierarchical levels of prominence assignment, from the level of the word up to the level of the utterance. The learner has to acquire all types of prominence, including word stress as well a phrasal stress. In addition to acquiring the system behind stress assignment, the learner must also learn how stress is phonetically implemented. Not only can the phonetic correlates of stress vary within a language (e.g. how word stress is phonetically realized may have different correlates than phrasal stress), but it can also vary across languages. Learners must first realize that the production of stress differs from that of their native language and then slowly acquire the phonetic correlates of how to implement it.

Because there are so many aspects to explore, this field of research is correspondingly wide and varied. Different researchers have examined different aspects of prosodic acquisition making the findings fairly scattered. Some researchers have focused on how learners acquire the phonetic implementation of stress (e.g. He et al., 2011; Mennen, 2004). Others have focused more on the acquisition of the underlying stress assignment algorithms (e.g. McGory, 1997; van Maastricht et al., 2016, etc.). Because this field is relatively new, and because researchers must first focus on one individual phenomenon at a time, a real coherent picture of all the aspects of prosodic L2 acquisition has yet to emerge. Likewise, there is no coherent model that can predict the difficulty of acquisition of any one structure and only a few studies have made comparisons between the acquisition of different prosodic structures. Much remains to be discovered and understood in order to obtain a more complete picture of the L2 acquisition of prosody.
This study proposes to look at the acquisition of prominence placement in various prosodic constructions. This will help contribute to the ongoing discussion by presenting a better picture as to whether certain constructions are more difficult to learn than others. Examining hierarchies within this perspective will pave the way to examine other aspects of prosodic acquisition. For example, the acquisition of the underlying metrical structure and phonological rules can be compared to the phonetic implementation once the acquisition of the underlying structure is better understood.

Before discussing these studies and their findings, however, this section will detail some of the studies that have already been done in regards to this question. As stated before, most studies have only examined one or two constructions. Only a subset of these has suggested a more coherent framework to help make future predictions. The frameworks from these studies will be discussed in Section 2.3.4 after the results from these studies are detailed. Afterwards, the research question that are addressed in the studies in this dissertation are given.

2.3.1 Prior L2 studies on compound stress

Zubizarreta et al. (2013) examined the acquisition of compound stress in L2 English by L1 Spanish speakers in order to better understand whether L1 Spanish speakers had difficulty with this stress pattern and whether there was a difference in target-like performance based on the type of compound. To do this, three types of compounds were included in this study. The first type included highly idiomatic, lexicalized compounds, which included words such as shopkeeper, highchair and headache. The convention of writing a compound as one word was taken as an indication of a lexicalized compound. The second two types of compounds consisted of non-lexicalized compounds. These two compound types were further sub-divided into argument-head (e.g. cheese-eaters, wage-earners) and modifier-head compounds (e.g. day-sleeping, Harvard-trained). Modifier-head type compounds correspond to Giegerich’s (2004) attribute-head compounds described in Section 2.2.2.3. To recap from the earlier section on compounds, lexicalized and argument-head compounds are predicted to be produced with left-hand stress, while modifier-head compounds are predicted to be produced with final, right-hand stress. Zubizarreta and colleagues tested the production of both a native speaker group of L1 English as well as the L1-Spanish/L2-English speaker group. By doing so, they were able to compare learners’ productions with native speakers and also examine whether there was a difference in the three types of compounds in terms of stress placement.

For the native speaker group, it was found that lexicalized and argument-head compounds were indeed produced largely with left-hand stress. This was most clear for the lexicalized compounds, which were produced with left-hand stress at rates of 100% of the time. Argument-head compounds were a bit more variable as they were produced with left-hand stress an average of 87.5% with a by-item range of 62.50%-100% when examining each token. Non-lexicalized modifier-head compounds also exhibited more variability with right-hand stress being produced an average of 63.28% of the time with a by-item range of 37.5%-100% when broken down by token. As can be seen, there is more variability in native input for the non-lexicalized compound types.

The L1-Spanish/L2-English speakers showed overall more variability and indeterminacy (i.e.
annotators had difficulty locating the main stress) than the native speaker group. Overall though, the L2 group produced the left-hand stress most consistently for the lexicalized compounds at an average of 75% of the time with a by-item range of 5.25%-100%, indicating there is a greater deal of variability not seen for the native speaker group. The other two types of non-lexicalized compounds were produced more consistently with final, right-hand stress. Argument-head compounds were produced with left-hand stress only 25.78% of the time (by-item range: 0%-50%). Modifier heads were produced with left-hand stress an average of 22.66% of the time (by-item range: 0-37.5%). There were no significant differences between these two types among in the learner group. Other non-linguistic factors, such as level of familiarity with the compound, age of acquisition and age of exposure were examined. It was found that age of acquisition and age of exposure played a role in the production of left-hand stress in lexicalized compounds. The earlier learners were exposed to English or arrived in an English speaking country, the more likely they were to produce lexicalized compounds with left-hand stress. These two factors were not found to play a significant role in the production of the non-lexicalized compounds. Interestingly enough, familiarity with a compound did not increase its chance of being produced in a more target-like manner.

This study indicates that learners can acquire left-hand stress in English even though it deviates from their L1 norm. However, this is not an easy task as was demonstrated by the variable and overall lower numbers of left-hand stress in compounds compared to the L1 speaker group. Additionally, the learners were more readily able to acquire left-hand stress with the lexicalized compounds as opposed to the non-lexicalized compounds, which indicates they are more likely to produce target-like stress patterns when they can rely on knowledge of the word instead of relying on an algorithm based on structural properties to determine stress. That is, speakers seem to have an easier time acquiring a new stress pattern when it is stored with the lexical entry of a word versus acquiring a new stress-assigning algorithm. Zubizarreta and her colleagues also point out that there is more noise in the distinction between the types of non-lexicalized compounds, as exhibited by the native speaker group, which could also complicate the target-like acquisition of stress. This was largely seen in the modifier-head compounds which L1 speakers produced with left-hand stress more frequently than originally predicted. This sort of noise can effectively obscure the input, making it difficult for learners to arrive at any generalizations based on structural properties, which in turn makes this particular stress alternation more difficult to acquire.

2.3.2 Prior L2 studies on the prosodic marking of focus

Many studies on the L2 acquisition of NA placement focus on the prosodic marking of information structure. Archibald (1997) was one of the earliest studies to examine this question. His pilot study featured two case studies, an L1 speaker of Polish and L1 speaker of Hungarian who both produced sentences in L2 English. Archibald was mainly interested in examining whether these two learners were producing left-retracted NA in focused contexts. He noted that Polish allows for the leftward-retraction of accent, whereas Hungarian does not. In Hungarian, focus is marked syntactically by putting the focused element immediately before the verb. Archibald’s findings
indicated that the Hungarian speaker tended to implement prominence patterns according to his L1. In 69% of the data, the speaker produced the main prominence either on the verb, or on the constituent immediately before the verb, regardless of where the focus was in the sentence. The L1 Polish speaker, on the other hand, was more target-like in her L2 English productions. She generally produced the main prominence on the rightmost constituent of a phrase, as found in L1 English. However, there was also evidence of shift leftwards to mark focus. Additionally, there were tokens in which the speaker shifted the NA to an element to the left for reasons that could not be explained. Archibald does not offer an explanation for this, but he does attribute much performance to transfer.

Grosser (1993) presented findings contradicting the claim that L2 prosodic acquisition is driven largely by transfer. Instead, he presented a case that universal principles of language acquisition are at play before transfer effects can come into play in L2 prosodic production. Grosser discussed a longitudinal study in which the intonational performance of L1-German/L2-English speakers were examined. Grosser found that, even though German and English have essentially the same accent assignment system, there were inappropriate accent placements by the L2 speakers that cannot be attributed to transfer. These principles of accent placement fall into four categories:

- **Cumulative Accentuation**: each word in a phrase is assigned an accent
- **Alternating Accentuation**: too many accents are assigned to a phrase, but they are assigned to alternating beats
- **Backshifting**: an accent is assigned to the final element even though it should be shifted leftward
- **Fronting of Accents**: an accent is shifted leftwards even though it should be final

Grosser claimed that the first two principles of accent placement do not arise due to linguistic constraints, but rather to production or cognitive constraints of being an L2 speaker. He also proposed that the final principle might arise as rote memorization of a holistic phrase, which is often marked for focus, though not applied in the present situation. Only the third principle, backshifting, could be due to an active rule, that of over-generalizing a final accent rule. This principle was found in more advanced stages (in this case, when the students were in their second year of study), while the others were found in the first months of study.

Many, more recent, studies examining this phenomenon investigate the acquisition of a plastic language by native speakers of a non-plastic language and how this compares to the acquisition of a non-plastic language by L1 speakers of a plastic language. Because these languages vary predictably from each other, researchers have been interested in how speakers of a non-plastic language acquire the prosodic system of a plastic language and vice versa.

Rasier & Hiligsmann (2009) examined how L1-Dutch/L2-French and L1-French/L2-Dutch speakers used prosody in both their native language and their L2 in order to mark information status. French is considered a semi-plastic language, whereas Dutch is a plastic language. In this study
participant groups completed a picture description task that elicited noun phrases consisting of an indefinite article, adjective and the modified noun. The noun and adjective were varied in information structure so that both could be new information, both could be old information, or one could be new while the other is old. Participants completed this task in both their L1 and L2 so the use of accentuation and de-accentuation could be compared across speakers for both L1 and L2 varieties. It was found that Dutch speakers tended to deaccent given information at the end of the sentence in their L1, whereas L1 French speakers tended to use the same accentual pattern across all information types. This pattern consisted of a 'bridge accent', a double accent pattern with an accent on both the noun and following adjective. Given information was found to be deaccented to a lesser degree in L1 French than in L1 Dutch. The L2 data indicated that the L1-French/L2-Dutch speakers produced the bridge accent pattern similar as they had in their L1 French productions. There was little evidence of deaccenting given elements as was found in the Dutch L1 productions. When examining the L1-Dutch/L2-French speakers, on the other hand, there was evidence of transfer of the deaccenting strategy to mark old information, but there was also similarities to the target variety. That is, transfer was found in both groups. However, L1 Dutch speakers tended to approximate the French accentuation pattern more in their L2-French, than did the native French speakers in their L2-Dutch. These findings were offered in support of the claim that acquiring a non-plastic L2, when coming from a plastic L1, is easier than acquiring a plastic L2 when starting with a non-plastic L1.

Van Maastricht et al. (2016) built on this previous research by examining the L2 acquisition in Spanish and Dutch in a study that examined both the production of prosodic prominence in focus constructions and boundary tones. It also examined learners performance as modulated by proficiency level (a variable that had been left out of Rasier and Hiligsmann’s (2009) study) and investigated bi-directional transfer by examining productions of the learner’s L1 as well as their L2. In addition, their analysis consisted of quantitative measurements as opposed to a perceptual analysis.

To test the research questions, a picture-naming task was conducted, which consisted of a set of items to be described in NP form with a noun and adjective. Participants were asked to name the item (the noun) and its color (its adjective). For example, such items as a 'blue donkey' or 'pink broom' were included. Participants were presented with a series of four pictures, and the sets of items were varied so that the two components in the NP in the last picture each differed in information status. There were four conditions which are described in Table 2.3 below:
Table 2.3: Conditions from van Maastricht et al.’s (2016) study

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
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| Contrastive-Contrastive (CC) | both noun and adjective are completely new  
                             e.g. blue donkey followed by pink broom |
| Given-Given (GG)   | both noun and adjective are old information  
                             e.g. blue donkey followed by blue donkey |
| Contrastive-Given (CG) | first element is new, second is given  
                              e.g. blue donkey followed by pink donkey |
| Given-Contrastive (GC) | first element is given, second is new  
                              e.g. blue donkey followed by blue broom |

For the L1 speakers, it was found that prosody was used to mark focus (i.e. the contrastive element) in Dutch, whereas all information status conditions were similar in L1 Spanish, indicating that information status was not being marked prosodically. The L2 data indicated that both L1 Spanish and L1 Dutch speakers transferred elements of their native language into L2 Dutch and Spanish respectively. Transfer was found in both the use of prosodic marking for focus as well as for boundary tones. Additionally, proficiency was found to modulate the amount of transfer for both speaker groups. The more proficient a speaker was, the more target-like their productions were. However, transfer was found across proficiency levels. Interestingly enough, it was found that L1-Spanish/L2-Dutch learners converged more readily to Dutch pitch accents marking focus and were less target-like when it came to the production of boundary tones. The opposite trend was found for the L2-Spanish learners. L2 Spanish learners were more likely to transfer pitch accent marking of focus and to become more target-like in the production of boundary tones. The authors suggested that it could be difficult for L1-Dutch/L2-Spanish learners to lose a part of their grammar that carries an important communicative function. This finding suggests that acquiring the less variable prominence assigning system of a non-plastic language may not be as straightforward or simple as some of the other research suggests. Instead, it shows that prominence marking information structure is subject to transfer even at high levels of proficiency.

Kim (2016) provided more evidence that L1 speakers of English transfer prosodic patterns to mark narrow focus in L2 Spanish. She tested the production of informational focus in Spanish in both heritage speakers and L2 learners of Spanish who spoke English as an L1, also comparing them to the productions of a native speaker control group. Kim found that the L2 participants marked focus prosodically in situ, regardless where the focused constituent occurred in the sentence. Any focused constituents occurring away from the right edge of the utterance were more likely to receive prosodic prominence than they were to be moved to the end of a sentence.

Zubizarreta & Nava’s (2011) studies is one of the few to examine NA shift in broad focus contexts. They investigated the production of NA shift in broad focus intransitives versus that in narrow focus constructions. The goal was to examine accuracy levels between these two constructions. The participant group consisted of L1-Spanish/L2-English speakers as Spanish varies predictably from English in both constructions, making for an informative comparison. It was pre-
dicted that NA shift in broad focus intransitives would be more difficult to acquire than in narrow focus intransitives. As described earlier, NA placement and shift in English intransitives relies on the ability of metrical nodes to be invisible, which is not allowed in Spanish and is therefore incompatible with Spanish grammar. Narrow focus constructions, on the other hand, require the adoption of a set of rules (A-deaccenting followed by NS-Shift), which are both absent in Spanish grammar, but not incompatible. The status of these rules’ incompatibility determines the difficulty level of acquisition.

To test this prediction, Zubizarreta and Nava conducted an oral production task which was presented in a Q&A format. The L2 speaker group was divided into two proficiency levels: a high proficiency group and an intermediate proficiency group. The productions of the two L2 speaker groups were compared with productions from a native speaker control group to see how the L2 learners differed from the native speakers, and to examine the effect of proficiency.

For the broad focus intransitive stimuli, it was found that high proficiency speakers tended to implement subject stress in unaccusative constructions the majority of the time, similar to what was found for the native speaker control group. Additionally, there was much variation in the unergative verbs for both the high proficiency L2 group and the native speaker group. The intermediate L2 speaker group, however, preferred verbal stress across both verb types, indicating that they have yet to acquire NA shift in intransitive constructions.

For the narrow focus stimuli, it was found that advanced L2 learners were very similar to the native control group in shifting the NA to the focused element (in this case the subject of an intransitive sentence). The intermediate group performed less target-like than the advanced speaker group, but still their levels of implementing NA shift were relatively high at 68%. This was a higher rate of predicted NA shift than was found in the production of the wide focus intransitive stimuli, which confirmed the prediction that the NA shift in broad focus intransitives would be more difficult than for narrow focus intransitives. However, it should be noted that only four items testing narrow focus were included in this study.

Overall, these studies offer insight into L2 acquisition of the prosodic marking of focus. Findings indicate that acquiring a system that marks focus prosodically (especially when this is not the case in the L1) is difficult. However, they also indicate that learning can take place and speakers do start converging on target-like forms as their proficiency increases. The acquisition of a non-plastic system has also been investigated. While some have suggested that learning a non-plastic system should be easier (e.g. Rasier & Hiligsmann, 2009), findings indicate that transfer is pervasive even at high levels of proficiency (van Maastricht et al., 2016; Kim, 2016). The majority of studies have focused solely on L2 acquisition of narrow focus, and only a few have started comparing the acquisition of NA shift in other constructions.

2.3.3 Prior L2 studies on Spanish word order

Research into L2 acquisition of word order inversions has traditionally comprised a separate field of study to that of the L2 acquisition of prosody, despite the fact that these two are closely interrelated.
in some languages, such as Spanish, where both mechanisms may potentially be used in the expression of prominence. Because of this we have yet little understanding of the relationship between the L2 acquisition of word order inversions and prosody. That is not to say, however, that studies in L2 Spanish word order inversion are lacking. Indeed, there is a fairly large body of literature that deals with this topic. Most researchers have specifically been interested in examining the difference in the production of word order inversions as a mechanism to mark focus versus the production of inversions in intransitives. Some works have found that word order inversions to mark focus are easier to acquire and learned before inversions to mark intransitives (e.g. Alvarado, 2018; Hertel, 2003). Others have found evidence for the opposite: that word order inversions in intransitives is acquired more readily than in focus constructions (e.g. Lozano, 2006). Regardless, it seems to be the case that acquiring L2 Spanish subject inversion is difficult for L1 English speakers, who do not acquire this even at more advanced levels of proficiency. This study hopes to contribute to this growing body of literature, by examining word order inversions in both focus and intransitive constructions and comparing it to the production of prosody in the same contexts. Before these research questions addressed by this study are detailed, the existing literature will be reviewed.

Hertel’s (2003) study described earlier in section 2.2.4 provided evidence that subject inversion to mark subject focus is acquired earlier than that to mark intransitives. This study examined the production of word order in L2 learners as compared to a group of native speakers. Participants were given a short context and asked to write down a sentence to answer the question at the end of the contextual paragraph. Target sentences were simple intransitives and were varied for verb type and focus (broad versus narrow). Learners of four different proficiency levels were included (from beginner to advanced). Participants’ performance in broad focus intransitives was compared to that in narrow focus intransitives. Verb type was also a factor in both focus conditions. In the broad focus conditions, learners at lower levels of proficiency were rarely found to use word order inversion to mark verb type. Instead, they preferred SV word order, similar to what is required in their L1. It was not until the most advanced group that more subject inversion was found. This group produced unaccusatives with VS word order 56% of the time and unergatives with VS word order 33% of the time. These findings evidence the claim that subject inversion is learned only late in the acquisition process for broad focus intransitives. The finding that unaccusative verbs occurred with subject inversion significantly more often than unergative verbs show that advanced learners are able to distinguish between the two verb type. However, the rate of subject inversion in unergatives was found to be clearly higher than for the native speakers (at 33% versus 6.56%), a finding which Hertel attributed to overgeneralization.

In the narrow focus conditions, both advanced and intermediate learner groups were found not to differ significantly from the native speaker control group. These findings for the narrow focus conditions differ from those for the broad focus conditions (which prompt subject inversion based on verb type). For the broad focus items, only the advanced speakers were shown to converge on native speaker patterns and the intermediate speakers were less target-like showing a stronger preference for SV word order. Based on these results, it appears that it is easier for L2 learners to
acquire discourse-based word order inversion rules than it is to acquire syntactically based rules.

This finding is not uncontroversial, however. Lozano (2006) found evidence for a conflicting account in which word order inversions marking focus are acquired before inversions in intransitives. He conducted a contextualized grammaticality judgment task that crossed verb type and focus and varied word order. A group of L1-English speakers acquiring L2 Spanish completed this study.

L2 learners were found to prefer SV word order in broad focus unergatives with an acceptance rate of 85% for SV versus 70% for VS word order. Conversely, they rated unaccusative SV structures higher at 87% than VS structures (at 75%). This was taken as an indication that learners were making a distinction between verb type in intransitives by accepting VS more for unaccusatives than for unergatives. However, it is interesting to note, that the acceptance rate of VS structures in unergatives was higher for the L2 learners than it was for the native speakers, who accepted VS unergatives at a rate of 45%, a finding reminiscent of Hertel’s (2003) findings of overgeneralization.

In narrow focus constructions, L2 learners were equally accepting of both word order types for unergatives. Both SV and VS structures were accepted at rates of about 80%. Unaccusative SV sentences were accepted at 73% in the narrow focus condition while VS structures were accepted at a rate of 85%. Despite the similar distance in acceptance rates between unaccusative SV and VS sentences in both the broad focus and narrow focus conditions, there was no effect of verb type found in the narrow focus condition. These findings support Lozano’s claim that word order inversions to mark narrow focus is easier for L2 learners than those in intransitives.

In their study with a context-dependent preference task, Domínguez & Arche (2014) included three groups of L1-English/L2-Spanish learners divided by proficiency level in addition to the native control group described earlier. It was found that the beginner and intermediate level speaker groups overall preferred SV word ordering across all focus and verb types. Advanced speakers, on the other hand, were much more accepting of other word orders. For broad focus intransitives, unaccusatives had the highest rate of preference for the VS word order (at 35%). However, for both verb types in broad focus, ‘Both’ was the most popular option, with advanced learners selecting both word orders as appropriate in these contexts for both unergative verbs (at 49%) and unaccusative verbs (at 45%). A similar trend is seen for the narrow focus condition. For the two verb types, both word orders have the highest rate of acceptance with 43% for unergatives and 49% for unaccusatives. The results of this study are used to show that subject inversion in both focus and intransitive structures are marked by optionality and indeterminacy even at advanced levels of proficiency. This contradicts studies such as Lozano’s (2006), which argue that mainly the focus structures would diverge from native speaker productions and intuitions.

Finally, Alvarado (2018) contributed to this discussion with her study, which included transitive sentences in addition to both narrow, subject focus and broad focus intransitives (of both verb types). This study consisted of an acceptability judgment task. Three participant groups took part: a native speaker control group and two learner groups (L1 English). The learner participant group was split into an advanced learner group and an intermediate group.

The intermediate group was found to accept both SV and VS word orders about equally in
the broad focus conditions for both unaccusative and unergative verbs. The advanced group was found to distinguish between the two different verb types in broad focus in that they gave VS higher ratings for unaccusative verbs than for unergative verbs. Similarly, the intermediate group gave equally high ratings for both SV and VS word orders for unaccusatives with subject focus. Unergative SV sentences with subject focus, however, were preferred over VS for this group. For subject focus, the advanced learner group rated VS structures higher for both unaccusatives and unergatives. Though they did also rate SV unergatives with narrow focus higher than native speakers did. Both learner groups gave low ratings to VS structures in transitive sentences with subject focus. The intermediate group preferred SV, while the advanced group made no distinction between SV and VS structures statistically, though there was a slight preference for SV.

Based on this data, Alvarado proposed that word inversions in broad focus intransitives had been acquired by both the intermediate and advanced groups. Though the proper restrictions, such as verb type, do not start forming in the grammar until the advanced stage, where learners start preferring VS more in unaccusatives than in unergatives, as intermediate learners accepted both types across the board. Alvarado also proposed that inversions marking focus are not acquired until the advanced stage, as you see a stronger preference for SV structures in the intermediate group, especially for transitives.

As can be seen from these studies, it is apparent that word order inversions in L2 Spanish is difficult for native speakers of English to acquire. L1-English speakers tend to prefer a grammar similar to their L1 as seen in their preference for SV constructions across the board. Learners do not seem to acquire inverted word order until advanced levels of proficiency, and even then learners are shown to accept both inverted and canonical word orders as being felicitous more often than native speakers. Moreover, learner productions and judgments are often characterized by indeterminacy, as indicated by the fact that many participants find both word order types equally good, and the fact that word order inversion is overgeneralized to inappropriate contexts, such as broad focus unergatives.

2.3.4 Frameworks of L2 acquisition of prosody and word order

2.3.4.1 L2 acquisition of prosody

As stated earlier, in the field of L2 acquisition of phonology, more attention has been given to the acquisition of segments compared to that of suprasegmentals and prosody. Resultingly, the major models in the field such as the Speech Learning Model (Flege, 1995; 2003) and the Perceptual Adaption Model (Best, 1994) were developed based on segmental perception and acquisition alone. While there have been attempts to extend these to the acquisition of suprasegmentals (e.g. So & Best, 2014), this has been done only to a limited extent.

The SLM and PAM models have guided much of L2 research in segments. Such a comprehensive, guiding model is missing though for the L2 acquisition of prosody. A few researchers have proposed a coherent model or theoretical framework that can guide future research in L2 acquisition of
prosody.

So & Best (2010) have attempted to extend the Perceptual Adaptation Model (PAM) to cover the acquisition of suprasegmentals in a model they call PAM-S (Perceptual Adaptation Model for suprasegmentals). In this study, they examine how the phonetic similarity of prosodic L2 categories to native prosodic categories can cause perceptual difficulty. The more phonetically similar two non-native prosodic categories are to a single native category, the more likely they are to be assimilated to that native category, therefore being difficult to discriminate.

While the phonetic form of prosodic units undoubtedly plays a significant role in L2 acquisition, it is also crucial that other aspects of prosodic acquisition are also accounted for due to prosody’s important function in communication.

Mennen (2015) was one of the first to develop a framework that addresses multiple aspects of prosody. She proposed four different dimensions along which languages’ prosodic systems can differ. When we understand the differences, we can better predict where transfer could occur and we can better examine what may be difficult for L2 learners. The four dimensions are summarized below:

1. The systemic dimension: the inventory of structural phonological categories, such as the number and types of pitch accents
2. The realizational dimension: the phonetic implementation of those elements, such as how pitch accents are aligned to their syllables, or what their shapes are
3. The semantic dimension: the function or meaning behind these units, such as how boundary tones can be used to indicate type of utterance (e.g. questions versus statements) or how pitch accents can be used to indicate focus
4. The frequency dimension: The frequency to which the different prosodic units may occur

Albin (2015) built on this framework, proposing a total of six dimensions along which languages can vary and be transferred. Some of these are similar to those found in Mennen’s 2015 work, though he also added new dimensions and made further specifications. The six dimensions are described below:

1. Position: How many categories could possibly occur in any given prosodic position
2. Category: the inventory of prosodic phonological structures
3. Accentuation: how pitch accents are distributed across an utterance
4. Realization: how categories are phonetically realized
5. Function: the purpose or pragmatic/discourse meaning of a prosodic element
6. Density: the frequency of occurrence of the each category
Albin then studied how learners transferred aspects of their L1 across the different dimensions by examining L1-Japanese speakers’ production of English as an L2, looking specifically for transfer in the three dimensions of Position, Density and Realization. He found that transfer of Position and Density occurred more frequently than transfer of Realization. From these findings, Albin suggests there is a hierarchy between which prosodic aspects may be more difficult to acquire.

While the works of Mennen (2015) and Albin (2015) provide a framework to discover hierarchies in the L2 acquisition of the various prosodic dimensions, we also need to learn more about hierarchies within the individual dimensions themselves. This stands out particularly for the functional dimension. Languages express different meanings through the use of different prosodic categories. For example, English can use pitch accents to mark focus and boundary tones to differentiate between statements and questions. There are many additional ways speakers can utilize prosodic categories to denote either pragmatic, discourse or even social functions. One interesting question is whether some functional categories are easier for learners to acquire than others. As of yet, there is no one dominant framework that can predict this. However, some authors have suggested principles or hypotheses that could explain their findings.

Although he was working with limited data, Archibald (1997) suggested a guiding principle to explain his findings. This principle, known as the Subset Principle (Wexler & Manzini, 1987) proposes that, if a phenomenon, Z, exists in language A and not language B, speakers of language B will encounter positive evidence that Z exists that is not accounted for in their L1. This positive evidence will help indicate that they have to update their grammar to account for it. On the other hand, speakers of A will have to rely on negative evidence or the lack of Z occurring in the input. It will be more difficult to realize their grammar is inadequate and acquisition will be more difficult.

The Markedness Differential Hypothesis (Eckman, 1977) has also been used to explain the level of difficulty in the L2 acquisition of prosodic phenomena. This is the framework adopted in Rasier & Hiligsmann (2009) whose study is detailed in Section 2.3.2. In this approach, markedness is defined by the relations between two linguistic structures. If the existence of one structure, A, is implicated by another, B, then A is said to be more marked than B. Structures that are more marked are said to be more difficult to acquire than unmarked structures. Moreover, more marked structures are said to be less susceptible to transfer than unmarked structures. Rasier and Hiligsmann apply this to prosodic phenomena by defining markedness based on whether NA placement is determined by either pragmatic or structural factors. NA placement in non-plastic languages, such as Spanish, is considered to be assigned through structural rules, and is therefore an unmarked structure. NA placement in plastic languages, on the other hand, is said to be more influenced by pragmatics and is therefore more marked. This implies acquiring a non-plastic L2 would be easier than a plastic L2. It is interesting to compare this framework with the Subset Principle, which makes the opposite predictions.
2.3.4.2 L2 acquisition of word order

Many studies on the L2 acquisition of word order have focused on whether it is more difficult to acquire discourse-based inversion (as prompted by the focus structure) or inversion driven by formal syntactic properties resulting from the difference in lexical categories between unaccusative and unergative verbs. Both Hertel (2003) and Lozano (2006) agree that learners are able to acquire word order inversions rooted in the narrow syntax based on verb type, that is, in broad focus intransitives. Though it may take awhile, learners are, they claim, eventually able to converge on target-like forms. However, Hertel and Lozano differ on their view of the acquisition of word inversion in focus constructions. Hertel claims, based on her data, that learners are able to converge on native norms concerning subject inversion in these contexts. Lozano, on the other hand, states that, as a phenomenon at the discourse-syntax interface, these forms will remain impaired for L2 learners.

Domínguez & Arche (2014) present a different account from these two earlier studies, drawing attention to the fact that neither of these approaches can explain the overgeneralization of VS structures in broad focus unergative verbs. Instead, they argue that there is an underlying syntactic deficit in learner grammar that can account for this. By having included a 'Both' option in their acceptability task, they were better able to demonstrate that, although learners know inversion exists in Spanish, they see it as optional, even at advanced levels of proficiency.

Finally, Alvarado (2018) offers another account for the overgeneralization of subject inversion in unergative verbs by appealing to the Multiple Grammars model originally proposed by Amaral & Roeper (2014). This model proposes a specific path of acquisition in which learners have both access to the grammar of their L1 (through transfer) as well as access to UG. This entails that speakers can access parallel rule sets and can assign weights to rules, based on whether or not these rules can account for the linguistic input speakers are receiving. These weights help determine how productive a given rule is in a language. Moreover, these rules are simple. They start out as very broad and general, and are slowly narrowed down and specified as more input is received. Based on this model, Alvarado argues that L1 speakers of English will start with an L2 grammar of Spanish consisting of mainly SV word order, as transferred from their L1. With more input of postverbal subjects, learners will add a rule allowing for VS word order. Since this rule is simple it does not yet contain restrictions, such as the fact that unaccusatives are treated differently than unergatives in this regard. As the learner receives more and more input, they will slowly acquire more constraints and stop allowing VS word order where it should be infelicitous. By positing simple rules with little to no restrictions, this model accounts for patterns of overgeneralizations that have been found in many studies of L2 Spanish word order.

All these studies offer insight into L2 acquisition of word order inversions in Spanish, driven by both the syntactic properties of verb class as well as by the discourse factor of focus. For the marking of focus especially, all authors recognize the close relationship between syntax and prosody. For one, many assume Zubizarreta’s (1998) model, the dominant model in the field, according to which subject inversion in focus constructions is prosodically motivated. Secondly, L1 speakers of
English have to learn to move from a system where focus is being marked prosodically to one where it is being syntactically encoded. Although this prosody-syntax relationship is mentioned in each of the previous works, none have yet to explore this topic more thoroughly.

2.3.4.3 L2 acquisition of prosody and word order

While most studies have examined only either prosody or word order and evaluated frameworks for the acquisition of one or the other, Zubizarreta & Nava (2011) is one of the few works to address both prosodic and syntactic L2 acquisition, though it stops short of experimentally testing both. As discussed in Section 2.3.2 Zubizarreta and Nava examine NA placement in both focus and intransitive constructions as produced by L1-Spanish/L2-English learners. They then compare their findings to the works of Hertel (2003) and Lozano (2006). This comparison allowed for a deeper cross-linguistic inquiry as to whether it is easier to move from prosodic encoding of certain grammatical features to syntactic or vice versa. Additionally, since different constructions were included (focus and intransitives), the authors were able to explore hierarchies within each L2.

The use of prosody to mark focus or intransitives arguably belongs to Mennen’s (2015) functional dimension. Although the functional dimension involves the meaning or semantics of a prosodic unit, it is actually the form of the algorithm behind accent assignment that is proposed to cause difficulty according to Zubizarreta and Nava. In their approach, L2 acquisition is seen as the learning of algorithmic rules, some that may be more difficult to learn than others based on what rules are found in a speaker’s L1. This process is captured in the authors’ competing algorithms hypothesis. This hypothesis is based on an earlier hypothesis originally proposed by Yang (2002) to explain L1 acquisition. According to this theory, children’s grammars are composed of a collection of potential grammars that are defined by Universal Grammar. This entails a finite number of possible grammars that are innately accessible to children during the acquisition process. Each of these grammars is assigned a weight. Grammars are either penalized or rewarded based on a child’s linguistic input. If a grammar has success with the incoming data, then it is rewarded with more weight. If it fails to explain the incoming data, then it is punished and given less weight. The grammars that are assigned more weight are more prominently represented in the learner’s mind. In this way the grammars are essentially competing for prominence within the speaker’s mind.

This framework could potentially predict which constructions in an L2 will be more difficult for a learner given the properties in their L1. For example, rules that have been assigned little weight in the L1 would plausibly be more difficult to acquire than rules that have been given more weight. However, as this was originally a framework to describe L1 acquisition, some aspects of how this theory would transfer to account for L2 acquisition are unclear. Yang specifically states that learning stops when the learner’s mental representation converges on a target. He compares this with a critical period-like stage of development. This suggests that L2 acquisition would exhibit fundamental differences to L1 acquisition. Moreover, Zubizarreta makes reference to the notion of ‘incompatibility’, hypothesizing that grammars that are incompatible with the L1 grammar will be more difficult to acquire. Incompatibility, however, is not explicitly defined making it difficult
determine which algorithms are incompatible and which are compatible, which, in turn, gives it less effective predictive power. If these notions were to be better defined, it may be a useful framework to explain which parts of an L2 grammar are more difficult to learn given the relationship of their underlying algorithms to those in the L2.

Based both on Zubizarreta’s (1998) original model of prominence assignment in both Spanish and English as well as the L2 findings in the studies Zubizarreta completed with her colleagues (including Zubizarreta & Nava, 2011; Zubizarreta et al., 2013), it is proposed that L1-Spanish speakers learning L2-English will have more difficulty acquiring NA placement in intransitives than in focus. This is due to the fact that English NA assignment in intransitives relies on the ability of nodes to be invisible, a feature that is not allowed in Spanish (instead, all nodes must be visible). This is seen as an incompatibility between grammars. Focus, on the other hand, should be easier as it involves the acquisition of a new rule to shift the NA. This rule is proposed to not be present in Spanish, but there is also nothing in the Spanish grammar that is incompatible with this it. Learners simply must acquire this rule. Once they do, it will not be actively competing with a rule in their L1 so it will be easier to implement.

Zubizarreta and Nava go a step further to predict that we would see the opposite pattern in L2-Spanish. They predict that L1-English speakers would have more difficulty acquiring word order inversions in L2-Spanish to mark focus as compared to intransitives. It is argued this is due to the compatibility of these grammatical structures with the learners’ L1. However, as stated earlier, since compatibility is not more precisely defined, it is difficult to know where exactly this compatibility (or lack thereof) is stemming from.

This framework has the advantage in that it can explain and predict L2 acquisition of both word order inversions and prosody, two properties of language that are at times closely related. It takes into account the properties of the L1 compared to the L2 to be able to predict which constructions in any given L2 may be more difficult to acquire. However, this hypothesis is as of yet supported by relatively little data. Much more data is needed in order to know if this approach will be able to account for the data when both a wider participant pool and more linguistic structures are included.

One other framework which could potentially predict difficulty level of the L2 acquisition of both prosodic and syntactic phenomena is the Interface Hypothesis (Sorace & Filiaci, 2006; White, 2011). While the Interface Hypothesis has various formulations and re-formulations, and at times can be somewhat vague, it generally predicts that internal interfaces, which only involve formal, grammatical properties of the language, will be less problematic for L2 speakers to acquire than external interfaces, those in which the grammar interfaces with outside cognitive domains, such as discourse. The Interface Hypothesis has largely been formulated and tested on the L2 acquisition of syntax at the interfaces. Research, such as that by Hertel (2003) and Lozano (2006), have addressed the question as to whether subject inversion in broad focus intransitives (assumed to be triggered purely through grammatical mechanisms) is easier to acquire in L2 Spanish than inversions triggered by narrow focus, a discourse property. Despite the fact that this hypothesis
has largely been constrained to the syntactic domain, it is generalizable to phonological interfaces as well. Goad and White (2004, 2019) have extended investigation of L2 acquisition at the interfaces to the interface of phonology and morphology, showing that the transfer of L1 prosodic structures (specifically at the level of the prosodic word) into an L2 can account for perceived deficits in functional morphology. To the author’s knowledge, no work exists on prosody at a higher level, such as at the level of the phrase, in relation to L2 acquisition at the interfaces. However, it seems reasonable that this hypothesis could be extended to make predictions about the acquisition of prosody and intonation in various contexts in which other domains of grammar (e.g. the lexicon, semantics, etc.) as well as discourse factors may interface with the phonology.

2.3.5 Research questions for L2 acquisition of prosody

There are still many interesting questions to explore regarding the L2 acquisition of NA placement and its relationship with the acquisition of word order. One remaining question is whether it is easier to move from a plastic L1 to a non-plastic L2 or vice versa. The Markedness Differential Hypothesis would predict that it is easier to acquire a non-plastic L2, a prediction which was further supported by Rasier and Hiligsmann’s (2009) findings. However, there is also evidence that the plastic properties of an L1 are often transferred into a non-plastic L2 suggesting that it may be more difficult to lose prosodic plasticity as a means to mark focus. This study will compare L2 acquisition of contrastive focus structures in both L2 English and Spanish to address the following research questions:

RQ6 Is it easier to acquire the prosodic system of a prosodically non-plastic L2 with a plastic L1 background? Is it easier to acquire a plastic L2 with a non-plastic L1? Or does each present an equal amount of difficulty?

Additionally, as discussed in Section 2.3.2, most studies have examined NA placement in L2 speakers in regards to the prosodic marking of focus. Only few studies have looked at other constructions of NA shift and even fewer have tried to establish whether there is a hierarchy of difficulty among these different constructions. This study will address this gap by examining the acquisition of L2 English by L1 Spanish speakers in different constructions where NA does not occur at the rightmost edge of the utterance. Additionally, it will contribute a broader understanding of NA placement in L2 Spanish as produced by L1-English speakers. This study, which will be presented in Chapter 4, will address the following research questions:

RQ7 Do L1 Spanish speakers transfer strategies of NA placement in intransitives, contrastive focus constructions, compounds and indefinite pronouns in L2 English?

RQ8 a. Do L1 English speakers mark intransitives prosodically by shifting NA to the subject of intransitive verbs in L2 Spanish?

b. Do L1 English speakers mark narrow focus constructions (both informational and contrastive) prosodically in L2 Spanish?
RQ9 Which categories of NA placement are easier to acquire for L2 learners?

Transfer in this case will be evidenced when an L2 speaker produces a non-target-like construction in their L2 that resembles their L1. It is predicted that there will be transfer evident in both L2 speaker groups. Previous research has shown that L1-Spanish speakers often produce non-target-like stress patterns at both the word and phrasal level. This has been shown for compounds (Zubizarreta et al., 2013), focus constructions and intransitives (van Maastricht et al., 2016; Zubizarreta & Nava, 2011). It is predicted that these findings will be replicated. The production of utterance final indefinite pronouns has not (to the author’s knowledge) been previously investigated. It is predicted that this construction may also be subject to transfer which would result in NA placement on the indefinite pronoun.

It has been shown that L1 speakers of Dutch (van Maastricht et al., 2016) and English (Kim, 2016) transfer prosodic strategies of marking focus into their L2. Research on L2 Spanish learners' productions of intransitives have generally focused on word order production and have therefore been written production or acceptability tasks. If we find evidence of transfer in these constructions, we will see patterns similar to what is found in L1 English. That is, unaccusatives may usually be realized with accented subjects whereas unergatives may exhibit more variation, with accent placed on either the subject or verb.

Since there is relatively little research on difficulty level between these different constructions it is difficult to make pointed predictions. However, some general properties of been proposed to influence the ease of learning certain constructions. Zubizarreta et al. (2013) suggest that learning an grammatical algorithm involving structural grammatical aspects (i.e. distinguishing between argument-head versus modifier-head compounds) is more difficult than acquiring a broad generalization based on word type (i.e. lexicalized compounds receive left-hand stress). The competing algorithms hypothesis suggests that the amount of variability in the input will have an effect. The more variable the input, the more difficult it could be to learn. Additionally, this hypothesis proposes that algorithms incompatible with the L1 grammar will be more difficult to acquire than those that are different but not incompatible. Markedness has also been a factor that has been said to affect the trajectory of L2 acquisition and transfer.

Since it was suggested that stress and accent as a word-level property could be easier to acquire than stress or accent that is assigned algorithmically (Zubizarreta et al., 2013), then we would expect NA shift with indefinite pronouns to be acquired earlier and more consistently than other categories of NA shift. It is thought that acquiring the accentual pattern in utterances ending in indefinite pronouns should be relatively easy since learners simply have to learn that they remain unaccented. There are few exceptions to this that would obscure this pattern in the input they receive. The compound category consisting of phrases versus compounds is also predicted to be relatively easier to acquire and easier to acquire than the compound category with right- versus left-stress compounds. The compounds in the phrase vs. compounds category is predicted be easier than the other compound category since many minimal pair compounds are lexicalized, which means learners must acquire stress as a word level property, which was already shown to be easier for L1
speakers of Spanish learning L2 English. However, there are more exceptions to this pattern than we see for indefinite pronouns and the focus structure can obscure patterns when not occurring in broad focus, which could make acquiring this pattern more difficult than the category with indefinites.

The right- versus left-stressed compounds are predicted to be one of the more difficult categories for learners, firstly because they are often not written as one word, and are therefore likely non-lexicalized compounds which means stress assignment is determined through an algorithm as opposed to being a word-level property. Either learners must acquire this algorithm or learn stress patterns on a word-by-word basis, making the contrast in NA placement more difficult to acquire.

The prosodic marking of contrastive focus is reported to exist in Spanish, but as a marked option (Hualde, 2005). If this strategy can transfer, the contrast between final and penultimate NA placement in the focus category should be clear even in speakers of lower proficiency. However, if this does not transfer, then as an algorithm, this might be more difficult for speakers to produce.

Intransitives seem like they could be the most difficult to acquire. As suggested by Zubizarreta and Nava (2011), this could be due to structural reasons that the algorithm that allows for NA placement alternations in intransitives is incompatible in Spanish. There is also the fact that intransitives are characterized by variability, especially the unergative verbs. These factors could make intransitives the most difficult construction for L1 Spanish speakers to acquire.

Finally, the relationship between the acquisition of prosody, or specifically NA placement, and word order have yet to be fully explored. Examining the acquisition of L2 Spanish by L1 English speakers presents a good opportunity to better examine this question as distinctions coded by prosody in English, such as intransitives or focus, can be expressed syntactically in Spanish. This allows us to investigate both the production of prosody and word order by learners. This part of the study, which is found in Chapter 4, will address the following research question:

**RQ10**

a. Do L1 English speakers use subject-verb inversion in broad focus intransitive clauses in L2 Spanish?

b. Do L1 English speakers move the subject to the end of the sentence in L2 Spanish to express narrow focus?

**RQ11** What is the relationship between the L2 acquisition of word order and prosody in expressing focus and intransitives? Is there evidence that the acquisition of one precedes the other?

### 2.4 Correlates of Nuclear Accent

As discussed in Section 2.3.2, measuring prosodic phenomena, such as NA, has been a challenging obstacle to the field. Studies have evidenced NA placement both through acoustic measures and through perceptual measures. Both of these approaches present difficulties. Perceptual measures can be unreliable, while it can be difficult to know which part of the signal to measure acoustically,
as accentual cues can vary, both within a language and certainly cross-linguistically. Despite this, some universal properties of accentuation have been found across languages (Ladd, 2008).

Many acoustic correlates of prominence, such as duration, intensity and pitch are shared cross-linguistically (Burdin et al., 2015; Ladd, 2008). However, despite some universal trends, languages do exhibit individual variation and there are some notable differences between English and Spanish.

2.4.1 Prosodic prominence in English

There is a large body of research that has been conducted exploring the acoustic properties of prominence in English. Researchers have explored the production of prominence at the level of word stress (e.g. Fry, 1955) up to the level of nuclear accent and phrasal stress (e.g. De Jong, 1991; Silverman et al., 1992). One question that has interested researchers is how focus is acoustically manifested (e.g. Burdin et al., 2015; Cooper et al., 1985; Y. Xu & Xu, 2005). Some research has also examined whether the realization of contrastive focus in English differs from that of informational focus (e.g. Katz & Selkirk, 2011). Other distinctions that are included in this study have been experimentally measured as well, including the acoustic differences between compound nouns and adjective + phrase NPs (e.g. Morrill, 2012; Nguyen et al., 2008). Discovering more about how these distinctions are acoustically produced gives us better methods of quantitatively measuring productions in both L1 and L2 speech. Once we know what acoustic dimensions to look for in the speech signal, we can better measure productions of the different grammatical distinctions and compare them across speaker groups.

Xu & Xu (2005) examined narrow focus constructions in English declarative sentences. They had participants read sentences which had narrow focus elicited on words in different parts of the sentences as well as broad focus sentences. To measure prosody, the F0 contours of both the focused and unaccented words were looked at. It was found that words under focus were marked through longer durations, higher F0 maximum values and steeper and faster rises in F0 contours. Additionally, if there were words following the focused word they tended to have lower pitch values.

These findings were corroborated by Katz & Selkirk (2011), who looked at whether informational focused elements had different phonetic realizations than contrastive focused elements. They examined the dimensions of duration, intensity and F0 movement. Greater values for all of these dimensions for both types of focus were found, but they were overall higher for contrastive focus than for discourse-new focus items.

Morill (2012) investigated the production of English adjective-noun compounds versus their minimal pair NP counterparts (e.g. greenhouse versus green house). She included duration, intensity and F0 measures in different intonational contexts, such as statement falling final, question rising, and continuation. She discovered that overall F0 was a reliable cue to discriminate between the two distinctions. Duration and intensity were also found to help discriminate the two patterns, but these were more variable in that they were not helpful in the rising question intonational contexts.

Nguyen et al. (2008) also examined the distinction between compounds and broad focus NPs,
but included narrow focus NPs as well. They were interested in examining how L1 speakers of Vietnamese were producing these contrasts in L2 English, but to do this, they first needed to determine how native speakers were differentiating these three contrasts. It was found that by manipulating relative duration and F0 (correlating with intensity), native speakers were able to distinguish between these three categories.

While these studies examine different constructions and different acoustic cues, some similarities become evident. Duration, intensity as well as certain F0 cues tend to be found in the realization of various constructions, including prominence in marking focus as well as the stress in compound nouns.

For English specifically, many studies have relied more on perceptual measures of accent placement as opposed to quantitative measures. Such studies have employed annotators trained specifically for this task. Annotators are educated about the correlates of nuclear accent and actively search for it in the speech signal, sometimes auditorily, but also visually using a program such as Praat (Boersma & Weenink, 2018). This has potential to provide information about accent placement, even if the cues are being used inconsistently, since human annotators should still be able to hear the prominence, especially if they have been trained to listen for it. However, it can also introduce biases into the study, as many of the annotators are linguists whose perceptions can be influenced by where they think it should occur. Also, the number of annotators tends to be small and training requires a lot of time. Despite even careful training and annotation, there are generally high levels of disagreement between annotators which brings this methodology into question.

Because both quantitative acoustic measures and perceptual measures present their own deficiencies, the English Experiment will incorporate the use of both. In this regard, the two types of measurements will be able to complement each other.

2.4.2 Prosodic prominence in Spanish

The realization of prosodic prominence in Spanish has also been given a lot of attention in the body of research. Again, there are studies from the level of word stress (e.g. Hualde, 2005, 2007) up to higher levels of phrasal stress (e.g. Calhoun et al., 2018; Hualde, 2005). Spanish shares some similarities with English in the realization of phrasal prominence. Pitch, duration and intensity have been measures used to evidence accent placement in Spanish as well as English (e.g. Kim, 2016). In Spanish, it has been noted that the alignment of the pitch accent is also important in differentiating pre-nuclear accents from nuclear accents (Hualde, 2005). In pre-nuclear accents, the pitch peak tends to be displaced from the stressed syllable to the post-tonic syllable. The pitch peak in nuclear accents, on the other hand, are realized within the accented syllable. This differs from English in which pitch accent peaks tend to occur within the stressed syllable.

Perceptual measures have been used in Spanish studies as well and these have often been supported by the quantitative findings (e.g. Calhoun et al., 2018). However, prominence in Spanish does not correlate as strongly with information structure as it does in English, with the exception
perhaps of contrastive focus. Instead, speakers have been shown to largely rate prominence based on raw acoustic material as opposed to taking meaning-based criteria, such as IS, into account (Cole et al., 2019). Because of this, it was decided that acoustic measures alone would suffice for the measurement of NA in Spanish.

2.4.3 Declination Effects

The declination of F0 and intensity across an utterance has been shown to be a pervasive phenomenon across languages that proves to be an important part of a language’s prosodic grammar (e.g. Beckman, 1986; Ladd, 2008; Pierrehumbert, 1979). Factors unrelated to accent placement, such as utterance length or overall pitch range, can affect the slope of declination (Pierrehumbert, 1979). The presence of declination in the various acoustic measures complicates the measurement of prosodic phenomena as pitch or intensity measures do not have a straightforward correspondence to prosodic phenomena such as accent. Instead, the relationship between acoustic measures and prosodic units is relative. This is important to consider when measuring for accent across various measurements. Declination has also been proposed to be part of the mental representation of prosodic grammar (Pierrehumbert, 1979) and listeners have been shown to take declination into account in the perception of an utterance and listeners will normalize based on the same factors that affect declination in productions, including utterance length and overall pitch range.

2.5 Summary of Research Questions

This dissertation will present two separate experiments, one in Spanish and one in English. These experiments will both examine production of NA by L1 and L2 speakers and the Spanish experiment will additionally investigate the production of word order inversions and its relationship to prosody. By presenting two separate experiments, we will better be able to gain a picture of what L2 prosodic acquisition looks like in the two languages, based on the unique properties of both the L1 and L2 of the speakers. Additionally, some constructions will be able to be compared across experiments, such as focus and intransitives, providing us of a bigger picture of L2 acquisition of NA in general. To summarize what these experiments will be investigating the research questions being addressed are reiterated here:

**RQ1** What effect does verb type have on NA placement in English intransitive clauses?

**RQ2** What effect does the pragmatic factor of expectedness have on NA placement in English intransitives?

**RQ3** To what extent do L1 speakers of Spanish use subject inversion in intransitives?

**RQ4** To what extent do L1 speakers of Spanish use subject inversion to mark focus, both contrastive and informational?
RQ5 To what extent do L1 speakers of Spanish use prosody to mark focus? Are prosodic means more likely to be used to mark contrastive focus as compared to informational focus?

RQ6 Is it easier to acquire the prosodic system of a prosodically non-plastic L2 with a plastic L1 background? Is it easier to acquire a plastic L2 with a non-plastic L1? Or does each present an equal amount of difficulty?

RQ7 Do L1 Spanish speakers transfer strategies of NA placement in intransitives, contrastive focus constructions, compounds and indefinite pronouns in L2 English?

RQ8

a. Do L1 English speakers mark intransitives prosodically by shifting NA to the subject of intransitive verbs in L2 Spanish?

b. Do L1 English speakers mark narrow focus constructions (both informational and contrastive) prosodically in L2 Spanish?

RQ9 Which categories of NA placement are easier to acquire for L2 learners?

RQ10

a. Do L1 English speakers use subject-verb inversion in broad focus intransitive clauses in L2 Spanish?

b. Do L1 English speakers move the subject to the end of the sentence in L2 Spanish to express narrow focus?

RQ11 What is the relationship between the L2 acquisition of word order and prosody in expressing focus and intransitives? Is there evidence that the acquisition of one precedes the other?

The research questions from the English Experiment will allow for a better examination of the L2 acquisition of phonology (specifically phrasal prosody) that intersects with other linguistic domains. By doing so, we gain a stronger understanding of what is easier and what is harder to acquire and why. Additionally, by comparing the acquisition of both word order and prosody, the Spanish Experiment will provide a better idea of the trajectory of acquisition of both word order versus the phonological domain of prosody. The two have largely been examined separately, though they are intertwined and the relationship between the two needs to be better studied. Finally, comparing both experiments will broaden our understanding of the acquisition of a prosodically plastic and non-plastic language. These research questions will be addressed as follows:

RQ1 and RQ2 will be addressed in the English Experiment in Chapter 3, specifically in examining the native speaker data. RQ7 and RQ8 will also be addressed in this experiment when examining the data collected from the L2 learners of English.
Chapter 4, which focuses on the Spanish Experiment will address RQ3, RQ4 and RQ5 in regards to native speakers of Spanish, and it will address RQ9 and RQ10 in regards to L2 learners of Spanish.

Finally, RQ6 will be addressed after the data for both the Spanish Experiment and English Experiment are collected and analyzed, as answering these research questions relies on comparing the two data sets. This research question will be discussed during the general conclusion and discussion section in Chapter 5.
3 English Experiment

The English Experiment was designed to test several questions about NA placement and shift in English as produced both by L1 speakers and L1-Spanish/L2-English speakers.

As discussed in Chapter 2, Section 2.2.2.2, the factors that drive NA placement in intransitives is still under debate. This study was designed to test two of these factors that are proposed to be responsible for the variation in NA placement. The research questions are as follows:

**RQ1** What effect does verb type have on NA placement in English intransitive clauses?

**RQ2** What effect does the pragmatic factor of expectedness have on NA placement in English intransitives?

This study also examines the L2 acquisition of NA placement and shift, especially when the prosodic system differs from English, as it does in Spanish. This study addresses the following research questions:

**RQ7** Do L1 Spanish speakers transfer strategies of NA placement in intransitives, contrastive focus constructions, compounds and indefinite pronouns in L2 English?

**RQ9** Which categories of NA placement are easier to acquire for L2 learners?

Finally, it will be interesting to compare both L2 English and L2 Spanish for a broader picture of the trajectory of L2 acquisition of prosody. This English Experiment, in conjunction with the Spanish Experiment presented in Chapter 2 examines the following research question:

**RQ6** Is it easier to acquire the prosodic system of a prosodically non-plastic L2 with a plastic L1 background? Is it easier to acquire a plastic L2 with a non-plastic L1? Or does each present an equal amount of difficulty?

3.1 General Methodology

In order to test the preceding research questions, participants completed a series of tasks, including an Oral Production Task, an Intuition Task, and a battery of tests to examine aspects their language knowledge, which will be referred as the Language Knowledge Tests. This set of tasks included a vocabulary test (for L2 speakers only), a Fluency Task, a Proficiency Test and a Language Background Questionnaire. The order of presentation for the different tasks can be seen below:
The vocabulary test, fluency task and language background questionnaire were designed to elicit information about different aspects of their linguistic knowledge, such as oral fluency, proficiency and language experience. The Oral Production Task was designed to test speakers’ production of NA placement, while the Intuition Task intended to test participants’ intuition of NA placement and shift in the same stimuli. The Intuition Task was included as both a categorical measure of NA placement as well as a window into participants’ underlying knowledge of NA placement in English. Due to certain methodological and technical issues however it was decided that the Intuition Task did not accurately reflect these intended findings. Categorical NA placement was also obtained through perceptual annotation of the data so it was decided that this measure would be used instead. While this does leave open a question of whether the data collected in this experiment reflects L2 participants’ underlying knowledge of English NA placement or whether it is more a reflection of performance only, this is a question that would be interesting to address in future research through either a revised intuition task or a perception task.

Procedures for all tasks are described in detail in the sections below.

3.2 Language Knowledge Tests

3.2.1 Vocabulary Test

The vocabulary test was administered only to the L2 speakers as it tested whether the words were familiar to the learners. This was done as a control to determine whether unfamiliarity with the vocabulary could be a factor in the observed production patterns. For this test, there was a different list for each version of the Oral Production Task (discussed in Section 3.4 below) that was presented to participants (though the majority of the words overlapped). There were 26 words selected from first list for the vocabulary test and 23 were selected from the second list. Words were selected on the basis that they were judged as potentially difficult or infrequent in classroom contexts by the author. Each word was presented without context, and participants were asked to choose the best Spanish translation from a selection of three. Feedback was provided and participants were informed of the correct answer if they had answered incorrectly. This was a computer based test and was completed before the Oral Production Task began.
Results for the vocabulary test can be seen in Table 3.1 (located at the end of Section 3.3 below).

3.2.2 Fluency Task

The fluency task was presented to the participants immediately after the Oral Production Task. The goal of this was to measure fluency in order to better understand if or how fluency in an L2 and the acquisition of the different stress shift patterns correlate and to investigate whether fluency could be a predictor of NA placement. After participants had finished reading the target sentences from the Oral Production Task, a set of instructions for the fluency task were presented to them. Participants were shown a simple bar graph of different technologies and the number of people who reported using each technology. They were asked to describe what was depicted in the graph. They were given time to examine the graph and think about what they wanted to say before they began speaking. This particular task was chosen since fluency tasks often consist of asking participants to describe the same picture or set of pictures (e.g. Derwing et al., 2004; Derwing et al., 2006). A graph was chosen since most of the participants were students who have had experience with simple graphs and the topic was one that was judged to be a common one often discussed in language classrooms and beyond.

Fluency measures were extracted with a Praat script (de Jong & Wempe, 2009). Fluency was defined by the speech rate, which was specifically measured as the total of number of syllables divided by the amount of time of the speech sample (in seconds) which was then multiplied by 60 for a number representing the number of syllables produced per minute (Riggenbach, 1991). This measurement of fluency has been found to correlate well with listeners’ perception of fluency of L2 speech of different proficiency levels (Kormos & Dénes, 2004).

Results for the fluency task are reported in Table 3.1.

3.2.3 Proficiency Test

All participants completed an English language proficiency task which consisted of a forced-choice cloze test (Ionin & Montrul, 2010; O’Neill et al., 1981) in order to obtain an measure of grammatical proficiency independent of one’s speaking ability. The cloze test consisted of a passage with every seventh word removed. For each missing word, participants were asked to supply the correct word and were given three options in multiple-choice format. There were a total of 40 missing words. This was administered on the same Qualtrics platform as the Intuition Task and was presented immediately afterwards.

Results for the proficiency test are reported in Table 3.1.

3.2.4 Background Questionnaire

A background questionnaire was included in the procedure in order to control for native language and also to collect information about where participants were born and raised, and whether there
were any other factors, such as time spent abroad, or other languages spoken in the home that could have a potential influence on the data. L2 speakers additionally answered questions about how long they have been studying English, what age they were first exposed to the language, and whether it has been acquired in more naturalistic contexts or if their exposure was rather largely gained in a classroom. All participants were asked to rate their perceived proficiency in their native language on a sliding scale from 0 - 100. The L2 speaker group also rated their perceived proficiency of their L2 of English. The background questionnaire was administered via Qualtrics and was the final task completed by the participants.

Relevant results from the background questionnaire results are discussed in Section 3.3 below and detailed in Table 3.1.

### 3.3 Participants

#### 3.3.1 L1 Speakers

A total of 22 L1 English speaking participants completed the English Experiment. Of these, two participants were eliminated. One of the eliminated speakers had noticeable influence of Indian English in her speech and was therefore not included as the prosodic patterns of Indian English differ from those of American English (Féry et al., 2016). The second speaker was eliminated due to the fact that the speech in the recordings he produced sounded very unnatural with each word given strong emphasis. These productions were not included since almost every word was occurring in its own intonational phrase which effectively obscures the relevant prosodic relationship within the phrase. After these two participants were eliminated, there were a total of 20 native speakers of American English. Of the 20 participants, 12 were female and 8 were male. All reported being born and raised in Illinois, and were currently residing there at the time of the study. All identified English as their native language. For the remaining four, they identified a second language in addition to English as their native language. This included Spanish, Greek, Polish and Cantonese.

All participants reported experience with at least one language other than English, with the most common language studied being Spanish. However, perceived proficiency levels in the speakers’ L2 appeared to be relatively low with the highest rating on the sliding scale at 50 (of 100). Only one participant reported time spent abroad for three months in Israel.

#### 3.3.2 L2 Speakers

A total of 23 native speakers of Spanish participated in this study. Thirteen of these participants were recruited and recorded at a university in Costa Rica. The remaining 10 participants were recruited and recorded at a university in the U.S. This was done in order to recruit L2 speakers of varying proficiency levels, including speakers at a more advanced level. The two groups of L2 speakers will be described separately.
Participants recruited in Costa Rica  A total of 13 speakers completed this study in Costa Rica. Of the 13, seven were female and the remaining six were male. All except one identified Costa Rica as their place of birth, where they grew up, and where they were currently residing. The one remaining participant identified Nicaragua as the place of birth and current residence. All identified Spanish and only Spanish as their native language.

All the Costa Rica participants, except for two, reported first learning English in the classroom. One participant claimed their first exposure to English was through a family member, and the other said it was through video games. The number of year of classroom-based English study participants had varied from 8 months to 14 years (average: 6.51, SD = 4.23). However, many were reluctant to count the years in High School. While English is a required subject during this time, many reported that classes were not very effective and were held for only a couple hours a week.

Few of the participants seemed to have extensive natural exposure to the language. None reported living abroad in an English speaking country. Most reported the university classroom as the place they used the language.

Eight of the participants reported experience with studying languages other than English and Spanish, with French and German as the more popular options. Most of these were given ratings of 50 or lower on the perceived proficiency scale, though there was a learner of Portuguese who rated that language at 92 and a learner of French who gave it a rating of 60.

Participants recruited in the U.S.  A total of 10 participants were recruited and recorded at a university in the U.S. Of the 10 participants, 7 were female and 3 were male. Two participants were born and raised in Colombia. Four were born and raised in Mexico. Two participants were born and raised in Puerto Rico and the final two were born and raised in Spain. All ten participants were currently residing in Illinois, USA. All except for one participant had been residing here for less than a year (with a range of 2 weeks to 8 months reported). The only exception to this was one participant who had been residing here for six years.

All participants, except for one, reported only Spanish as their native language and as the only language spoken in the home. One participant reported both Spanish and Nahuatl as a native language, but reported that she stopped speaking Nahuatl at the age of four and estimated her proficiency at only a 10 (out of 100).

Eight participants reported that they first started learning English in the classroom. The other two reported more naturalistic exposures. One participant reported that she was able to speak English with her father who had spent 30 years in the U.S. The other participant reported listening to sources such as podcasts and practicing with her husband who was at a more advanced level.

Three of the participants reported other experiences abroad in an English speaking country. One participant had lived in El Paso for six years. One reported living in Canada for two months, and one reported living in Ireland for two months.

Participants had various experiences with languages other than Spanish or English, including Arabic, Catalan, French, German, Italian, Japanese and Portuguese. One participant was quite
multi-lingual, rating her Catalan proficiency at a 90 (of 100) and French at a 70 (in addition to her Spanish and English). Another speaker estimated his Portuguese proficiency rating at 80. A third participant gave his estimated proficiency ratings of both French and Portuguese 60. And a final participant rated her French at a 60. The remainder of the estimated proficiency ratings were at 50 or below.

Table 3.1 shows a summary of all the participants for the English Experiment including the group totals for both the L1 and L2 speakers as well as for the L2 speakers divided by group (i.e. the location in which they were recruited and recorded).
<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Proficiency Test Score (of 40)</th>
<th>Fluency</th>
<th>Self-Reported English Proficiency</th>
<th>Vocab Score (% correct)</th>
<th>Age of Eng Exposure</th>
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</thead>
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<tr>
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<td></td>
<td></td>
<td></td>
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<tr>
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<tr>
<td>SD</td>
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<td>1.11</td>
<td>41.75</td>
<td>5.28</td>
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<td>35-40</td>
<td>65-238</td>
<td>82-100</td>
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<td></td>
</tr>
<tr>
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<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Total Group</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Mean</td>
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<td>3.1</td>
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<td>29-100</td>
<td>81-96</td>
<td>3-28</td>
</tr>
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</tr>
<tr>
<td>Mean</td>
<td>21.3</td>
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<td>66.69</td>
<td>81.42</td>
<td>9.77</td>
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<td>111-199</td>
<td>29-90</td>
<td>65-92</td>
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<tr>
<td>Mean</td>
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<td>72.2</td>
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<td>103-193</td>
<td>40-100</td>
<td>48-96</td>
<td>3-28</td>
</tr>
</tbody>
</table>
3.4 Oral Production Task

The Oral Production Task can be divided into two sub-experiments. One sub-experiment, which will be referred to as the Accent Shift experiment, contained sets of sentences designed to elicit nuclear accent shift in compounds, utterances ending in indefinite pronouns and narrow focus constructions. In each of these categories, there was a contrast between the predicted nuclear accent placements. Half of the target sentences consisted of utterances with NA predicted to occur on the final word, while the other half consisted of utterances with NA predicted to be retracted leftwards to the penultimate content word. The set of target sentences in the other sub-experiment examined NA placement in intransitives. This will be referred to as the Intransitives experiment. In this sub-experiment, experimental items were manipulated for both verb type and expectedness in order to test the effect of these two factors on NA placement in both native speaker and L2 productions. Stimuli from both experiments were presented to participants at the same time, effectively serving as filler items for each other as they were combined and randomized.

Section 3.4.1 below details the Accent Shift experiment while Section 3.4.2 is devoted to the Intransitives experiment.

3.4.1 Accent Shift

3.4.1.1 Procedure

The Accent Shift sub-experiment of the Oral Production Task was administered on a computer through *Psychopy 1.84.2* (Peirce, 2007, 2009). It consisted of recording participants as they read through a series of sentences that were presented to them through this platform. For each target sentence, participants first both heard and were able to read a contextual text, which was presented in the upper half of the screen. After the context appeared and was read aloud, the target sentence appeared at the bottom half of the screen and participants were asked to read this sentence out loud as if they were engaged in a dialogue and they were responding to the first utterance. The presentation of the items was randomized for each participant. After reading each answer out loud, the participant could click through to the next one.

The L1-English speaking participants and the L1-Spanish/L2-English participant group recruited in the U.S. completed these recordings in a sound-attenuated booth while wearing a head-mounted microphone. Lab space or equipment was not available for the L2 speaker group recruited in Costa Rica, so instead, they completed this procedure in a quiet room, using the researcher’s computer and were recorded by a Sony ICD PX312 handheld recorder that was placed to the right with the microphone as close to the speaker as possible.

3.4.1.2 Materials

The stimuli in the Accent Shift experiment can be divided into four categories that elicit NA retraction: narrow (contrastive) focus, utterances ending in indefinite pronouns and two compound
categories: phrase vs. compounds and left- versus right-stress compounds. Within each category, tokens were contrasted so that in half, accent was predicted to fall on the final word and in the other half, accent was predicted to be retracted to the penultimate word. In order to elicit the intended contrast, all target sentences were paired with a short context, which occurred in both written and spoken form (as was detailed in the preceding section, Section 3.4.1.1). This helped build a small communicative context, helping to elicit certain accent patterns (especially for the narrow focus category). It was also an attempt to make the task more natural than simply having participants read isolated sentences out loud. There were a total of 84 tokens in this sub-experiment. The structure of each category is discussed in more details and examples of target sentences are presented with their contextual text below:

**Compounds: Left- versus Right-Stressed Compounds** The compounds set of test items consisted of a total of 18 target sentences, all of which ended in a compound. Half of these compounds had stress predicted to fall on the rightmost element and half had stress predicted on the leftmost element. In order to ensure the words used were indeed compounds, and to predict where the stress would fall, they were taken out of previous sources (Giegerich, 2004; Morill, 2012; Zubizarreta et al., 2013).

(28) **Example of right-stressed compound**

*Context:* Did your team win anything?

*Target Sentence:* Yes, they won a **gold MEDAL**.

(29) **Example of left-stressed compound**

*Context:* What did you eat for dessert?

*Target Sentence:* I tried an **APPLE cake**.

**Compounds versus Phrases** The compounds versus phrases category contained a total of 26 minimal pair target sentences. 13 of these ended in right-stressed compounds, different from the right-stressed compounds in the other compound category. The other 13 ended in adjective + noun phrases that were segmentally identical to the compounds in this set. In these phrases, the NA is predicted to fall on the stressed syllable of the final, rightmost word as they were contextualized to occur in broad focus. Some of these phrases were borrowed from previous studies so as to best find stimuli that were shown to elicit the desired patterns (Farnetani et al., 1988; Nguyen et al., 2008).

(30) **Example of a phrase (NA predicted to occur on rightmost element)**

*Context:* What happened to Priscilla? I heard she got hurt.

*Target Sentence:* She was hit by a **moving VAN**.

(31) **Example of a compound (NA predicted to be retracted to penultimate word)**
Context: How did you get all your stuff from one place to the other?

Target Sentence: I hired a MOVING van.

Utterance final indefinite versus full NP The category containing indefinite pronouns consisted of 20 target sentences, split into pairs of identical sentences which differed only in the rightmost word, which was a definite noun (either a proper name or a definite NP) in 10 of those tokens and an indefinite pronoun on the other 10.

(32) Example of predicted rightmost NA placement

Context: We have mice, and we must get rid of them. What should we do?

Target Sentence: We should call BEN.

(33) Example of predicted leftward retracted NA placement

Context: We have mice, and we must get rid of them. What should we do?

Target Sentence: We should CALL someone.

Narrow Focus Finally, the narrow, contrastive focus category also consisted of a total of 20 target sentences. These sentences contained utterance-final adjective + noun NPs. They were divided into minimal pair sentences, 10 with narrow, contrastive focus on the final noun, and the other ten with narrow, contrastive focus predicted to occur on the adjective, which was the penultimate word in the utterance.

(34) Example of predicted rightmost NA placement

Context: Did you climb that big tree?

Target Sentence: No, I climbed that big ROCK.

(35) Example of predicted leftward retracted NA placement

Context: Did you climb that small rock?

Target Sentence: No, I climbed that BIG rock.

3.4.1.3 Data Analysis

Nuclear accent placement and shift was evidenced through two methods: both through quantitative acoustic measures as well as through perceptual annotation of NA placement by trained annotators. The procedure for both analyses are described in this section.
Acoustic Measurements  Quantitative acoustic measurements included measures of the pitch (maximum pitch, mean pitch and pitch range), intensity and duration of the vowel of the stressed syllables of the target words or phrases. To obtain this data, the recorded production data was first segmented so that the appropriate measurements could be extracted. Each recorded target sentence was segmented into its own sound file, and then for each sound file an accompanying TextGrid was made in *Praat* (Boersma & Weenink, 2018). The vowel of the stressed syllable of the final word was segmented and labeled within the TextGrid.

There were a couple different measurement methods that were considered for the task of identifying NA placement. The first possibility was to take difference measures between the values of the stressed syllable of the second word from that of the first word in a two word sequence occurring at the end of an utterance. This has been a common procedure reported in the literature (e.g. Kim, 2016; van Maastrict et al., 2016). The second option was to examine only the values from the stressed syllable of the second word (i.e. the final word of the sentence), which could then be compared across tokens. Ultimately, it was decided that only the values in the second word would be examined and compared. This was due to the fact that there was a concern in examining the difference values between the first and second words. There are three potential patterns that could be found in the data. Firstly, the penultimate word could be accented and the final word could be unaccented. Secondly, only the second word could be accented with an unaccented preceding word. Finally, it is also possible for both words to be accented. These three patterns are illustrated in Figures 3.1 to 3.3 below.

**Figure 3.1:** Pitch pattern with accented first word and unaccented second word
As can be seen in these figures, the pitch pattern in Figure 3.1 is similar to that in Figure 3.3 in that the first word has higher pitch than the second word since the first is accented in both cases. The second word can still be accented and have lower values than the first word due to downstepping. What is noticeable, is that the pitch values in Figure 3.3 are higher than those in Figure 3.1. It is the accentedness of the second word that really matters since in both cases it represents the nuclear accent. It was thought that a downstepped pitch accent could obscure difference measures, as it may result in closer values to the accented-unaccented pattern. Therefore, it was decided that only the values of the second word would be collected and compared across tokens.

Values from the second word were extracted specifically from the vowel of the stressed syllable. Vocalic portions of the stressed syllable were determined visually by examining the spectrogram. Vowels were evidenced and differentiated from the surrounding consonantal segments by the presence of higher intensities and the presence of a clear formant structure. Segmentation of the vowel started from the onset of regular voicing and ended with the offset of regular voicing. This was more difficult to determine when the vowel was preceded or followed by a sonorant, including /w/, /r/ and /l/. When a sonorant preceded the vowel, the formants were inspected to determine when the sonorants began transitioning into the vowel. For /r/, the vowel was segmented at the point F3 began to rise. For /w/, the vowel was segmented at the point F1 and F2 started to separate from one another, which is an indication of the transition into the vowel (Pycha & Dahan, 2016). For
/l/, again F1 and F2 were examined and the vowel was segmented when these two formants began to separate (Hualde et al., 2017). In cases where the target item had a syllable-final sonorant and was part of a minimal pair, the sonorant was included in the segmentation (e.g. /l/ was included in belched but not in bellowed). This was done to avoid arbitrary segmenting of the speech stream. If it was not included in the segmented portion, then the same criteria were followed as in the case when it occurred before the vowel.

Tokens were eliminated during this time if there was disfluency in the final or penultimate word. They were also eliminated if there was a long pause between the two words, as that can affect the prosodic structure as a boundary is usually inserted in between the words. There were also instances of misplaced word stress in some cases, which also led to tokens being eliminated. Word stress errors were determined on a perceptual basis by the researcher. Participants occasionally accidentally skipped tokens during the experimental procedure which resulted in tokens which could not be included in the analysis. Tokens were further eliminated if there was some background noise that could potentially obscure the obtained measurements. This was mainly an issue for the L2 participants recruited in Costa Rica as they did not complete the study in a sound-attenuated booth. These tokens were eliminated from the quantitative analysis, but still retained for perceptual annotation.

For the L1 speakers, there was a total of 840 tokens from the Accent Shift categories presented to participants. Of these 22 tokens had to be eliminated for the preceding reasons, which resulted in a total of 818 tokens for analysis, which represented 97.38% of the total data collected. For the L2 speakers, there was a total of 966 tokens presented to participants. Of these, 27 had to be eliminated for the reasons above, a total of 97.2% of the data that was included in the analysis.

After the non-eliminated tokens were segmented and labeled, measurements for F0, intensity and duration were extracted using ProsodyPro 6 (Y. Xu, 2013). For F0 values, ProsodyPro provides the mean F0 for each labeled interval, as well as the maximum and minimum measurements for each interval. The mean F0 was collected for each labeled segment, as was the maximum and minimum measurements. These last two measurement were used to calculate the pitch range of each syllable (max - min = pitch range). Because there were multiple acoustic dimensions that were measured to evidence NA placement, a Principal Component Analysis (PCA) was run as a pre-processing step to reduce dimensionality. For both the Accent Shift and Intransitives Experiment, a PCA was run which included duration, intensity, maximum pitch, mean pitch and pitch range in order to determine which components best explain the variation in the data. Because a PCA requires that all included components are measured in the same units, all raw measurements were z-scored within participant. This also helped control for differences in speech rate, pitch, and intensity values (Kim, 2016), which can cause variation in the data unrelated to the research questions. The output of the PCA was examined to determine how many Principal Components (PCs) should be retained for analysis, and these components were then used as the outcome variable in a linear mixed effects regression model in order to evaluate the predicted relevant variables on production. More details on the method of analysis for both the PCA and the regression models can be found in Sections
Perceptual annotation  The quantitative acoustic measures described above were accompanied by perceptual measures, in which a trained group of annotators examined each token produced by participants and indicated whether they perceived the NA to be placed on the rightmost or penultimate word.

Because the data was collected over a long period of time, the entire data set was annotated by two separate groups of annotators. The data from the L1 speaker group as well as from the L2 speaker group recruited from Costa Rica were annotated by two undergraduate Linguistics students. At a later date, a second group of annotators, comprised of three undergraduate students in Linguistics, was recruited to solve the disagreements from the first round of annotations and annotate the data from the L2 speaker group recruited in the U.S., as this speaker group had completed the experiment at a later date. All annotators were native speakers of American English and had at least an introductory background in Linguistics. They completed this project for course credit.

Annotators were explicitly trained to listen for the nuclear accent and they were provided with an overview of the phonetic correlates of prominence. After this introduction they were given examples, both written and auditory, of utterances with differing NA placement. They then completed a series of training samples during an in-person meeting, and were later asked to complete an additional set of training files at home. After completion of the training files, they were given access to the data.

Annotators completed the annotation using Psychopy (Peirce, 2007, 2009). Psychopy played each audio file while displaying the last two content words of the utterance on the screen. Of these two words, annotators selected the one they perceived to be accented. Their selection was indicated by pushing either the left or right arrow key. Each sound file could be repeated as many times as they felt was necessary.

3.4.1.4 Predictions

L1 Speakers  It is predicted that the L1 speaker group will make a distinction, in all four categories, between the tokens with predicted final NA placement versus those with predicted penultimate NA placement. This is predicted to be evident in both the perceptual annotation as well as in the acoustic measurements. This would be evidenced in the acoustic measurements if the target sentences with predicted utterance-final NA have higher values than those with NA predicted to be retracted leftwards to the penultimate word. This trend is expected to be seen across all four categories. For the perceptual annotation results, it is predicted that there will be higher rates of identified rightmost NA placement in target sentences with predicted rightmost NA placement. Likewise, it is predicted that there will be higher rates of identified NA placement on the penultimate word in the target sentences where we expect leftward NA retraction. Again, these trends are expected to be seen across all four Accent Shift categories.
L2 Speakers  It is predicted that the L2 speaker group will exhibit more variability and indeterminacy in their productions than the L1 speaker group. This will be evidenced in the perceptual annotation results and in the quantitative acoustic results through a less clear distinction between tokens with NA predicted to fall on the rightmost element versus tokens with NA predicted on the penultimate element. It is thought that this indeterminacy will be partially a result of transfer from L1 Spanish (i.e. a tendency to produce accent on the rightmost element regardless of context) and learning, as L1 Spanish speakers have been shown to gradually acquire more flexible NA placement as found in English.

It is predicted that more advanced speakers will be more target-like than the lower proficiency speakers, which will be evidenced through values that are more similar to the L1 speaker group. Furthermore, it is interesting to consider which categories will be more target-like, indicating that they are acquired earlier. Predictions for an order of acquisition are laid out in the Lit Review in Chapter 2.3.5 along with their motivation. As a review, the predicted order of acquisition of categories is as follows:

1. Contrastive Focus
2. Utterances ending in indefinite pronouns versus full NPs
3. Phrase versus compounds
4. Left- versus right-stress compounds

The order of acquisition is predicted to be evidenced through both quantitative acoustic measurements and the perceptual annotation tasks. If these predictions hold, we would expect to see more target-like and consistent performance in the categories that are predicted to be easier to acquire among speakers of low or mid-level proficiency. For the more difficult patterns, such as compounds, we may expect to see target-like performance only in the speakers at a high proficiency level. Even then, it may be marked by more variation and indeterminacy than we see for the native speaker control group.

3.4.1.5 Results: Principal Component Analysis

In order to reduce dimensionality of the measurements for the Accent Shift experiment, a PCA was run, which included all the measured tokens from this sub-experiment from both speaker groups. Before the PCA was run, missing data was imputed using the `imputePCA` function from the `missMDA` package in R (Josse & Husson, 2016). The PCA was then run using the `PCA` function from the `FactoMineR` package in R (Lê et al., 2008).

The proportion of variance for each PC accounts for can be seen in Table 3.2 below.
Table 3.2: Variance for each Principal Component (L1 versus L2)

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<th>PC2</th>
<th>PC3</th>
<th>PC4</th>
<th>PC5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variance (Std. Dev)</td>
<td>2.19</td>
<td>1.19</td>
<td>0.85</td>
<td>0.6</td>
<td>0.16</td>
</tr>
<tr>
<td>Percent of variance</td>
<td>43.87</td>
<td>23.91</td>
<td>17.01</td>
<td>11.99</td>
<td>3.22</td>
</tr>
<tr>
<td>Cumulative % of var</td>
<td>43.87</td>
<td>67.78</td>
<td>84.79</td>
<td>96.78</td>
<td>100</td>
</tr>
</tbody>
</table>

The standard deviation is related to the eigenvalue of each PC. The higher the standard deviation is for a PC, the more data it accounts for. Only the PCs that account for most of the data are generally kept for further analysis. One way to determine if a PC explains enough variance to be retained is to examine the eigenvalue. Eigenvalues with a value greater than 1 are often retained, whereas those with smaller values are not (Bro & Smilde, 2014). As can be seen in Table 3.3 below, only the first two PCs have eigenvalues of greater than 1 so only these two will be kept for further analysis.

Table 3.3: Eigenvalues for each Principal Component (L1 versus L2)

<table>
<thead>
<tr>
<th>PC</th>
<th>Eigenvalue</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC1</td>
<td>2.19</td>
</tr>
<tr>
<td>PC2</td>
<td>1.2</td>
</tr>
<tr>
<td>PC3</td>
<td>0.85</td>
</tr>
<tr>
<td>PC4</td>
<td>0.6</td>
</tr>
<tr>
<td>PC5</td>
<td>0.16</td>
</tr>
</tbody>
</table>

The relationship between each PC and the original variables can be examined to determine which variables are the largest contributors to each PC and whether there is a positive or negative correlation between the retained PCs and each of the contributing variables. The contribution percentage of each original variable for PC1 is plotted in Figure 3.4 and the contributions from the original variables for PC2 are plotted in 3.5:

Figure 3.4: The percentage of contribution of the original variables for PC 1
As can be seen from these graphics, both the maximum pitch and mean pitch of the second word are the largest contributors to PC1 whereas the duration and intensity of the stressed syllable in the second word contribute the most to PC2.

The correlation plot is shown in Figure 3.6 below. As can be seen in this plot, the mean pitch and maximum pitch measures have a strong positive correlation with PC1. Duration measures have a strong positive correlation with PC2, though intensity is shown to have a negative correlation.

What is notable in Figures 3.4 through 3.6 above is that mean pitch and maximum pitch measures are the greatest contributors to PC1, whereas duration is the greatest contributor to PC2. Because half of the categories where not minimal pairs, PC2 is likely due to variation from factors outside the research questions. It is likely a result of differences based on segmental differences between the measured areas of the target sentences.
3.4.1.6 Results: Linear Mixed Effects Regression Models

For each of the resulting Principal Components, linear mixed effects models were run using the `lmer` function from the `lme4` package in R (Bates et al., 2014) in order to evaluate the effect of each of the predictor variables. Firstly, two separate regressions were run, one for PC1 and another for PC2. These regressions both included speaker group as a predictor variable to test whether there was a difference between the L1 and L2 speakers. Speaker group was included as a binary factor (L1 versus L2). Regression models were also run on the L2 speaker data only in order to test for effects of proficiency. In this case the proficiency scores were included as a covariate. The other predictor variables that were evaluated for each model were Category (i.e. Focus, Indefinites, Compounds versus Phrases, Left- versus Right-Stressed Compounds) and Predicted Accent Placement (right versus left). Focus was taken as the reference level within the predictor of Category as this was predicted to be the easiest to acquire for the L2 speakers. The predictor variable of Sex was included in the models as the PCs included pitch measures and there seemed to be a difference between males and females even after the normalization of the data. Speaker and token were evaluated as random variables. No random slopes were included due to issues of convergence. These predictor variables were chosen since they are theoretically predicted to have an effect on the output.

The final models were selected using the `drop1` function in R. In this approach all fixed effects and interactions are included in the model. The `drop1` function then evaluates the model and indicates whether a fixed effect or interaction can be dropped for the reason that it does not explain the variation in the data and does not contribute to the model. Interactions and fixed effects that are identified by the `drop1` function as not contributing to the model are dropped one by one until there are no longer any predictors that can be dropped, meaning everything included in the model contributes significantly.

P values were computed from the final model using the `lmerTest` package in R (Kuznetsova et al., 2015). Pairwise comparisons were calculated using `emmeans` in R (Lenth et al., 2018). The final statistical model for each PC will be specified in the paragraphs below, in which the findings are discussed.

**L1 versus L2: PC1**  Figure 3.7 below shows the boxplot representations of the PCA scores for the L1 and L2 speaker groups across categories and predicted accent placement. Because mean pitch and maximum pitch are the main contributors to PC1 and because they have a positive correlation with this Principal Component, we would expect values to be higher when the accent is predicted to occur on the final element versus when it is predicted to be retracted leftwards. This is furthermore predicted to be a clearer trend for the L1 speaker group than for the L2 speaker group. As can be seen in the figure below, there is evidence that this is the case as the distributions for each category seem to be separating more cleanly for the L1 speaker group, whereas they is more overlap for the L2 speaker group across categories, with possible exceptions for the Compounds and Focus categories.
The final regression model\(^1\) for PC1 included the main effects of speaker group, category, predicted accent placement and sex. Two two-way interactions were also included. There was an interaction between speaker group and category as well as and interaction between predicted accent placement and speaker group. Both two-way interactions were found to be significant. Sex, predicted accent placement and category were all significant as main effects, though speaker group was not. The output for this regression model can be seen in Tables 3.4 and 3.5 below.

Table 3.4: Linear mixed effects output for PC1 (L1 versus L2)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>T value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>.23</td>
<td>.14</td>
<td>64.27</td>
<td>1.69</td>
<td>0.1</td>
</tr>
<tr>
<td>Category Indefinites</td>
<td>.32</td>
<td>.08</td>
<td>85.38</td>
<td>4.17</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Category Phrase vs. Compounds</td>
<td>-0.12</td>
<td>.07</td>
<td>85.4</td>
<td>-1.62</td>
<td>0.11</td>
</tr>
<tr>
<td>Category Compounds</td>
<td>.13</td>
<td>.08</td>
<td>85.38</td>
<td>1.65</td>
<td>0.1</td>
</tr>
<tr>
<td>Predicted NA Placement Right</td>
<td>.44</td>
<td>.05</td>
<td>85.34</td>
<td>8.16</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>.002</td>
<td>.15</td>
<td>43.67</td>
<td>0.02</td>
<td>0.99</td>
</tr>
<tr>
<td>Sex Male</td>
<td>-10.29</td>
<td>.16</td>
<td>43.08</td>
<td>-6.58</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Category Indefinites : Status L2</td>
<td>-0.01</td>
<td>.02</td>
<td>36640</td>
<td>-5.41</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Category PvC : Status L2</td>
<td>-0.09</td>
<td>.02</td>
<td>36640</td>
<td>-5.15</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Category Compounds : Status L2</td>
<td>-0.02</td>
<td>.02</td>
<td>36630</td>
<td>-8.99</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Predicted Accent Right:Speaker Group L2</td>
<td>-0.03</td>
<td>.01</td>
<td>36630</td>
<td>-25.58</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 3.5: Variance of random effects and residuals for PC1 (L1 versus L2)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.06</td>
<td>.24</td>
</tr>
<tr>
<td>Speaker</td>
<td>(Intercept)</td>
<td>.24</td>
<td>.49</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.38</td>
<td>.62</td>
</tr>
</tbody>
</table>

\(^1\) formula: PC1 ~ Category + Predicted NA + Speaker group + Sex + Category:Speaker Group + Predicted NA:Speaker Group + (1|Token) + (1|Speaker)
Subsequent pairwise comparisons were conducted in order to better examine the interaction between speaker group and predicted accent placement. Results from the *emmeans* pairwise comparison are shown in Table 3.6 (results averaged over the factors of category and sex) and further illustrated in the interaction plot in Figure 3.8. Results indicate that the L1 speaker group is differentiating between the two accent placement contrasts, the difference of which reaches significance. The L2 speaker group, on the other hand, does not exhibit as strong a differentiation between the two predicted accent placement contrasts.

Table 3.6: Output for pairwise comparisons for PC1 for L1 versus L2 speaker groups (significant results denoted with a *)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>SE</th>
<th>t ratio</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Speaker Group = L1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left - Right</td>
<td>-0.44</td>
<td>0.053</td>
<td>-8.16</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td><strong>Speaker Group = L2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left-Right</td>
<td>-0.10</td>
<td>0.053</td>
<td>-1.94</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Predicted Accent = Left</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1 - L2</td>
<td>0.09</td>
<td>0.15</td>
<td>0.59</td>
<td>0.56</td>
</tr>
<tr>
<td><strong>Predicted Accent = Right</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1 - L2</td>
<td>0.42</td>
<td>0.15</td>
<td>2.78</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Figure 3.8: Interaction plot for estimated marginal means for PC1 (L1 versus L2)

**L1 versus L2: PC2** Figure 3.9 below shows the boxplot representations of the PC2 coordinates for the L1 and L2 speaker group across categories and predicted accent placement. Duration and intensity were the most important contributors to this PC, with duration having the highest contribution. Since only the Focus category and Phrase versus Compounds categories are minimal pairs, duration can really only be used to potentially evidence NA placement in these two categories,
as any effects of duration on the other two categories could be obscured by the fact that the segmental properties could not be controlled for in these categories. According to the boxplot below, there is a large difference in PC2 scores for the category with indefinite pronouns with the indefinite pronouns having much smaller PC2 scores than their full NP counterparts. We see the opposite trend for the right- versus left-stressed compounds category. For the two minimal pair categories, there is very little difference between the two NA placement contrasts. Visually, these trends seem to hold across speaker groups.

Figure 3.9: PC2 scores for L1 and L2 speaker groups by category and predicted accent placement

The final regression model\(^2\) included the main effects of speaker group, category, predicted accent placement and sex. All of these were found to be significant with the exception of predicted accent placement. A three-way interaction between speaker group, category and predicted accent placement was also found to be significant, so was included in the final model as well. Since a three-way interaction was included two-way interactions between each combination of the three variables was also included in the model. All two way interactions were indicated to be significant. The output for this regression model is located in Tables 3.7 and 3.8 below:

\(^2\)Formula: \(\text{PC2} \sim \text{Category} \times \text{Predicted NA} \times \text{Speaker Group} + \text{Sex} + (1|\text{Token}) + (1|\text{Speaker})\)
Table 3.7: Linear mixed effects output for PC2 (L1 versus L2)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>SE</th>
<th>df</th>
<th>T value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>.41</td>
<td>.19</td>
<td>87.46</td>
<td>2.16</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Category Indefinites</td>
<td>-1.47</td>
<td>.27</td>
<td>84.49</td>
<td>-5.5</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Category Phrase vs. Compounds</td>
<td>.11</td>
<td>.25</td>
<td>84.5</td>
<td>0.46</td>
<td>0.65</td>
</tr>
<tr>
<td>Category Compounds</td>
<td>-.04</td>
<td>.27</td>
<td>84.49</td>
<td>-0.14</td>
<td>0.89</td>
</tr>
<tr>
<td>Predicted NA Placement Right</td>
<td>-.18</td>
<td>.27</td>
<td>84.5</td>
<td>-0.66</td>
<td>0.51</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>-.22</td>
<td>.04</td>
<td>74.21</td>
<td>-6.02</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Sex Male</td>
<td>-.13</td>
<td>.03</td>
<td>41.25</td>
<td>-3.88</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Category Indefinites : PredictedAccent R</td>
<td>.9</td>
<td>.38</td>
<td>84.47</td>
<td>2.39</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Category PvC : PredictedAccent R</td>
<td>.37</td>
<td>.36</td>
<td>84.48</td>
<td>1.03</td>
<td>0.3</td>
</tr>
<tr>
<td>Category Compounds : PredictedAccent R</td>
<td>-.18</td>
<td>.39</td>
<td>84.49</td>
<td>-0.46</td>
<td>0.65</td>
</tr>
<tr>
<td>Category Indefinites : Status L2</td>
<td>.14</td>
<td>.03</td>
<td>36630</td>
<td>5.15</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Category PvC : Status L2</td>
<td>-.06</td>
<td>.03</td>
<td>36640</td>
<td>-2.21</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Category Compounds : Status L2</td>
<td>-.02</td>
<td>.03</td>
<td>36640</td>
<td>-0.85</td>
<td>0.4</td>
</tr>
<tr>
<td>Predicted Accent Right:Speaker Group L2</td>
<td>.14</td>
<td>.03</td>
<td>36630</td>
<td>5.07</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Cat Indef:PA R:Spkr Group L2</td>
<td>-.08</td>
<td>.04</td>
<td>36630</td>
<td>-2.21</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Cat PvC:PA R: Spkr Group L2</td>
<td>-.25</td>
<td>.04</td>
<td>36640</td>
<td>-7</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Cat Compo:PA R: Spkr Group L2</td>
<td>.18</td>
<td>.04</td>
<td>36640</td>
<td>-4.68</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 3.8: Variance of random effects and residuals for PC2 (L1 versus L2)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.35</td>
<td>.6</td>
</tr>
<tr>
<td>Speaker</td>
<td>(Intercept)</td>
<td>.01</td>
<td>.1</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.38</td>
<td>.62</td>
</tr>
</tbody>
</table>

Pairwise comparisons were conducted in order to examine these effects more closely. The output can be found in Table 3.9 and illustrated in the interaction plot in Figure 3.10. As indicated by the pairwise comparisons, the only predicted accent placement contrast that reaches significance is that in the category with indefinite pronouns. This is found for both speaker groups. Neither of the two minimal pair categories reaches significance, indicating that PC2 might be detecting variation based on factors other than predicted accent placement.
Table 3.9: Pairwise comparisons for regression model for PC2 (L1 versus L2)

<table>
<thead>
<tr>
<th>Speaker Group</th>
<th>Contrast: Left - Right</th>
<th>Estimate</th>
<th>SE</th>
<th>z-ratio</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>Category = Focus</td>
<td>0.18</td>
<td>0.27</td>
<td>0.66</td>
<td>0.51</td>
</tr>
<tr>
<td></td>
<td>Category = Indefinites</td>
<td>-0.73</td>
<td>0.27</td>
<td>-2.72</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td></td>
<td>Category = Phrase vs. Compounds</td>
<td>-0.19</td>
<td>0.23</td>
<td>-0.81</td>
<td>0.42</td>
</tr>
<tr>
<td></td>
<td>Category = Compounds</td>
<td>0.35</td>
<td>0.28</td>
<td>1.26</td>
<td>0.21</td>
</tr>
<tr>
<td>L2</td>
<td>Category = Focus</td>
<td>0.04</td>
<td>0.27</td>
<td>0.15</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>Category = Indefinites</td>
<td>-0.78</td>
<td>0.27</td>
<td>-2.92</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td></td>
<td>Category = Phrase vs. Compounds</td>
<td>-0.08</td>
<td>0.23</td>
<td>-0.33</td>
<td>0.74</td>
</tr>
<tr>
<td></td>
<td>Category = Compounds</td>
<td>0.4</td>
<td>0.28</td>
<td>1.42</td>
<td>0.15</td>
</tr>
</tbody>
</table>

Figure 3.10: Interaction plot for estimated marginal means for PC2 (L1 versus L2)

**L2 proficiency effects: PC1** Since the analysis above indicates that only PC1 may be relevant to the research questions while PC2 may reflect another source of variation, only PC1 will be modeled in a linear mixed effects regression testing the effect of proficiency on L2 productions. Figure 3.11 shows PC1 scores for the L2 group only. The PC scores are plotted against proficiency scores and is further divided by category and predicted accent placement. Visually, we can see that the scores between the two predicted accent placement contrasts are separating, especially for the focus and compound categories, and especially at higher levels of proficiency. The accent contrasts in the category with indefinite pronouns is also separated, but in the opposite direction one would expect, with observations with the accent predicted to fall on the rightmost word as higher than for those observations where the accent is predicted to be retracted leftwards. In other words, the indefinite pronouns seem to be produced with higher mean and maximum pitch values than do the corresponding utterance-final content words.
In order to test this and examine the effect of proficiency a linear mixed effects model was run that included the main effects of predicted accent placement, category, proficiency score and sex. The final model\(^3\) included a three-way interaction between the three predictor variables of predicted accent placement, category and proficiency score. This interaction was found to be significant. Two-way interactions between category and accent placement, category and proficiency score as well as proficiency score and predicted accent were also included. All three two-way interactions were shown to be significant with the exception of that between category and predicted accent placement. All main effects, except that of proficiency score, were also significant. Results can be seen in Tables 3.10 and 3.11 below.

\(^3\)formula: \(\text{PC1} \sim \text{Category} \times \text{Predicted NA} \times \text{Proficiency Score} + \text{Sex} + (1|\text{Token}) + (1|\text{Speaker})\)
Table 3.10: Linear mixed effects output for PC1 including effects of proficiency (L2 speaker group only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>SE</th>
<th>Df</th>
<th>T value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.21</td>
<td>0.12</td>
<td>88.77</td>
<td>1.71</td>
<td>0.09</td>
</tr>
<tr>
<td>Category Indefinites</td>
<td>0.37</td>
<td>0.1</td>
<td>82.45</td>
<td>3.64</td>
<td>&lt;.05*</td>
</tr>
<tr>
<td>Category Phrase vs.</td>
<td>-0.09</td>
<td>0.1</td>
<td>82.45</td>
<td>-0.88</td>
<td>0.38</td>
</tr>
<tr>
<td>Compounds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category Compounds</td>
<td>-0.06</td>
<td>0.01</td>
<td>82.44</td>
<td>-0.61</td>
<td>0.55</td>
</tr>
<tr>
<td>Predicted NA Placement right</td>
<td>0.32</td>
<td>0.01</td>
<td>82.44</td>
<td>3.09</td>
<td>&lt;.05*</td>
</tr>
<tr>
<td>Proficiency Score</td>
<td>-0.07</td>
<td>0.08</td>
<td>44.81</td>
<td>-0.88</td>
<td>0.38</td>
</tr>
<tr>
<td>Sex Male</td>
<td>-1.04</td>
<td>0.16</td>
<td>43.11</td>
<td>-6.43</td>
<td>&lt;.05*</td>
</tr>
<tr>
<td>Category Indefinites:PredictedAccent R</td>
<td>-0.22</td>
<td>0.15</td>
<td>82.4</td>
<td>-1.49</td>
<td>0.14</td>
</tr>
<tr>
<td>Category PnC:PredictedAccent R</td>
<td>-0.17</td>
<td>0.14</td>
<td>82.42</td>
<td>-1.23</td>
<td>0.22</td>
</tr>
<tr>
<td>Category Compounds:PredictedAccent R</td>
<td>0.2</td>
<td>0.15</td>
<td>82.44</td>
<td>1.33</td>
<td>0.19</td>
</tr>
<tr>
<td>Category Indefinites:Proficiency</td>
<td>-0.02</td>
<td>0.01</td>
<td>36700</td>
<td>-1.36</td>
<td>0.17</td>
</tr>
<tr>
<td>Category PhrasevCompounds:Proficiency</td>
<td>0.05</td>
<td>0.01</td>
<td>36700</td>
<td>4.02</td>
<td>&lt;.05*</td>
</tr>
<tr>
<td>Category Compounds:Proficiency</td>
<td>0.003</td>
<td>0.01</td>
<td>36700</td>
<td>0.23</td>
<td>0.82</td>
</tr>
<tr>
<td>Predicted Accent R:Proficiency</td>
<td>0.1</td>
<td>0.01</td>
<td>36700</td>
<td>7.56</td>
<td>&lt;.05*</td>
</tr>
<tr>
<td>Cat Indefinites:PredictedAccent R:Prof</td>
<td>0.11</td>
<td>0.02</td>
<td>36690</td>
<td>5.76</td>
<td>&lt;.05*</td>
</tr>
<tr>
<td>Cat PnC:PredictedAccent R:Prof</td>
<td>-0.06</td>
<td>0.02</td>
<td>36690</td>
<td>-3.11</td>
<td>&lt;.05*</td>
</tr>
<tr>
<td>Cat Compounds:PredictedAccent R:Prof</td>
<td>0.01</td>
<td>0.02</td>
<td>36690</td>
<td>0.63</td>
<td>0.53</td>
</tr>
</tbody>
</table>

Table 3.11: Variance of random effects and residuals for PC1 (L2 only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>0.05</td>
<td>0.23</td>
</tr>
<tr>
<td>Speaker</td>
<td>(Intercept)</td>
<td>0.26</td>
<td>0.51</td>
</tr>
<tr>
<td>Residuals</td>
<td></td>
<td>0.39</td>
<td>0.62</td>
</tr>
</tbody>
</table>

Follow-up analyses were conducted in order to better examine the three way interaction and to investigate the relationship between proficiency and NA retraction in each category. To do this, the simple slopes between each predicted accent placement contrast (left versus right) was examined within each category across proficiency scores. The tables for this can be found in Tables 3.12 and 3.13 below. Table 3.12 shows the slope for each NA placement contrast for each category, while 3.13 shows the comparison of the two slopes within each category. As can be seen, slopes for conditions with a retracted NA placement are negative, while slopes with rightmost NA placement are positive. This indicates that the distinction between the two accent placement contrasts becomes greater as proficiency increases. Unsurprisingly, these slopes differ significantly from each other. While this trend is seen across categories, the degree of the slope varies. In order to visualize the trend, the predictions are plotted in the interaction plot in Figure 3.12.
Table 3.12: Post-hoc comparisons indicating the slope (PC1 over proficiency score) for the two predicted NA placement contrasts within each category

<table>
<thead>
<tr>
<th>Category</th>
<th>Predicted NA</th>
<th>Slope</th>
<th>SE</th>
<th>asymp.LCL</th>
<th>asymp.UCL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>-0.02</td>
<td>0.02</td>
<td>-0.07</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>0.01</td>
<td>0.02</td>
<td>-0.04</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>Indefinites</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>-0.03</td>
<td>0.02</td>
<td>-0.07</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>0.04</td>
<td>0.02</td>
<td>-0.01</td>
<td>0.09</td>
<td></td>
</tr>
<tr>
<td>Phrase versus Compounds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>-0.005</td>
<td>0.02</td>
<td>-0.05</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>0.01</td>
<td>0.02</td>
<td>-0.04</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>Compounds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>-0.02</td>
<td>0.02</td>
<td>-0.07</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>0.012</td>
<td>0.02</td>
<td>-0.03</td>
<td>0.06</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.13: Comparisons of the slopes for the two predicted NA placement contrasts within each category by proficiency score (L2 only)

<table>
<thead>
<tr>
<th>Category</th>
<th>estimate</th>
<th>SE</th>
<th>z-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus</td>
<td>-0.03</td>
<td>0.004</td>
<td>-7.56</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Indefinites</td>
<td>-0.07</td>
<td>0.004</td>
<td>-15.9</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Phrase vs. Compounds</td>
<td>-0.01</td>
<td>0.004</td>
<td>-4.05</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Compounds</td>
<td>-0.04</td>
<td>0.005</td>
<td>-8.08</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Figure 3.12: Interaction plot for predicted PC1 scores by category, predicted NA placement and proficiency (L2 only)

Post-hoc comparisons within each predicted NA placement were also conducted in order to examine differences across categories for each predicted placement contrast. This provides an picture as to whether slopes for each NA placement contrast differ by category. Results can be found in Table 3.14 which shows the slope of the lines (PC1 by proficiency score). The comparisons for these slopes are shown in Table 3.15 and the predictions are plotted in the interaction plot Figure 3.13 below.
Table 3.14: Post-hoc comparisons indicating the slope (PC1 over proficiency score) of each predicted accent placement for each category

<table>
<thead>
<tr>
<th>Predicted NA Placement</th>
<th>Category</th>
<th>Slope</th>
<th>SE</th>
<th>asymp.LCL</th>
<th>asymp.UCL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left</td>
<td>Focus</td>
<td>-0.02</td>
<td>0.02</td>
<td>-0.07</td>
<td>0.03</td>
</tr>
<tr>
<td>Left</td>
<td>Indefinites</td>
<td>-0.03</td>
<td>0.02</td>
<td>-0.07</td>
<td>0.02</td>
</tr>
<tr>
<td>Left</td>
<td>Phrase v. Compounds</td>
<td>-0.005</td>
<td>0.02</td>
<td>-0.05</td>
<td>0.04</td>
</tr>
<tr>
<td>Left</td>
<td>Compounds</td>
<td>-0.02</td>
<td>0.02</td>
<td>-0.07</td>
<td>0.03</td>
</tr>
<tr>
<td>Right</td>
<td>Focus</td>
<td>0.01</td>
<td>0.02</td>
<td>-0.04</td>
<td>0.06</td>
</tr>
<tr>
<td>Right</td>
<td>Indefinites</td>
<td>0.040</td>
<td>0.02</td>
<td>-0.007</td>
<td>0.09</td>
</tr>
<tr>
<td>Right</td>
<td>Phrase v. Compounds</td>
<td>0.01</td>
<td>0.02</td>
<td>-0.04</td>
<td>0.06</td>
</tr>
<tr>
<td>Right</td>
<td>Compounds</td>
<td>0.02</td>
<td>0.02</td>
<td>-0.03</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Table 3.15: Comparisons of the slopes for the each predicted NA placement contrasts for all categories by proficiency score (L2 only)

<table>
<thead>
<tr>
<th>Predicted NA Placement</th>
<th>Contrast</th>
<th>Estimate</th>
<th>SE</th>
<th>z-ratio</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left</td>
<td>Focus - Indefinites</td>
<td>0.006</td>
<td>0.004</td>
<td>1.36</td>
<td>0.53</td>
</tr>
<tr>
<td>Left</td>
<td>Focus - PvC</td>
<td>-0.02</td>
<td>0.004</td>
<td>-4.02</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Left</td>
<td>Focus - Compounds</td>
<td>-0.001</td>
<td>0.004</td>
<td>-0.23</td>
<td>1</td>
</tr>
<tr>
<td>Left</td>
<td>Indefinites - PvC</td>
<td>-0.02</td>
<td>0.004</td>
<td>-5.72</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Left</td>
<td>Indefinites - Compounds</td>
<td>-0.007</td>
<td>0.0042</td>
<td>-1.62</td>
<td>0.37</td>
</tr>
<tr>
<td>Left</td>
<td>PvC - Compounds</td>
<td>0.02</td>
<td>0.004</td>
<td>3.86</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Right</td>
<td>Focus - Indefinites</td>
<td>-0.03</td>
<td>0.004</td>
<td>-6.89</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Right</td>
<td>Focus - PvC</td>
<td>0.001</td>
<td>0.004</td>
<td>0.32</td>
<td>0.99</td>
</tr>
<tr>
<td>Right</td>
<td>Focus - Compounds</td>
<td>-0.005</td>
<td>0.004</td>
<td>-1.13</td>
<td>0.67</td>
</tr>
<tr>
<td>Right</td>
<td>Indefinites - PvC</td>
<td>0.03</td>
<td>0.004</td>
<td>7.45</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Right</td>
<td>Indefinites - Compounds</td>
<td>0.02</td>
<td>0.004</td>
<td>5.33</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Right</td>
<td>PvC - Compounds</td>
<td>-0.006</td>
<td>0.004</td>
<td>-1.46</td>
<td>0.46</td>
</tr>
</tbody>
</table>

Figure 3.13: Interaction plot for predicted PC1 scores by category and proficiency score for each predicted NA placement (L2 only)
As is shown above, as the proficiency score increases, in each category, the slope for leftward-retracted NA placement decreases and the slope for rightmost, utterance-final NA placement increases. As proficiency improves, the distinction between the two accent placement contrasts increases. This is seen across categories. However, it is also shown that the category with utterance-final indefinite pronouns differs significantly from other categories. The slopes for this category are steeper than those for the other categories. The category with phrase versus compounds also differs significantly from other categories. These slopes seem to be flatter than others, which suggests that there may be less change in this category across proficiency levels than is found in other categories.

3.4.1.7 Results: Perceptual Annotation

Agreement Rates The agreement rate and kappa values were calculated for raters. For the first round of annotations, Cohen’s kappa was used since there were two raters (Cohen, 1960). In this case disagreements were solved by a third rater who was also completing the second round of annotations. For the second round of annotations, Light’s kappa was used as this can accommodate calculating the reliability between three raters or more (Light, 1971). In this case the final decision for identified NA placement was decided by the majority. Cohen’s kappa and Light’s kappa were calculated using the \( \text{kappa2} \) and \( \text{kappam.light} \) functions respectively from the \textit{irr} package in \textit{R} (Gamer et al., 2012).

For the first round of annotation, there was an overall agreement rate between the two raters of 80.2% (kappa = .584, \( z=21.1, p < .05 \)). A kappa range between .41 and .60 is considered to be moderate agreement (McHugh, 2012). The agreement rate for annotations of L1 speakers only was 81.3% (kappa = .589, \( z=75.5, p < .05 \)) while the agreement rate for the L2 speakers was 78.2% (kappa = .563, \( z=59.6, p < .05 \)) indicating there was not a large discrepancy in agreement rates between the annotations of the L1 and L2 speaker groups.

Table 3.16 shows the agreement rates and kappa output as divided by variable. It is interesting to note that raters were in higher agreement in annotating NA when it was predicted to be retracted leftwards, versus when it was predicted to fall on the rightmost element. It is also noteworthy that there were high kappa values for both the focus category and the category with indefinite pronouns. The compounds category had a more moderate value, whereas the agreement for the phrase versus compounds category was fairly low.
Table 3.16: Agreement rate and Cohen’s kappa results by variable for first annotation round

<table>
<thead>
<tr>
<th></th>
<th>Agreement</th>
<th>Kappa</th>
<th>z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus</td>
<td>85.7%</td>
<td>.711</td>
<td>12.5</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Indefinite Pronouns</td>
<td>82.6%</td>
<td>.65</td>
<td>11.5</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Phrase vs Compounds</td>
<td>73.8%</td>
<td>.357</td>
<td>7.29</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Compounds</td>
<td>80.7%</td>
<td>.553</td>
<td>9.27</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Right-Predicted NA Placement</td>
<td>73.8%</td>
<td>.45</td>
<td>11.6</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Left-Predicted NA Placement</td>
<td>86.5%</td>
<td>.519</td>
<td>13.3</td>
<td>&lt;.05</td>
</tr>
</tbody>
</table>

For the second round of annotations, there was a 62.87% agreement rate. While this agreement rate is lower than found in the first round of raters, this is expected as the addition of a third rater will naturally lead to the possibility of more variability which leads to lower rates of agreement. The output for the kappa statistics is shown in Table 3.17 below. As can be seen, the values are lower than they are for the first round. This is likely due to the fact that there are more raters. However, it is likely also caused by the fact that raters were responsible for annotating only L2 speakers in this round (with the exception of when they were supplying the third rating for native speakers from the first round). It is unsurprising that there should be lower agreement rates for the L2 speaker group than for the L1 speaker group.

Table 3.17: Light’s kappa output for second annotation round

<table>
<thead>
<tr>
<th></th>
<th>Kappa</th>
<th>z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>.276</td>
<td>6.75</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Focus</td>
<td>.162</td>
<td>1.27</td>
<td>.2</td>
</tr>
<tr>
<td>Indefinite Pronouns</td>
<td>.361</td>
<td>2.69</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Phrase vs Compounds</td>
<td>.129</td>
<td>.873</td>
<td>.38</td>
</tr>
<tr>
<td>Compounds</td>
<td>.232</td>
<td>1.76</td>
<td>.08</td>
</tr>
<tr>
<td>Right-Predicted NA Placement</td>
<td>.203</td>
<td>2.52</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Left-Predicted NA Placement</td>
<td>.271</td>
<td>2.58</td>
<td>&lt; .05</td>
</tr>
</tbody>
</table>

Results

L1 versus L2  To examine the data visually, the identified NA placement, which was annotated through the perceptual annotation procedure, was compared to the predicted NA placement.
The two predicted accent placement contrasts are visualized separately below in 3.14 for tokens with identified leftwards, retracted NA placement and in 3.15 for identified rightmost NA placement. The percentages of identified accent placement are separated by predicted accent placement on the x-axis.

Figure 3.14: Average percentage of identified leftwards retracted NA placement by category and predicted accent placement for L1 and L2 speaker groups
As can be seen from these two graphics, the L1 speaker group is perceived to be shifting the NA leftwards in the contexts where predicted. Interestingly enough, predicted accent placement in the contexts with expected rightmost, final accent is what deviates from predictions the most, especially for the two compound categories. The L2 speaker group seems to have overall lower percentages of leftward retracted accent when expected.

A binomial mixed effects regression was run on the data with the annotated accent placement as the independent variable. This was done through the `glmer` function from the `lme4` package in R (Bates et al., 2014). The final models were decided using forward stepwise regression selection process. This process begins by evaluating a minimal model (i.e. one with only random effects). Predictors are then added until the the Akaike Information Criterion (AIC) number becomes larger instead of smaller (Akaike, 1974). The AIC can be used to evaluate a model as it estimates the quality of the model while penalizing for predictors. A smaller number is indicative of a better model. Two models were run, the first to evaluate the L2 speakers against the L1 speakers, and the second to evaluate effects of proficiency for the L2 speaker group only. For both models, the perceived accent placement was the dependent variable. Category, predicted accent placement and either speaker group or proficiency score were included as fixed effects. Item and speaker were included as random effects unless there were issues of convergence.

The output for the first model, which evaluated the effect of speaker group, is shown in Tables 3.18 and 3.19 below. This model included the main effects of category, predicted accent placement
and speaker group. It also included an interaction between speaker group and predicted accent placement. Item was removed from the random effects structure due to issues of convergence. All main effects except for speaker group were significant. The interaction between predicted accent placement and speaker group was significant.

Table 3.18: Binomial mixed effects output for perceptual annotation including effects of speaker group (L1 versus L2)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>z value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-1.01</td>
<td>0.21</td>
<td>-4.73</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Category Indefinites</td>
<td>-0.88</td>
<td>0.18</td>
<td>-4.98</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Category Phrase vs. Compounds</td>
<td>1.21</td>
<td>0.17</td>
<td>7.3</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Category Compounds</td>
<td>0.59</td>
<td>0.17</td>
<td>3.37</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Predicted Accent Left</td>
<td>3.94</td>
<td>0.26</td>
<td>15.1</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>SpeakerGroup L2</td>
<td>0.33</td>
<td>0.25</td>
<td>1.3</td>
<td>0.19</td>
</tr>
<tr>
<td>PredictedAccent L:SpeakerGroup L2</td>
<td>-2.69</td>
<td>0.3</td>
<td>-9.04</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 3.19: Variance of random effects and residuals for perceptual annotation (L1 versus L2)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaker</td>
<td>(Intercept)</td>
<td>0.43</td>
<td>0.65</td>
</tr>
</tbody>
</table>

Pairwise comparisons were conducting using *emmeans* in *R* in order to better examine the interaction between speaker group and predicted accent placement. Results for these comparisons are shown below in Table 3.20 and the interaction is illustrated in Figure 3.16.

Table 3.20: Output for pairwise comparisons for perceptual annotation by predicted accent placement and speaker group (results averaged over category, significant results denoted with a *)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>SE</th>
<th>df</th>
<th>t ratio</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaker group = L1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right - Left</td>
<td>-3.94</td>
<td>0.26</td>
<td>Inf</td>
<td>-15.1</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker group = L2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right - Left</td>
<td>-1.26</td>
<td>0.15</td>
<td>Inf</td>
<td>-8.13</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Predicted Accent Placement = Left</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1 - L2</td>
<td>2.36</td>
<td>0.32</td>
<td>Inf</td>
<td>7.34</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Predicted Accent Placement = Right</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1 - L2</td>
<td>-0.33</td>
<td>0.25</td>
<td>Inf</td>
<td>-1.3</td>
<td>0.19</td>
</tr>
</tbody>
</table>

87
The pairwise comparisons and interaction plots indicate that both speaker groups are perceived to be making a distinction between the two NA placement contrasts. Specifically, for both groups the accent is more likely to be identified to be on the rightmost element when predicted, and shifted leftwards when it is predicted to be on the penultimate word. However, this trend is seen more strongly for the L1 speaker group compared to the L2 speaker group.

While the overall trend indicates that identified NA placement corresponds to the predicted NA placement, it does not hold evenly across categories. We see higher rates of matching prediction and identification of NA placement (i.e. when perception of NA placement matches predicted NA placement) in the focus and indefinite pronoun vs. NP categories than we do in the two compound categories. Instead, these two compound categories have higher than predicted levels of identified penultimate accent placement for tokens in which rightmost accent placement is predicted. For L1 speakers, the phrase vs. compounds category has only about a 42% rate of perceived rightmost NA placement for tokens with predicted rightmost placement in this category. The rate of perceived rightmost accent placement for right- versus left-stressed compounds is only a little higher at 59%. These rates are similar for the L2 speaker group at about 39% and 61% respectively.

**L2 proficiency effects** Figure 3.17 below plots the percentages for L2 speakers of identified retracted accent placement in contexts in which NA is predicted to be retracted leftwards. The percentage for each speaker is plotted against their proficiency score to visualize whether rates of retracted NA placement are increasing with proficiency. Figure 3.18 shows the relationship between identified rightmost NA placement rates in contexts in which final accent placement is predicted and L2 participants’ proficiency scores.
In both plots, there is quite a range of identified accent rates across proficiency scores and there is little visual evidence for strong correlations between proficiency score and the percentages of identified accent placement in the corresponding tokens with the same predicted NA placement (for both retracted and final NA placement). Based on these graphics, we might suspect a positive correlation between proficiency and identified NA retraction rates for the two compound categories. The percentages for the other two categories, with narrow focus and utterance-final indefinite pronouns seem to be more scattered throughout proficiency levels. For tokens with NA predicted to fall on the rightmost element, we see the highest levels of identified final NA placement in the indefinite pronouns vs. NP category across all proficiency levels. The other categories exhibit a downward sloping line indicating that the more proficient L2 speakers become, the more likely they are to retract NA, even in contexts where NA is predicted to be on the final element.

To test the effect of proficiency, the second binomial regression model was run on the annotation results from only the L2 speaker group. In this model, category, predicted accent placement and
proficiency score were included as main effects and all were significant. There were no significant interactions. Item was not included as part of the random effects structure due to issues of convergence. The output for this model can be found in Tables 3.21 and 3.22 below:

Table 3.21: Binomial mixed effects regression output for perceptual annotation including effects of proficiency (L2 speaker group only)

<table>
<thead>
<tr>
<th>Estimate</th>
<th>Std. Error</th>
<th>z value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-7.26</td>
<td>1.5</td>
<td>-4.84</td>
</tr>
<tr>
<td>Category Indefinites</td>
<td>-0.87</td>
<td>0.22</td>
<td>-4.02</td>
</tr>
<tr>
<td>Category Phrase vs. Compounds</td>
<td>1.22</td>
<td>0.21</td>
<td>5.82</td>
</tr>
<tr>
<td>Category Compounds</td>
<td>-0.51</td>
<td>0.29</td>
<td>-1.73</td>
</tr>
<tr>
<td>Predicted Accent Left</td>
<td>1.27</td>
<td>0.16</td>
<td>8.11</td>
</tr>
<tr>
<td>Proficiency Score</td>
<td>0.48</td>
<td>0.22</td>
<td>2.23</td>
</tr>
</tbody>
</table>

Table 3.22: Variance of random effects and residuals for perceptual annotation (L2 group only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaker (Intercept)</td>
<td>0.25</td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>

The results of this model evidence the claim that the rate of NA retraction increases as proficiency increases. There is also an effect of category. As was seen in Figures 3.17 and 3.18, the compounds in the phrase versus compounds category had the highest rates of NA retraction, followed by the compounds with right- and left-stressed compounds, followed by focus with the indefinite pronouns having the lowest levels. Leftward retracted accent was overgeneralized in the two compound categories, where there is relatively high levels of NA placement on the penultimate word even when NA was predicted to fall on the rightmost constituent. This overgeneralization increases as proficiency increases.

3.4.2 Intransitives

The Intransitives sub-experiment of the Oral Production Task was designed to test the effect of verb type and the pragmatic factor of expectedness on NA placement. In order to define what target sentences could be construed as ‘expected’ and which would be ‘unexpected’, a norming study was first conducted. The procedure and results for the norming study will be described before detailing the procedure and the finalized stimuli for the Intransitives sub-experiment.

3.4.2.1 Expectedness Norming Study

Materials In order to manipulate the expectedness of the target sentences, a list of 32 token sets was first built. The token sets had a 2x2 design in which verb type (unaccusative versus unergative) was crossed with predicted expectedness (expected versus unexpected). Verbs were
drawn from Levin et al. (1995) who listed and categorized different intransitive verbs according to verb type. Verbs were drawn from this source in order to select appropriate examples of both unaccusative and unergative verbs since the categorization of some verbs is less clear than the prototypical examples. After the verbs were chosen, the target sentences were created, each with a contextual question designed to elicit broad focus and to hypothetically create a situation in which some of the target sentences as answers to these questions would be expected and the others unexpected.

It was noted during the construction of these stimuli that some were predicted to be unexpected since they seemed to be a strange answer to the question, as is demonstrated by the example below:

(36) Question: What happened when the teacher was waiting in the classroom at the preschool?

Target sentence: A child traveled

Others were predicted to be unexpected since they described an unnatural event. For instance, the sentence in (37) was predicted to be expected since the verb describes an event naturally expected of tigers, whereas the sentence in (38) was predicted to be unexpected as it is a more unnatural event. The sentence in (38) differs from the one in (36) above in that (38) is predicted to be unexpected regardless of the preceding context.

(37) A tiger roared.

(38) A tiger smiled.

The examples in (39) illustrate one token set that was ultimately used in the Oral Production Task. It shows the contextual question eliciting an answer in broad focus and the four target sentences are varied for both verb type and predicted expectedness.

(39) Contextual Question: What happened after you hung up your birdfeeder?

Expected:

a Unaccusative: A robin appeared.
b Unergative: A robin chirped.

Unexpected:

c Unaccusative: A robin ripped.
d Unergative: A robin burped.

Procedure In order to determine whether the target sentences from each token set would be construed as either expected or unexpected by readers, they were uploaded to Amazon Mechanical Turk where workers were asked to rate them.

Because of the difference described above between unexpected answers based on context and unexpected answers based on the naturalness of the event, two versions of the test were put on
Participants Responses from a total of 44 participants were collected from the expectedness task and responses from a total of 21 participants were collected for the naturalness task. Of these, responses from two participants were discarded from the expectedness task, and one was discarded from the naturalness task since they reported that they were not native speakers of English on the Language Background Questionnaire.

Results To determine which of the token sets would be used for the production experiment, the results from the survey were averaged across participants. Then, within each token set a difference score between the predicted expected and unexpected (and natural versus unnatural) tokens was calculated for each of the verb types. After examining the difference scores, the 12 token sets with the highest expectedness difference scores were taken to be used as stimuli. The results for the expectedness were selected to be used for the Oral Production Task over the results for naturalness since these measurements provided more token sets. Additionally it is the property of 'expectedness' that was originally proposed to influence nuclear accent place according to Zubizarreta & Nava (2011).

The expectedness difference scores ranged from 3.13 as the highest to 1.82 as the lowest. The average of all difference scores is 2.31 (SD: 0.34). The naturalness difference scores for these stimuli ranged from 0.09 as the lowest to 2.95 as the highest, with an average of 1.31 (SD: 1).

3.4.2.2 Procedure

The Intransitive stimuli for the Oral Production Task were presented at the same time as the stimuli for the Accent Shift. The procedure was the same as the one described in Section 3.4.1.1.

3.4.2.3 Materials

There were a total of 96 target sentences for the Intransitives experiment, which had a 2x2x2 design that crossed the factors of verb type (unaccusative versus unergative), expectedness (expected versus unexpected) and focus (narrow versus broad). This resulted in eight different conditions, each being represented by 12 token sets that had been selected based on the results from the
Expectedness Norming Study described above. Since stimuli were divided into two lists, participants saw half of the Intransitives stimuli. For each token set, they read four of the target sentences.

The broad focus items were the items of experimental interest. These items were created first, and the narrow focus items were based on the sentences from the broad focus item set. The narrow focus target sentences were segmentally the same, but they were paired with contextual questions eliciting narrow, informational focus on the verb. This alternation is illustrated in (40) and (41) below. (40) shows the contextual question and target sentence for an item in the broad focus condition, while (41) shows the same sentence, this time presented with a contextual question eliciting narrow focus on the verb, for the narrow focus condition.

(40) **Broad Focus:**
- Contextual Question: What happened at the theater during the show?
- Target sentence: An actress performed

(41) **Narrow Focus:**
- Contextual Question: What did an actress do?
- Target sentence: An actress performed

The narrow focused items were included because they provided minimal pairs with more predictable NA placement to compare their broad focus counterparts. This was important because it can be difficult to determine if NA is occurring on the subject or verb if there is no difference in means between two groups or conditions. Evidencing NA placement and shift relies on having tokens with both final and non-final NA placement. If the means do not significantly differ between tokens with, for example, unaccusative expected and unexpected verbs, it is difficult to know if this is because NA is being placed consistently on the subject in both cases, or on the verb. Adding tokens with narrow focus on the verb provided a better baseline to measure broad focus items against since NA placement is more predictable and better understood. However, since the perceptual annotation analysis was added at a later date, and because this resolves the same problem, the narrow focus items were eliminated from this analysis. There were a total of 48 test items from the broad focus intransitive conditions.

### 3.4.2.4 Data Analysis

The same data analysis procedure for the tokens in the Accent Shift experiment, described in Section 3.4.1.3, was followed in the Intransitives experiment. Both quantitative measurements and perceptual annotation were utilized to evidence NA placement in each token. For the quantitative measurements, the data were segmented and measured following the same procedure and tokens were eliminated at this time. The procedure and the annotators for the perceptual annotation analysis were also the same as those in the Accent Shift experiment.

A total of 480 tokens (960 including narrow focus tokens) were presented to the participants in the L1 Speaker Group. 97.08% of this data was used for analysis. 14 tokens were eliminated for a
total of 466 that were included in the analysis. A total of 552 tokens (1104 including narrow focus) were presented to the L2 Speaker group. Of these, 60 were eliminated, for a total of 492 or 89.13% included in the analysis.

The same acoustic measurements were extracted from the Intransitives tokens that were extracted from the tokens from the Accent Shift experiment described in Section 3.4.1. A Principal Components Analysis was then run following the same procedure outlined in Section 3.4.1.3 in order to reduce dimensionality and discover the underlying variables that best accounted for the variation in the Intransitives stimuli.

3.4.2.5 Predictions

**L1 Speakers** If verb type has an effect on NA placement in English intransitives, then it is predicted that unaccusatives will be realized with NA placement on the subject, regardless of expectedness (as per Zubizarreta & Nava, 2011). In this case, it is predicted that there will only be an effect of expectedness in sentences with unergative verbs. Constructions with unexpected unergative verbs would be predicted to elicit NA on the verb, whereas expected unergative constructions would be predicted to elicit NA on the subject. This would be evidenced through higher measurement values in unexpected unergatives compared to the rest of the conditions. This would be expected to be seen in the perceptual annotation results as well through a higher percentage of identified verbal accent in unexpected unergatives, and higher percentages of identified subject accent in the other conditions.

If, however, verb type does not matter (according to others such as Hirsch & Wagner, 2011), then we may expect that expectedness will have an effect in both types of verbs. In this case, we would expect higher values in target sentences with unexpected unaccusative verbs and in target sentences with unexpected unergative verbs. This trend would also be expected to be supported by the perceptual annotation results.

**L2 Speakers** It is predicted that NA shift in intransitive verbs will be the most difficult distinction for L2 learners to acquire. Therefore, we do not expect to see a clear differentiation between unaccusative verbs and unergative verbs, nor do we expect to see a clear effect of expectedness, as is predicted for the L1 speakers. Instead, it is predicted that most intransitives will be produced with NA on the verb. Only L2 speakers of the highest proficiency levels who have acquired the distinctions in the Accent Shift experiment are predicted to make this distinction in intransitives.

3.4.2.6 Results: Principal Component Analysis

The PCA for the Intransitives experiment followed the same procedure outlined in Section 3.4.1.5 above. Duration was not included in the PCA as there were no minimal pairs so this measurement would not have been reflective of NA placement.
L1 and L2 Speaker Groups  The proportion of variance each PC accounts for can be seen in Table 3.23 below.

Table 3.23: Variance for each Principal Component for Intransitives (L1 versus L2)

<table>
<thead>
<tr>
<th>PC</th>
<th>Variance (Std. Dev)</th>
<th>Percent of variance</th>
<th>Cumulative % of var</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC1</td>
<td>2.04</td>
<td>50.91</td>
<td>50.91</td>
</tr>
<tr>
<td>PC2</td>
<td>1.05</td>
<td>26.31</td>
<td>77.23</td>
</tr>
<tr>
<td>PC3</td>
<td>0.79</td>
<td>19.64</td>
<td>96.87</td>
</tr>
<tr>
<td>PC4</td>
<td>0.12</td>
<td>3.13</td>
<td>100</td>
</tr>
</tbody>
</table>

As with the PCA for the Accent Shift stimuli, for the intransitives, only the PCs that account for most of the data were kept for further analysis. Eigenvalues with a value greater than 1 were retained, while those with smaller values were not. Table 3.24 gives the eigenvalues for each PC, and as can be seen, only the first two PCs have eigenvalues of greater than 1 so only these two will be kept for further analysis.

Table 3.24: Eigenvalues for each Principal Component (L1 versus L2)

<table>
<thead>
<tr>
<th>PC</th>
<th>Eigenvalue</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC1</td>
<td>2.04</td>
</tr>
<tr>
<td>PC2</td>
<td>1.05</td>
</tr>
<tr>
<td>PC3</td>
<td>0.79</td>
</tr>
<tr>
<td>PC4</td>
<td>0.13</td>
</tr>
</tbody>
</table>

The relationship between each PC and the original variables was examined to determine which variables are more important components and how each PC relates to those variables. The percentage of contribution from each original variable for PC1 is plotted in Figure 3.19 and the contributions from the original variables on PC2 are plotted in 3.20:

Figure 3.19: The percentage of contribution from the original variables for PC 1
Figure 3.20: The percentage of contribution from the original variable for PC 2

As can be seen from these graphics, both the maximum pitch and mean pitch of the second word contribute the most to PC1 whereas the pitch range and intensity of the second word contribute most to PC2.

The correlation plot between the original variables and the various Principal Components is shown in Figure 3.21 below. As can be seen in this plot, the mean pitch and maximum pitch measures have strong positive correlation with PC1. Pitch range measures have a strong positive correlation with PC2, while intensity has a negative correlation with this PC.

Figure 3.21: Correlation of original variables with the PCs for Intransitives

### 3.4.2.7 Results: Linear Mixed Effects Regression Models

Similarly to the Accent Shift data, a linear mixed effects model was run for each resulting PC from the PCA for the Intransitives experiment using the `lmer` function from the `lme4` package in R (Bates et al., 2014). This time, the fixed effects that were evaluated were verb type (unaccusative versus unergative), expectedness (2 levels), and sex as the PCs included pitch measurements. Speaker group (L1 versus L2) was included in the first models with PC1 as the dependent variable, in order to evaluate the difference in performance between L1 and L2 speakers. A second regression was run
including only the L2 speaker group that included proficiency score as a covariate to evaluate the effect of proficiency on production. Interactions between the fixed effects were evaluated as well. Speaker and Token were evaluated as random effects. The final models and the results for each model are reported in paragraphs below.

**L1 versus L2 : PC1**  Figure 3.22 reflects the overall values of the observations on the new PC1 coordinates presented by both verb type and expectedness for both L1 and L2 speaker groups. Based on these boxplots, it appears for the L1 speaker group, the distributions for the expected versus unexpected tokens are separating for the unaccusative verbs, but less so for the unergative verbs. The values for PC1 for the L2 speaker group, on the other hand, appear to be very similar across verb types and expectedness conditions.

Figure 3.22: PC1 values by verb type and expectedness (L1 versus L2)

The final regression model included sex, verb type, expectedness and speaker group as main effects, as well as an three-way interaction between verb type, expectedness and speaker group. The inclusion of a three-way interaction entails three two-way interactions between each of predictors. Verb type, expectedness and sex were all significant as main effects. The two-way interactions between verb type and expectedness, between verb type and speaker group and between speaker group and expectedness were all significant. The three-way interaction between verb type, expectedness and speaker group was also found to be significant. The output for this model can be found in Tables 3.25 and 3.26 below.

\[ \text{formula: PC1} \sim \text{Expectedness} \times \text{Verb Type} \times \text{Speaker Group} + \text{Sex} + (1|\text{Token}) + (1|\text{Speaker}) \]
Table 3.25: Linear mixed effects output for PC1 by verb type and expectedness (L1 versus L2)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>T value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-.05</td>
<td>.18</td>
<td>79.85</td>
<td>-0.26</td>
<td>0.79</td>
</tr>
<tr>
<td>Verb Type Unergative</td>
<td>.64</td>
<td>.15</td>
<td>47.51</td>
<td>4.29</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Expectedness Unexpected</td>
<td>.46</td>
<td>.15</td>
<td>47.51</td>
<td>3.04</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>.12</td>
<td>.18</td>
<td>43.44</td>
<td>0.68</td>
<td>0.5</td>
</tr>
<tr>
<td>Sex Male</td>
<td>-.8</td>
<td>.18</td>
<td>43.07</td>
<td>-4.37</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Verb Type Unerg:Expectedness Unexp</td>
<td>-.44</td>
<td>.21</td>
<td>47.56</td>
<td>-2.09</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Verb Type Unerg:Speaker Group L2</td>
<td>-.29</td>
<td>.024</td>
<td>19570</td>
<td>-11.67</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Expectedness Unexp:Speaker Group L2</td>
<td>-.31</td>
<td>.02</td>
<td>19570</td>
<td>-12.65</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Verb Type Unerg:Exp Unexp:Spkr Group L2</td>
<td>.13</td>
<td>.036</td>
<td>19570</td>
<td>3.61</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 3.26: Variance of random effects and residuals for PC1 for intransitives (L1 versus L2)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.13</td>
<td>.36</td>
</tr>
<tr>
<td>Speaker</td>
<td>(Intercept)</td>
<td>.33</td>
<td>.57</td>
</tr>
<tr>
<td>Residuals</td>
<td></td>
<td>.38</td>
<td>.62</td>
</tr>
</tbody>
</table>

Further pairwise comparisons were conducted to better explore the three-way interaction. The interaction plot based on the estimated marginal means is depicted in Figure 3.23 below.

Figure 3.23: Interaction plot for estimated marginal means of PC1 by verb type, expectedness and speaker group (L1 versus L2)

Pairwise comparisons are shown below in Tables 3.27 and 3.28 which respectively indicate the simple contrasts between verb types when holding both speaker group and expectedness constant, and the simple contrasts between expectedness when holding verb type constant for each speaker group.
Table 3.27: Pairwise comparisons for unaccusative versus unergative verbs from regression model for PC1 (L1 versus L2)

<table>
<thead>
<tr>
<th>Speaker Group</th>
<th>Contrast</th>
<th>Estimate</th>
<th>SE</th>
<th>z-ratio</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>Expectedness = expected</td>
<td>-0.64</td>
<td>0.15</td>
<td>-4.29</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>L1</td>
<td>Expectedness = unexpected</td>
<td>-0.2</td>
<td>0.15</td>
<td>-1.34</td>
<td>0.18</td>
</tr>
<tr>
<td>L2</td>
<td>Expectedness = expected</td>
<td>-0.36</td>
<td>0.15</td>
<td>-2.38</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>L2</td>
<td>Expectedness = unexpected</td>
<td>-0.04</td>
<td>0.15</td>
<td>-0.29</td>
<td>0.77</td>
</tr>
</tbody>
</table>

Table 3.28: Pairwise comparisons for expected versus unexpected verbs from regression model for PC1 (L1 versus L2)

<table>
<thead>
<tr>
<th>Speaker Group</th>
<th>Contrast</th>
<th>Estimate</th>
<th>SE</th>
<th>z-ratio</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>Verb Type = unaccusative</td>
<td>-0.46</td>
<td>0.15</td>
<td>-3.04</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>L1</td>
<td>Verb Type = unergative</td>
<td>-0.01</td>
<td>0.15</td>
<td>-0.09</td>
<td>0.93</td>
</tr>
<tr>
<td>L2</td>
<td>Verb Type = unaccusative</td>
<td>-0.14</td>
<td>0.15</td>
<td>-0.96</td>
<td>0.34</td>
</tr>
<tr>
<td>L2</td>
<td>Verb Type = unergative</td>
<td>0.17</td>
<td>0.15</td>
<td>1.13</td>
<td>0.26</td>
</tr>
</tbody>
</table>

As can be seen in both the interaction plot and pairwise comparison tables above, the variables of both verb type and expectedness have an effect on L1 productions. Expected, unaccusatives have lower PC1 scores than unexpected unaccusatives. However, expectedness does not play a role in unergatives. Instead, both expected and unexpected unergatives are produced with similar values, and there are no significant differences between the two conditions for the L1 speaker group. Sentences with unergative verbs have similar values to those with unexpected, unaccusative verbs. This means the condition with expected, unaccusative verbs is the only one that differs significantly. PC1 values are lower for this condition than all others, suggesting that NA shift is most frequently triggered by an expected, unaccusative verb.

The comparisons for the L2 speaker group indicate that they are, as a whole, less consistently producing any variation in terms of NA placement in intransitives. Expected unaccusatives differ from expected unergatives, which could indicate NA shift in unaccusatives to an extent. However, there was no significant difference between expectedness conditions in unaccusative verbs and no other significant findings otherwise, which suggests that there are no strong trends that the L2 speakers as a group are producing NA shift.

**L1 versus L2 : PC2** Figure 3.24 reflects the overall values of PC2 for intransitives. Visually, it appears that there are higher values for expected, unaccusative conditions than for any of the other conditions. This holds for both speaker groups. Expected unergative conditions are also slightly higher than unexpected unergative conditions.
The final regression model for PC2 included the main effects of verb type, expectedness and speaker group. A three-way interaction between these three predictors was also included as were three two-way interactions between each pair of variables\(^7\). Verb type and expectedness were significant as main effects. Expectedness and speaker group was the only significant two-way interaction. The three-way interaction was also found to be significant. The output of this mixed effects regression model can be found in Tables 3.29 and 3.30 below.

Table 3.29: Linear mixed effects output for PC2 by verb type and expectedness (L1 versus L2)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>T value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>.42</td>
<td>.11</td>
<td>81.37</td>
<td>3.79</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Verb Type Unergative</td>
<td>-.57</td>
<td>.13</td>
<td>49.24</td>
<td>-4.4</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Expectedness Unexpected</td>
<td>-.46</td>
<td>.13</td>
<td>49.26</td>
<td>-3.54</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>.01</td>
<td>.09</td>
<td>47.54</td>
<td>0.12</td>
<td>0.9</td>
</tr>
<tr>
<td>Verb Type Unerg:Expectedness Unexp</td>
<td>.24</td>
<td>.18</td>
<td>49.38</td>
<td>1.32</td>
<td>0.19</td>
</tr>
<tr>
<td>Verb Type Unerg:Speaker Group L2</td>
<td>.07</td>
<td>.03</td>
<td>19570</td>
<td>1.9</td>
<td>0.06</td>
</tr>
<tr>
<td>Expectedness Unexp:Speaker Group L2</td>
<td>-.17</td>
<td>.03</td>
<td>19580</td>
<td>-4.89</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Verb Type Unerg:Exp Unexp:Spkr Group L2</td>
<td>.21</td>
<td>.05</td>
<td>19580</td>
<td>4.28</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 3.30: Variance of random effects and residuals for PC2 for intransitives (L1 versus L2)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.1</td>
<td>.31</td>
</tr>
<tr>
<td>Speaker</td>
<td>(Intercept)</td>
<td>.07</td>
<td>.27</td>
</tr>
<tr>
<td>Residuals</td>
<td></td>
<td>.75</td>
<td>.87</td>
</tr>
</tbody>
</table>

The output from the subsequent pairwise comparisons are shown in the interaction plot in Figure 3.25.

\(^7\)PC2 ~ Verb Type * Expectedness * Speaker Group + (1|Token) + (1|Speaker)
Figure 3.25: Interaction plot for estimated marginal means of PC2 by verb type, expectedness and speaker group (L1 versus L2)

Visually, we can see that expected unaccusative verbs have higher PC2 values than other conditions. This is an unexpected finding, though it is difficult to conclude that this could be reflective of NA placement in this case as we see a positive correlation with the variables that contribute to PC1 and which further pattern as expected for the L1 speaker group. Moreover, intensity measures have a negative correlation with PC2 indicating that pitch range is behaving differently than all other measurements. The acoustic realization of NA placement and shift in intransitives may have to be more closely investigated to determine why this may be happening.

**L2 proficiency effects: PC1** Because PC1 appeared to be more reflective of variation in the data based on factors related to the research questions, only PC1 was included in further analysis of proficiency effects in the L2 speaker group. Figure 3.26 below shows the linear trend of the PC1 scores over proficiency score, divided both by verb type and expectedness. Visually, it appears that the scores seem to separate based on expectedness within unaccusatives as proficiency increases. For unergative verbs on the other hand, there seems to be a more consistent separation between expected and unexpected verbs. Values for the expected tokens tend to be higher than those for the unexpected tokens.
The final mixed effects regression model included the main effects of verb type, expectedness, proficiency score and sex. A three-way interaction between verb type, expectedness and proficiency score was also included. Two-way interactions between verb type and expectedness; verb type and proficiency; as well as between expectedness and proficiency were also included. The three-way interaction was found to be significant as were the two-way interactions between verb type and proficiency and expectedness and proficiency. Only the main effects of verb type and sex were found to be significant. The output for this model can be found in Tables 3.31 and 3.32 below:

**Table 3.31: Linear mixed effects output for PC1 by verb type and expectedness (L2 only)**

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>T value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>.30</td>
<td>.19</td>
<td>39.8</td>
<td>1.6</td>
<td>0.12</td>
</tr>
<tr>
<td>Verb Type Unergative</td>
<td>.31</td>
<td>.13</td>
<td>46.33</td>
<td>2.33</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Expectedness Unexpected</td>
<td>.11</td>
<td>.13</td>
<td>46.34</td>
<td>0.85</td>
<td>0.4</td>
</tr>
<tr>
<td>Proficiency Score</td>
<td>-.08</td>
<td>.12</td>
<td>24.17</td>
<td>-0.65</td>
<td>0.52</td>
</tr>
<tr>
<td>Sex Male</td>
<td>-1.11</td>
<td>.25</td>
<td>23.08</td>
<td>-4.35</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Verb Type Unerg:Expectedness Unexp</td>
<td>-.31</td>
<td>.19</td>
<td>46.42</td>
<td>-1.61</td>
<td>0.11</td>
</tr>
<tr>
<td>Verb Type Unerg:Proficiency</td>
<td>.1</td>
<td>.02</td>
<td>10110</td>
<td>6.7</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Expectedness Unexp:Proficiency</td>
<td>.12</td>
<td>.02</td>
<td>10100</td>
<td>7.53</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Verb Type Unerg:Exp Unexp:Proficiency</td>
<td>-.12</td>
<td>.02</td>
<td>10110</td>
<td>-5.34</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

**Table 3.32: Variance of random effects and residuals for PC1 for intransitives (L2 only)**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.11</td>
<td>.33</td>
</tr>
<tr>
<td>Speaker</td>
<td>(Intercept)</td>
<td>.35</td>
<td>.59</td>
</tr>
<tr>
<td>Residuals</td>
<td></td>
<td>.26</td>
<td>.51</td>
</tr>
</tbody>
</table>

Additional post-hoc analyses were conducted in order to better investigate the finding of a

---

8formula: PC1 ~ Verb Type * Expectedness * Proficiency Score + Sex + (1|Token) + (1|Speaker)
significant three-way interaction between proficiency score, verb type and cloze test. The interaction plot illustrating the trends is found in Figure 3.27:

Figure 3.27: Interaction plot for estimated slopes by verb type and expectedness (L2 only)

Slopes for PC1 scores by proficiency divided by verb type and expectedness can be found in Table 3.33. The comparison of these slopes can be found in Table 3.34.

Table 3.33: Post-hoc comparisons indicating the slope (PC1 over proficiency score) by verb type and expectedness

<table>
<thead>
<tr>
<th>Verb Type</th>
<th>Expectedness</th>
<th>Slope</th>
<th>SE</th>
<th>asymp.LCL</th>
<th>asymp.UCL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unaccusative</td>
<td>Expected</td>
<td>-0.03</td>
<td>0.04</td>
<td>-0.11</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>Unexpected</td>
<td>0.01</td>
<td>0.04</td>
<td>-0.07</td>
<td>0.09</td>
</tr>
<tr>
<td>Unergative</td>
<td>Expected</td>
<td>0.008</td>
<td>0.04</td>
<td>-0.07</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>Unexpected</td>
<td>0.007</td>
<td>0.04</td>
<td>-0.07</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Table 3.34: Comparisons of the slopes for the two expectedness contrasts (expected vs. unexpected) within each verb type type by proficiency score (L2 only)

<table>
<thead>
<tr>
<th>Verb Type</th>
<th>estimate</th>
<th>SE</th>
<th>z-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unaccusative</td>
<td>-0.04</td>
<td>0.005</td>
<td>-7.53</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Unergative</td>
<td>0.0009</td>
<td>0.006</td>
<td>0.15</td>
<td>0.88</td>
</tr>
</tbody>
</table>

As can be seen, the slope for expected, unaccusative verbs trends downward as proficiency increases. This indicates that PC1 values become smaller at higher proficiency levels, which could be suggestive of the acquisition of NA retraction in unaccusative verbs in the expected condition. The slope for unaccusative, expected verbs is the only to differ significantly from the other slopes as proficiency increases.
3.4.2.8 Results: Perceptual Annotation

Agreement Rates  The method of calculating agreement rates and kappa values was the same as found in Section 3.4.1.7 for the Accent Shift sub-experiment.

For the first round of annotations there was an overall agreement rate of 85.5% (kappa = .511, z = 20.3, p < .001). The agreement rate for annotations of L1 speakers only was 82% (kappa = .624, z = 117, p < .05) while the agreement rate for the L2 speakers was 91.6% (kappa = .657, z = 101, p < .05) indicating there was not a large discrepancy in agreement rates between the annotations of the L1 and L2 speaker groups. Table 3.35 shows the agreement rates and kappa output as divided by verb type and expectedness for the first round of annotations.

Table 3.35: Agreement rate and Cohen’s kappa results by verb type and expectedness for first annotation round

<table>
<thead>
<tr>
<th></th>
<th>Agreement</th>
<th>Kappa</th>
<th>z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unaccusatives</td>
<td>83.2%</td>
<td>.542</td>
<td>15.2</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Unergatives</td>
<td>87.7%</td>
<td>.423</td>
<td>12.1</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Expected</td>
<td>83.1%</td>
<td>.55</td>
<td>15.5</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Unexpected</td>
<td>88%</td>
<td>.384</td>
<td>10.9</td>
<td>&lt; .05</td>
</tr>
</tbody>
</table>

There was a 65.01% agreement rate for the second round of annotations within the Intransitives experiment. The Light’s kappa statistics are shown in Table 3.36 below:

Table 3.36: Light’s kappa for second round of annotations for intransitives

<table>
<thead>
<tr>
<th></th>
<th>Kappa</th>
<th>z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Intransitives</td>
<td>.257</td>
<td>4.08</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Unaccusatives</td>
<td>.28</td>
<td>3.22</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Unergatives</td>
<td>.232</td>
<td>2.54</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Expected</td>
<td>.274</td>
<td>3.23</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Unexpected</td>
<td>.236</td>
<td>2.51</td>
<td>&lt; .05</td>
</tr>
</tbody>
</table>

Results

L1 versus L2  To examine the data visually, a by-subjects analysis was conducted, in which the mean percentage of NA placement on the subject was calculated. This is shown in Figure 3.28 for both the L1 and L2 speaker groups. Based on this bar chart, it appears that L1 speakers show a preference for accenting the subject for expected sentences with an unaccusative verb. An accented verb seems to be the preference for the other conditions (unexpected conditions across verb types, and unergative verbs across both expectedness conditions). Overall, the percentage of identified NA on the subject for the L2 speaker group is lower than that for the L1 speakers, and it is actually higher for unexpected conditions than for expected conditions.
In order to examine the effects of the relevant factors of verb type, expectedness and speaker group on the dependent variable of identified accent placement, a binomial mixed effects regression was run using the same methods, packages and model selection process described in Section 3.4.1.7. Again, both speaker and item were evaluated as random effects.

The final model included verb type, expectedness and speaker group as well as an interaction between speaker group and expectedness\(^9\). All main effects and the interaction were found to be significant. Tables 3.37 and 3.38 below show the output for this regression model:

Table 3.37: Binomial mixed effects regression output for perceptual annotation of intransitives including effects of speaker group (L1 versus L2)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>z value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.69</td>
<td>0.5</td>
<td>1.39</td>
<td>0.17</td>
</tr>
<tr>
<td>Verb Type Unergatives</td>
<td>-1.16</td>
<td>0.34</td>
<td>-3.43</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Expectedness Unexpected</td>
<td>-2.52</td>
<td>0.4</td>
<td>-6.29</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>-1.87</td>
<td>0.61</td>
<td>-3.03</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Expectedness Unexpected: Speaker Group L2</td>
<td>2.23</td>
<td>0.4</td>
<td>5.56</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 3.38: Variance of random effects and residuals for perceptual annotation of intransitives

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>(Intercept)</td>
<td>.87</td>
<td>.93</td>
</tr>
<tr>
<td>Speaker</td>
<td>(Intercept)</td>
<td>3.12</td>
<td>1.77</td>
</tr>
</tbody>
</table>

\(^9\) formula: Annotated Accent (right = 0) ∼ Verb Type + Expectedness * Speaker Group + (1|Item) + (1|Speaker)
Further pairwise comparisons were conducted using *emmeans* in *R* in order to better evaluate the interaction between expectedness and speaker group. As can be seen in Table 3.39 below, there is a significant difference between expected and unexpected tokens for L1 speakers, but not for L2 speakers. Additionally, L1 speakers differ from the L2 speaker group significantly only in the expected conditions, and not in the unexpected conditions. Overall, L1 speakers are more likely to have NA identified on the subject when the verb is expected versus when it is unexpected, whereas the L2 speaker group is more likely to have NA identified on the verb regardless of expectedness. This is further illustrated in the interaction plot in Figure 3.29.

Table 3.39: Output for pairwise comparisons for perception annotation by expectedness and speaker group (results averaged over verb type, significant results denoted with a *)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>SE</th>
<th>df</th>
<th>t ratio</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaker group = L1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expected-Unexpected</td>
<td>2.52</td>
<td>0.4</td>
<td>Inf</td>
<td>6.29</td>
<td>&lt;.05**</td>
</tr>
<tr>
<td>Speaker group = L2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expected-Unexpected</td>
<td>0.3</td>
<td>0.39</td>
<td>Inf</td>
<td>0.77</td>
<td>0.44</td>
</tr>
<tr>
<td>Expectedness = Expected</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1 - L2</td>
<td>1.87</td>
<td>0.61</td>
<td>Inf</td>
<td>3.03</td>
<td>&lt;0.05**</td>
</tr>
<tr>
<td>Expectedness = Unexpected</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1 - L2</td>
<td>-0.36</td>
<td>0.64</td>
<td>Inf</td>
<td>-0.57</td>
<td>0.57</td>
</tr>
</tbody>
</table>

Figure 3.29: Interaction plot for estimated marginal means of perception annotation results by expectedness and speaker group (L1 versus L2)

Overall the L1 speaker group has a higher rate of NA placement on the subject than the L2 speaker group. However, patterns are similar in that both L1 and L2 speaker groups have the highest levels of identified NA on the subject in unaccusative verbs. While both groups show an
effect of verb type, the two groups diverge in the treatment of expectedness. L1 speakers are more likely to accent a subject if the verb is expected, whereas the identified accent for L2 speakers does not vary based on expectedness.

**L2 proficiency effects** Figure 3.30 below shows the correlation of the proportion of tokens with identified NA retraction to the subject with the proficiency scores of the participants.

Figure 3.30: Proportion of identified NA placement on the subject divided by verb type and expectedness in correlation to proficiency score

In order to gauge the effect of proficiency level as well as the effect of the other factors on the performance of the L2 speaker group, another binomial mixed effects model was run. This one included verb type and proficiency score as main effects, both of which were significant. Expectedness was not significant, nor was the interactions between the two main effects. Only speaker was included as a random effect due to issues of convergence\(^{10}\). Tables 3.40 and 3.41 show the output of this regression:

Table 3.40: Binomial mixed effects output for perceptual annotation including effects of proficiency (L2 only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>z value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-14.88</td>
<td>4.66</td>
<td>-3.19</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Verb Type Unergatives</td>
<td>-0.51</td>
<td>0.26</td>
<td>-2.00</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Proficiency Score</td>
<td>0.4</td>
<td>0.14</td>
<td>2.93</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 3.41: Variance of random effects and residuals for perceptual annotation of intransitives (L2 only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaker</td>
<td>(Intercept)</td>
<td>3.13</td>
<td>1.77</td>
</tr>
</tbody>
</table>

\(^{10}\)formula: Annotated Accent (right = 0) \(\sim\) Verb Type + Proficiency Score + (1|Speaker)
These results indicate that the higher in proficiency a speaker is, the more likely the are to retract the nuclear accent to the subject. Sentences are also influenced by verb type in that sentences with unaccusative verbs have higher levels of NA retraction to the subject than those with unergative verbs. Visually, there is evidence that expectedness makes a slight difference within the unaccusative constructions, with expected verbs more likely to exhibit accent retraction than unexpected verbs. However, this trend is not strong enough to reach significance.

3.5 Summary of English Experiment

3.5.1 Accent Shift

L1 speakers performed overall as predicted in the categories in the Accent Shift experiment. There is evidence that native speakers produced final NA in tokens where it was predicted across categories, and retracted the accent to the penultimate word where predicted. This pattern is evidenced through the acoustic measures. PC1 scores, which largely correlated with mean pitch and maximum pitch measures, were evidenced to vary in relation to the experimental manipulations. In all categories, values for sentences with NA predicted to fall on the final word were higher than those sentences predicted to have NA retracted leftwards. The trends found in the acoustic measurements were further supported by the perceptual annotation results. Overall, the L1 speaker group had higher levels of identified rightmost accent when predicted and identified NA on the penultimate word when NA was predicted to be retracted leftwards. There were, however, a couple exceptions to this. In both the right- versus left-stressed compounds category and the phrase versus compounds categories, there were higher levels of identified retracted accent when it was predicted to fall on the rightmost element. There could be a couple reasons for this. Firstly, for the phrase versus compounds category, it was thought that the contextual question could have been influencing the focus structure of the target sentence. Sentences were constructed with a noun plus a modifying adjective and it is possible that this adjective could have been interpreted as being present to contrast with another entity (e.g. *We live in the GREEN house (not the RED house)*). Because the stimuli were not designed to contrast and because this may rely on individual speakers' interpretations, this could explain the variability in this condition. This could have led to more variability in NA placement in this category. Secondly, both of these categories had higher levels of disagreement among raters. It is possible that there were some latent variables that obscured identification based on acoustic information (as the acoustics indicate there is more of a difference between the accent placement contrasts than do the perceptual annotation results) that made it difficult for the raters to decide which word was accented. It is possible that this variability is a result of perception of this contrast more so than of production.

The L2 speaker group differs from the L1 speaker group and as a whole shows evidence of lower rates of NA retraction than the L1 speaker group. This is seen in the perceptual annotation results, where leftwards retracted accent was identified less often. This is furthermore corroborated through the acoustic measurement results. While the native speakers reliably make distinctions
across categories, this is much less clear for the L2 speaker groups. We do see evidence of learning, as there is evidence of NA retraction in both the perceptual annotation and the acoustic measurements. Overall, there is much more variability than seen for the native speaker group. There does seem to be an effect of proficiency, with rates of accent retraction growing as proficiency increases. With these findings in mind we can address the following research questions:

**RQ7** Do L1 Spanish speakers transfer strategies of NA placement in intransitives, contrastive focus constructions, compounds and indefinite pronouns in L2 English?

We see that native speakers of Spanish do differ from the L1 English speakers’ patterns and we see smaller rates of NA retraction where predicted. Such a pattern is typically found in Spanish, the participants’ L1 and could reasonably be a result of transfer of NA placement. However, it also appears that transfer is not the only explanation for the results. As mentioned previously, learning is also apparent. There is an effect of predicted accent placement in intensity and mean pitch measures as well as in the perceptual annotation results, indicating that learners are acquiring NA shift even if it is at lower levels than seen for the L1 speaker group.

3.5.2 Intransitives

For the Intransitives stimuli, it appears that there is an effect of all the factors that were tested, which included verb type, expectedness and language background. For the L1 speaker group, we can address the following research questions:

**RQ1** What effect does verb type have on NA placement in English intransitive clauses?

**RQ2** What effect does the pragmatic factor of expectedness have on NA placement in English intransitives?

Results indicate that both verb type and expectedness play a role in influencing L1 production of simple intransitives. According to the perception annotation results, sentences with unaccusative verbs were more likely to have NA retracted to the subject than those with unergative verbs. Likewise, expected sentences were more likely to trigger NA retraction than their unexpected counterparts. This is seen across verb type in the perceptual annotation results. While it is seen across both verb types, it is also apparent that expected verbs in unaccusative structures trigger NA retraction to a larger extent than do expected verbs in sentences with unergative verbs. These results are supported by the acoustic measures, which indicate a difference based on expectedness for unaccusative verbs but not for unergative verbs. Many of the expected, unaccusative verbs seem semantically unimportant or newsworthy, which may be why they trigger NA shift. This would support approaches positing a semantic difference between unaccusative and unergative verbs that helps trigger NA shift. Most of the unexpected, unaccusatives were very infrequent verbs and likely sounded quite odd in the context. It is difficult to find unaccusative verbs that could be construed as unexpected.
As for the measurement of intransitives, it is interesting to note, that for both speaker groups, pitch range does not seem to be a reliable measure, which was seen to have a negative correlation to PC2, going in the opposite direction as predicted and in the opposite direction than the other measures would suggest. Because this is an outlier in this regard, it it thought to be reflective of pitch range failing to measure the intended construction (i.e. nuclear accent) rather than an indication of NA placement itself. It is interesting to note that most studies that examine the acoustic prosodic realization of the constructions included in this study have included focus and compounds. The acoustic realization of NA placement in intransitives has been examined to a lesser extent. This study indicates that this might be an interesting direction of future research, which would also allow researchers to better examine NA placement in such constructions once we better understand how it is realized.

Overall, this study confirms that L2 speakers of English produce utterance-final NA placement in intransitives, even where NA retraction would be expected. However, There is evidence that NA retraction is being acquired, especially for speakers at higher proficiency levels. While these findings indicate that NA retraction is difficult for L2 learners in intransitives, the relationship of verb type, expectedness and NA retraction could still be further explored. The effect of expectedness on L2 production of NA placement is obscured since the L1 speakers did not reliably distinguish between expectedness conditions in the unergative verbs as had been predicted. It is possible that this could be an effect of confounding factors in this study, and it would be interesting to examine this further. It is thought that there could be certain variables that were not controlled for, such as the focus structure of an utterance and word frequency, that could be affecting NA placement. While the focus structure was controlled for to an extent (as all utterances were intended to be in broad focus), it is possible that this could have been improved. While the subjects of the intransitive verbs were not old information in the sense that they had not been mentioned in previous discourse, the situation the contextual question set up may have nonetheless invoked these terms. For example, a question such as 'What happened at the theater before the show?' may implicitly invoke information about words that belong at a theater, including actors and actresses. This was done to control for the expectedness of the verb, but doing so might have also affected the information structure of the utterance, making it more likely participants were going to accent the final verb. Additionally, word frequency was not controlled for. Due to their nature of being unexpected, many of the verbs in the unexpected conditions were likely much less frequent than their expected counterparts. Expected, unaccusative verbs tend to include such common verbs as come, arrive or leave and expected unergative verbs included verbs such as play or work. Unexpected verbs on the other hand, included words such as squawk, bellow or expire. While not all the unexpected verbs are likely to be as rare, and not all the expected verbs are as common as the ones cited above, it is likely that overall, the included expected verbs occur with higher frequencies than the unexpected verbs. This asymmetry in average frequency may have had an effect on NA placement, and is a variable that could be controlled for in the future.

Finally, in this study, the distinction between unergatives and unaccusatives was regarded as
a binary distinction, despite evidence that intransitive verbs may actually be best viewed as a continuum between unaccusative and unergative (Sorace, 2000). As stated above, some change of location verbs were included (such as *come* or *arrive*), which represent very typical unaccusative verbs. Typical unergative verbs, which are often characterized as verbs denoting controlled processes (such as *work* or *roar*) were included in the study, but so were unergative verbs denoting uncontrolled processes (such as *tremble*), which are less typical unergatives and are moving along the continuum towards unaccusative verbs. All these factors are likely important to take into account when testing NA placement in intransitives, as it seems to be a highly complex process, being affected by many factors at once. This complexity alone suggests a reason that NA placement in intransitives would be difficult to learn for L2 speakers, especially those coming from an L1 with more invariant NA placement.

To control for the aforementioned affecting factors, thus hopefully avoiding such conflicting findings arising from uncontrolled variables, a slightly different experimental design could be presented in which the target sentences are the same and contextual questions are manipulated to make the target sentence either expected or unexpected (e.g. 'An actress arrived' may be more expected to a question such as 'What happened at the theater before the show?' and more unexpected for a question such as 'What happened at the theater after the show?').

### 3.5.3 L2 performance based on proficiency

After examining the results of both the Accent Shift and Intransitives sub-experiments, we can now reflect on the final research question of this chapter:

**RQ9** Which categories of NA placement are easier to acquire for L2 learners?

There is an effect of proficiency seen in both the acoustic measurements (as indicated through PC scores) and through the perceptual annotation. In both measures, higher proficiency speakers are more likely to be making a distinction between the two predicted NA placement contrasts. Perceptual annotation results indicate that the two compound categories have the highest rates of NA retraction compared to other categories. This is supported by the acoustic measurements, as there is a consistent difference between the two accent placement contrasts across proficiency levels. Acoustically, learners seem to have acquired NA retraction to mark narrow focus as well, as there is a distinction among learners of various proficiency levels. Perceptual annotation results indicate that focus falls in between the compound categories and the category with utterance-final indefinite pronouns.

It appears utterances ending with indefinite pronouns are being produced with NA retraction more reliably only by higher proficiency speakers and less reliably by speakers of lower proficiency. It seems to be that this category is affected by proficiency more than the other categories. NA retraction in intransitives also seems to have been acquired only by L2 speakers at higher levels of proficiency. Results from both the Accent Shift experiment and the Intransitives experiment
suggest that NA retraction in utterances ending with an indefinite pronoun, and in intransitives is acquired at a later stage than NA retraction in the other categories.
4 Spanish Experiment

The Spanish Experiment was designed to investigate the production of both word order and prosody in L1 Spanish speakers as well as the L2 acquisition of prosody and word order inversions in L1-English/L2-Spanish learners.

In order to understand the input L2 learners of Spanish are receiving this study asks a series of questions related to the marking of prominence in L1 Spanish speakers. These research questions are as follows:

RQ3 To what extent do L1 speakers of Spanish use subject inversion in intransitives?

RQ4 To what extent do L1 speakers of Spanish use subject inversion to mark focus, both contrastive and informational?

RQ5 To what extent do L1 speakers of Spanish use prosody to mark focus? Are prosodic means more likely to be used to mark contrastive focus as compared to informational focus?

This study is also designed to test the production and acquisition of both word order and prosody in L1-English/L2-Spanish speakers and the relationship between the two in marking prominence. The research questions addressed in this study are as follows:

RQ8 a. Do L1 English speakers mark intransitives prosodically by shifting NA to the subject of intransitive verbs in L2 Spanish?
   b. Do L1 English speakers mark narrow focus constructions (both informational and contrastive) prosodically in L2 Spanish?

RQ10 a. Do L1 English speakers use subject-verb inversion in broad focus intransitive clauses in L2 Spanish?
   b. Do L1 English speakers move the subject to the end of the sentence in L2 Spanish to express narrow focus?

RQ11 What is the relationship between the L2 acquisition of word order and prosody in expressing focus and intransitives? Is there evidence that the acquisition of one precedes the other?

Finally, the results of this study will be compared to those from the English study from Chapter 3 to address the following research question:
RQ6 Is it easier to acquire the prosodic system of a prosodically non-plastic L2 with a plastic L1 background? Is it easier to acquire a plastic L2 with a non-plastic L1? Or does each present an equal amount of difficulty?

4.1 General Methodology

In the Spanish Experiment, participants completed a series of tasks, including an Oral Production Task, a Word Order Task, and a similar battery of tests to those in the English Experiment, which examined aspects their language knowledge, including a Fluency Task and a Proficiency Test, and a Language Background Questionnaire. The order of presentation for the different tasks can be seen below:

1. Word Order Task
2. Proficiency Test
3. Fluency Task
4. Oral Production Task
5. Language Background Questionnaire

Procedures for each task will be described in detail in the sections below starting with the Fluency Task, Proficiency Test and Language Background Questionnaire as these were the simplest components of the procedure. Afterwards, the Word Order Task and Oral Production Task will be described.

4.2 Language Knowledge Tests

4.2.1 Fluency Task

The fluency task was the same task from the English Experiment. Participants were asked to describe the same graph, which only differed in the labels, which had been translated into Spanish. Fluency was analyzed with the same measures as it was for the participants who completed the English Experiment. The fluency task was presented after the word order and proficiency tasks and before the Oral Production Task.

Results for the fluency task are presented in Table 4.1

4.2.2 Proficiency Test

The proficiency test consisted of a cloze test that was originally taken from the Diploma de Español como Lengua Extranjera (DELE). Participants were asked to select the appropriate word for each
blank from a multiple-choice set with three options. This was included to provide a measure of proficiency level for each participant (Ionin et al., 2013; Montrul & Slabakova, 2003).

Results for the proficiency test are reported in Table 4.1.

4.2.3 Background Questionnaire

A background questionnaire was included in the procedure in order to control for native language and to collect information about where participants were born and raised, and whether there were any other factors, such as time spent abroad, or other languages spoken in the home that could have a potential influence on the data. L2 speakers additionally answered questions about how long they had been studying Spanish, what age they were first exposed to the language, and whether it had been acquired in more naturalistic contexts or if their exposure was rather largely gained in a classroom. All participants were asked to rate their perceived proficiency in their native language on a sliding scale from 0 - 100. The L2 speaker group also rated their perceived proficiency of Spanish. The background questionnaire was administered via Qualtrics and was the final task participants were asked to complete.

Relevant Background Questionnaire results will be discussed in Section 4.3 below and in Table 4.1.

4.3 Participants

4.3.1 L1 Speakers

A total of 17 native speakers of Spanish completed the experiment. Of these, two were eliminated. One was eliminated since she had a relatively low proficiency score compared to the rest of the native speaker group and reported growing up in both the U.S. and Mexico, suggesting she reflected more of a heritage speaker status. The second speaker was eliminated since he also moved to the U.S. at a young age. Additionally, the sentences in his recordings were read word-by-word as opposed to natural sounding phrases, making it difficult to extract information about phrase-level prosodic structure.

Of the remaining 15 participants, 12 were female and 3 were male. Seven participants reported being born and raised in Spain, 2 were born and raised in Mexico, 2 in Puerto Rico, 2 in Paraguay and 1 was born and raised in Ecuador. One participant reported being born in the U.S. but moved to Mexico at a young age and reported growing up there. All participants were residing in the U.S. at the time of the experiment. The lengths of stay ranged from 2 weeks to 8 years. All participants reported Spanish as their native language. Most participants reported this as their only native language except for two of the participants. One reported Nahuatl as a second native language, though she also reported that she stopped speaking this at age four. Another reported both Spanish and Basque as native languages. Two other participants reported speaking Basque from early ages or with family members, but did not identify it as a native language.
As participants were living and studying in the U.S., they self-reported overall high levels of proficiency in English with a range of 50-95 out of 100 on a sliding scale (mean = 79.27, sd = 12). Age of exposure to English ranged from 2 years of age to 11 years of age. All participants, with the exception of two, reported studying an additional language besides Spanish or English. These languages included Arabic, Basque, Catalan, French, Italian, German, Guarani, Korean, Portuguese and Quechua. While most of the self-reported proficiencies of these languages were lower than English, three participants reported stronger second languages other than English, including Catalan, Guarani and Italian.

Of the 15 participants, 9 had experience teaching Spanish to L2 learners.

More information about the L1 participants can be found in Table 4.1.

4.3.2 L2 Speakers

A total of 25 L1-English speakers learning L2 Spanish completed the Spanish Experiment. Of these, four were eliminated. The four that were eliminated struggled with word stress placement, which led to a large number of tokens being eliminated. It was decided that higher level proficiency speakers who had fewer problems with word stress should be recruited instead and included in the analysis so a more accurate picture of phrasal accent could emerge.

Of the 21 participants included in the analysis, 14 were female and the remaining 7 were male. All reported being born and raised in the U.S. and all were residing in the U.S. during the time of the experiment. All participants reported English and only English as their native language, with the exception of three who reported English and another language both as native languages. These languages included Polish and Urdu.

The L2 learners were largely recruited from university Spanish courses. The number of years of formal study of Spanish varied from 2-15 (mean = 7.48, sd = 3.67). Twelve of the participants reported naturalistic exposure outside of the classroom. Most of these consisted of a few hours a week of language use online, through tv or with friends or co-workers. Of these twelve, two participants reported using Spanish more extensively to communicate with friends. One participant noted especially early exposure of the language through the community and family members. Two participants reported time spent abroad in Spain, one for four months and the other for two months. More information about the L2 participants and their experience with Spanish can be found in Table 4.1

Six participant reported learning a language other than Spanish and English. These languages included American Sign Language, Chinese, French, German, Italian, Japanese, Polish, Tagalog and Thai.
Table 4.1: Background information for L1 and L2 Spanish speaking participants

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Proficiency Score</th>
<th>Fluency</th>
<th>Self-Reported Spanish Proficiency</th>
<th>Age of Span Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L1 Speakers</strong></td>
<td>Mean</td>
<td>25.87</td>
<td>18.53</td>
<td>162</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>4.22</td>
<td>1.13</td>
<td>33.6</td>
<td>na</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>18-38</td>
<td>16-20</td>
<td>106-213</td>
<td>100-100</td>
</tr>
<tr>
<td><strong>L2 Speakers</strong></td>
<td>Mean</td>
<td>19.76</td>
<td>8.29</td>
<td>134</td>
<td>51.43</td>
</tr>
<tr>
<td>Total Group</td>
<td>SD</td>
<td>1.67</td>
<td>3.1</td>
<td>30.39</td>
<td>17.98</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>18-26</td>
<td>4-16</td>
<td>77-216</td>
<td>20-85</td>
</tr>
</tbody>
</table>

4.4 Word Order Task

In order to test both the L1 and L2 speaker groups’ use of word order inversion in broad focus intransitives and to mark narrow focus, they first completed a word order task preference task. This task was designed to test whether certain factors triggered a preference for subject inversion and whether this differed across speaker groups. The factors that were tested were narrow focus, including contrastive and informational focus, as well as verb type and subject type in broad focus intransitives. These factors were chosen as they have been reported to trigger subject inversion in Spanish (e.g. Ocampo, 1995; Zubizarreta, 1998). Expectedness was not included as a factor, even though doing so would have better mirrored the design in the English study. To the author’s knowledge, expectedness has not been proposed to influence word order in Spanish (though the potential is there). Because of this, the definiteness of the subject was manipulated in addition to verb type, as this is more likely to have an effect in triggering word order inversions.

4.4.1 Experimental Design

The Word Order Task consisted of a contextualized forced-choice word order preference task. Even though this study is primarily concerned with investigating prosody, a computer-based written word order task was selected to test participants’ word order preferences. This was done for several reasons. Firstly, the majority of studies on Spanish word order (both L1 and L2) have consisted of written tasks. This makes results easier to compare across studies. Secondly, separating the two seemed the easiest way to test the L2 speaker group. Creating a task in which participants were given a subject and verb to orally put together as an answer to a question was considered as a methodology. However, it was thought that building a sentence by selecting the word order then saying it out loud could be too cognitively demanding for the L2 speaker group, especially those at lower levels of proficiency. This could potentially lead to more disfluencies, effectively distorting speakers’ prosodic patterns. It was decided for these reasons that word order and prosody would be tested separately.

The test items in the Word Order Task consisted of two different categories: broad focus intransitives and narrow focus transitives. There were a total of 24 test items for the broad focus intransitives, which varied by subject type and verb type. Subjects were either definite, in this case
a proper noun, or indefinite, specifically occurring as an indefinite noun phrase. Six separate token sets were created for each subject type, the number of tokens remaining constant across both sets. Each token set was also manipulated for verb type (unaccusative versus unergative) for a total of 12 token sets for each subject type. Participants were presented with a question contextualizing the target sentences. They were also presented with two word order variants of the target sentence, both SV and VS word order variants, and were asked to select one of the word orders that they deemed most appropriate given the context. Some sample stimuli for the intransitive conditions are provided in Tables 4.2 and 4.3 below:

Table 4.2: Example of intransitive stimuli with definite subject. Accompanied by the following Contextual Question: ¿Por qué dejó de hablar el maestro? (‘Why did the teacher stop talking?’)

<table>
<thead>
<tr>
<th>Unaccusative</th>
<th>SV</th>
<th>VS</th>
</tr>
</thead>
<tbody>
<tr>
<td>José</td>
<td>salió</td>
<td>Salió</td>
</tr>
<tr>
<td>José</td>
<td>left</td>
<td>Left</td>
</tr>
</tbody>
</table>

‘José left’

<table>
<thead>
<tr>
<th>Unergative</th>
<th>SV</th>
<th>VS</th>
</tr>
</thead>
<tbody>
<tr>
<td>José</td>
<td>gritó</td>
<td>Gritó</td>
</tr>
<tr>
<td>José</td>
<td>yelled</td>
<td>Yelled</td>
</tr>
</tbody>
</table>

‘José yelled.’

Table 4.3: Example of intransitive stimuli with indefinite subject. Accompanied by the following Contextual Question: ¿Qué pasó en el teatro? (‘What happened in the theater?’)

<table>
<thead>
<tr>
<th>Unaccusative</th>
<th>SV</th>
<th>VS</th>
</tr>
</thead>
<tbody>
<tr>
<td>An actriz</td>
<td>llegó</td>
<td>Llegó</td>
</tr>
<tr>
<td>An actress</td>
<td>arrived</td>
<td>Arrived</td>
</tr>
</tbody>
</table>

‘An actress arrived’

<table>
<thead>
<tr>
<th>Unergative</th>
<th>SV</th>
<th>VS</th>
</tr>
</thead>
<tbody>
<tr>
<td>An actriz</td>
<td>actuó</td>
<td>Actuó</td>
</tr>
<tr>
<td>An actress</td>
<td>performed</td>
<td>Performed</td>
</tr>
</tbody>
</table>

‘An actress performed.’

Additionally, there was a set of items with narrow focus on the subject. There were a total of 12 token sets for the narrow focus conditions. These stimuli were crossed for focus type, which included both contrastive and informational focus for a total of 24 narrow focus test items. All of these were sentences with transitive verbs that occurred with a contextual question eliciting either informational or contrastive narrow focus. Subjects in narrow focus occurred only as proper nouns. Again, participants were given two word order variants (in this case S-Clitic-V and Clitic-V-S) and asked to select which they preferred. Examples of the contextual questions can be found in Table 4.4, which illustrates the questions eliciting both informational and contrastive narrow focus, while Table 4.5 illustrates the accompanying target sentence for both of these.
Finally, there was a set of 12 fillers, which consisted of a set of sentences, contextualized in broad focus, with transitive verbs. For the filler items, participants could select between standard SVO word order and VOS word order. Including fillers, there were a total of 48 items in the Word Order Task.

Participants completed the Word Order Task on Qualtrics. On this survey platform, they saw the series of contextual questions paired with two potential answers, one with SV word order and the other with inverted VS word order. Participants were asked to select their preferred word order given the preceding context. Tokens were randomized upon presentation. Figure 4.1 illustrates what the participants saw when completing this task.

Figure 4.1: A screenshot of the word order task participants were asked to complete. Participants saw a question and two potential answers. They indicated which answer they preferred by clicking on it.

### 4.4.2 Predictions

**L1 Speakers** It is predicted that the L1 speaker group will prefer subject inversion in broad focus intransitives when the verb is unaccusative and will prefer standard SV word order when the verb is unergative. It is also predicted that the definiteness of the subject will have an effect
and speakers will exhibit higher preference rates for VS sentences for unaccusative verbs when the subject consists of an indefinite noun phrase, as it has been shown that subjects that are new information are more likely to be postposed after the verb in Spanish intransitives (Ocampo, 1995). This will be evidenced by higher rates of preferred VS word order selected in these categories.

It is predicted that L1 speakers will prefer VS word order to mark both narrow focus types. However, it is predicted that this trend will be stronger for informational focus than for contrastive focus, as prosodic marking of contrastive focus has been reported to be an option more so than for informational focus (e.g. Zubizarreta, 1998; Hualde, 2005).

**L2 Speakers** L2 speakers are predicted to show an overwhelming preference for SV word order across categories. It is predicted that learning will occur, and especially the speakers at more advanced proficiency levels will show a greater tendency to use inverted word orders in both intransitive sentences and to mark focus.

### 4.4.3 Results

Data from the intransitives conditions and the narrow focus conditions of the word order preference task were analyzed separately as the two sets had a different number of levels since the intransitives stimuli were manipulated for verb type and definiteness of the subject, whereas the narrow focus stimuli were only manipulated for type of focus (contrastive versus information). For each sub-part data was collected and a by-subjects analysis was conducted to examine trends for both the L1 and L2 speaker groups. A binomial mixed effects regression model was run on both sets data to examine the effects of the categories and language background on the binary variable of word order preference (SV versus VS). First, the L1 and L2 speaker group was compared by evaluating speaker group as a potential predictor. Afterwards, L2 proficiency effects were evaluated by finding the best fitting model for the L2 data only, which included the proficiency score as a covariate. Models were built and evaluated using the *glmer* function from the *lme4* package in *R* (Bates et al., 2014). P-values were obtained through the *lmerTest* package (Kuznetsova et al., 2015). Each of the models will be discussed in more detail below.

#### 4.4.3.1 Intransitives Results

Results for the intransitives section of the Word Order task are illustrated visually in Figure 4.2 below, which depicts the by-subjects summary of word order preferences by verb type, definiteness of subject and speaker group. It appears that L1 speakers have the highest rates of VS preference in sentences with unaccusative verbs. This trend is seen the most clearly when the subject is indefinite. L2 speakers prefer SV to VS word order at higher rates than L1 speakers, which is especially apparent in the unaccusative conditions. However, it does look like the highest rates of preference for VS word order occurs in sentences with an unaccusative verb that has an indefinite subject.
In order to test whether there were differences among conditions and across groups, a binomial mixed effects regression was run. A forward-stepwise regression model selection procedure was followed in order to find the best fitting model. In order to evaluate fit, AIC values were examined. Predictors and interactions were added until the AIC value started to become larger. Main effects that were included were verb type, subject type and speaker group. Interactions between these factors were also evaluated. Speaker and token were evaluated as random effects. For the intransitives data, the best fitting model included the main effects of definiteness, verb type and speaker group as well as an interaction between speaker group and verb type. Only speaker was included as a random effect due to issues of convergence\(^1\).

As main effects, definiteness, verb type, and speaker group were found to be significant. The interaction between speaker group and verb type was also found to be significant. Output for the final statistical model can be found in Tables 4.6 and 4.7 below.

Table 4.6: Output for binomial regression for intransitives including effects of speaker group (L1 versus L2)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>Z value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.15</td>
<td>0.29</td>
<td>0.52</td>
<td>.6</td>
</tr>
<tr>
<td>Definiteness</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indefinite</td>
<td>0.86</td>
<td>0.17</td>
<td>4.97</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Verb Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unergative</td>
<td>-1.95</td>
<td>0.26</td>
<td>-7.41</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L2</td>
<td>-1.82</td>
<td>0.37</td>
<td>-4.85</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Verb Type Unerg : Speaker Group L2</td>
<td>1.35</td>
<td>0.35</td>
<td>3.88</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 4.7: Variance of random effects for word order preference in intransitives (L1 versus L2)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>.74</td>
<td>.86</td>
</tr>
</tbody>
</table>

\(^1\) formula: Word Order (SV = 0) \sim\) Definiteness + Verb Type * Speaker group + (1|Participant)
These results indicate that when the subject is indefinite, it is more likely to occur with inverted word order than when it is definite. As there are no significant interactions with subject type and either verb type or speaker group, this is found to be the case across both unaccusative and unergative verbs, and the case for both speaker groups. While the L1 speaker group is more likely than the L2 speaker group to select VS word order, further pairwise comparisons further indicate that both speaker groups are making a distinction between unaccusative and unergative verbs, with unaccusative verbs more likely to elicit a preferred VS word order than unergative verbs. The output for the pairwise comparisons is shown in Table 4.8 (results averaged over levels of definiteness).

Table 4.8: Output for pairwise comparisons for word order preference in intransitives (significant results denoted with a *)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>SE</th>
<th>df</th>
<th>z ratio</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verb Type = Unaccusative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1 - L2</td>
<td>1.82</td>
<td>0.37</td>
<td>Inf</td>
<td>4.86</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Verb Type = Unergative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1 - L2</td>
<td>0.47</td>
<td>0.39</td>
<td>Inf</td>
<td>1.18</td>
<td>0.24</td>
</tr>
<tr>
<td>Speaker Group = L1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unaccusative - Unergative</td>
<td>1.95</td>
<td>0.26</td>
<td>Inf</td>
<td>7.41</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group = L2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unaccusative - Unergative</td>
<td>0.59</td>
<td>0.23</td>
<td>Inf</td>
<td>2.54</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

While both groups are found to be distinguishing between unaccusative and unergative verbs in terms of word order preferences, this trend is greater for the L1 speaker group than for the L2 speaker group. This can be seen in the interaction plot below which illustrates the difference in preference rates of the verb types between the two speaker groups.

Figure 4.3: Interaction plot for word order preference by verb type (L1 versus L2)
L2 Proficiency Effects  The logistic regression model for the L2 speaker group only for the broad focus intransitives included the main effects of proficiency score, verb type and and subject definiteness, all of which were significant, which is illustrated in Tables 4.9 and 4.10 below. These results indicate that speakers are more likely to prefer VS word order as proficiency increases. VS word order is also more likely to be preferred for unaccusative verbs and for sentences with indefinite subjects, which supports the findings from the section above.

Table 4.9: Output for binomial regression for intransitives including L2 proficiency effects (L2 only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>Z value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-2.93</td>
<td>0.57</td>
<td>-5.1</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Definiteness Indefinite</td>
<td>0.8</td>
<td>0.24</td>
<td>3.4</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Verb Type Unergative</td>
<td>-0.59</td>
<td>0.23</td>
<td>-2.53</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Proficiency Score</td>
<td>0.16</td>
<td>0.06</td>
<td>2.65</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 4.10: Variance of random effects for word order preference in intransitives (L2 only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>.43</td>
<td>.66</td>
</tr>
</tbody>
</table>

4.4.3.2 Narrow Focus Results

A by-subjects summary of the narrow focus section of the Word Order Task is presented visually in Figure 4.4, which depicts word order preference rates by focus type and speaker group. As can be seen, L1 speakers prefer VS word order in both focus conditions, though it appears the preference rate for VS versus SV word order is slightly higher in the contrastive condition compared to the informational focus condition. Again, in the narrow focus conditions, L2 speakers select SV word order as their preferred word order at higher rates than the L1 speaker group.

Figure 4.4: Word order preferences for narrow focus stimuli for L1 and L2 speaker groups (by-subjects summary)
To test whether there were differences among focus conditions and between the two speaker groups, another binomial mixed effects regression was run. The final model included focus type and speaker group as main effects, as well as speaker as a random effect. An interaction between the two predictors was evaluated, but not found to contribute to the model so it was not included\(^2\). Both fixed effects of focus type and speaker group were found to be significant.

These results indicate that, compared to L2 speakers, L1 speakers are significantly more likely to prefer VS word order with either contrastive or informational focus on the subject. Additionally, contrastive focus on the subject is significantly more likely to elicit preference for VS word order as compared to informational focus on the subject. The output for the regression model can be found in Tables 4.11 and 4.12 below.

Table 4.11: Output for binomial regression for narrow focus conditions including effects of speaker group (L1 versus L2)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>Z value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>1.72</td>
<td>0.77</td>
<td>2.22</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>FocusType Informational</td>
<td>-0.81</td>
<td>0.31</td>
<td>-2.62</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>-3.72</td>
<td>1.08</td>
<td>-3.44</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 4.12: Variance of random effects for word order preference in narrow focus (L1 versus L2)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>7.05</td>
<td>2.65</td>
</tr>
</tbody>
</table>

**L2 Proficiency Effects** The best fitting logistic regression for the L2 speaker group included focus type as a main effect only. Proficiency score did not reach significance, and the model was found to fit better without this covariate. Even though, according to the AIC score, the best fitting model included focus type as a predictor, it did not actually reach significance. The output from the regression models are shown in Tables 4.13 and 4.14 below.

Table 4.13: Output for binomial regression for narrow focus conditions including L2 proficiency effects (L2 only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>Z value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-2.55</td>
<td>1.1</td>
<td>-2.33</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>FocusType Informational</td>
<td>-0.69</td>
<td>0.45</td>
<td>-1.52</td>
<td>0.13</td>
</tr>
</tbody>
</table>

Table 4.14: Variance of random effects for word order preference in narrow focus (L2 only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>12.41</td>
<td>3.52</td>
</tr>
</tbody>
</table>

\(^2\)formula: Word Order (SV = 0) \sim Focus Type + Speaker Group + (1|Participant)
4.4.4 Word Order Task Summary

Results from the word order task indicate that, as predicted, L1 speakers of Spanish are more likely than the L1-English/L2-Spanish speaker group to use inverted word order in both broad focus intransitive constructions and sentences with narrow focus on the subject. However, learning is taking place within the L2 speaker group. For the intransitives, although the L1 speakers had higher rates of VS preference overall compared to the L2 speaker group, both groups are more likely to prefer VS word order when the subject is indefinite as well as when the verb is unaccusative. There is also an effect of proficiency for the L2 speaker group. The more proficient a speaker is, the more likely they are to prefer subject inversion in broad focus intransitives.

For the narrow focus conditions, again, the L1 speakers had higher VS preference rates of the two speaker groups. The L1 speaker group was also shown to prefer subject inversion in contexts of contrastive focus over informational focus. Visually, the L2 learners appear to be following a similar pattern, however, the difference between the two focus types does not reach significance.

The results for the L1 intransitives is similar to what was predicted, as there is evidence for VS preference in unaccusatives compared to unergatives, and in sentences with indefinite subjects versus definite subjects. L1 speakers also show a preference for VS word order to mark narrow focus. However, contrastive focus has higher rates of VS preference compared to subjects with informational focus, when it was predicted to be the other way around. The L2 speakers performed as predicted by preferring SV across the board. However, there is no evidence of overgeneralization of VS word order in unergative, which has been found in the past for more advanced L2 speakers. Proficiency played a role in subject inversion in intransitives, which is perhaps not surprising as the proficiency score is based off of a cloze passage which tests speakers’ morphosyntactic knowledge. Proficiency did not play a role in how likely an L2 learner was to prefer VS word order in the narrow focus conditions, which is an interesting contrast to the intransitives results.

4.5 Oral Production Task

4.5.1 Sentence Norming Task

For the oral production experiment, it was decided that it would be best to avoid having participants read aloud any sentences that could be highly unnatural to them. This was especially relevant for the intransitive stimuli, as it was unclear whether sentences with certain verbs (especially unergative verbs) would sound infelicitous with inverted word order in broad focus contexts. In order to test this, a sentence norming task was conducted before the production task was conducted in order to evaluate the intransitive stimuli and evaluate whether any could be construed as being too unnatural or infelicitous in their given context. This norming task is described in the present section.
4.5.1.1 Experimental Design

The sentence norming task consisted of the same intransitive stimuli from the Word Order Task. For this task, the contextual question (eliciting only broad focus contexts) was paired with one sentence only that occurred in either the SV or VS variant. Definiteness of the subject was varied, with half the stimuli occurring with a definite subject (a proper noun) and the other half with an indefinite NP. These conditions were crossed with both verb type and word order of the target sentence. There were 12 token sets in each subject definiteness condition, and since these were crossed with both verb type and word order, there was a total of 96 tokens. Example stimuli can be found below in Table 4.15:

Table 4.15: Example of stimuli for Sentence Norming Task, varied by definiteness of subject and verb type. These examples show the SV variants only though the stimuli were also varied for word order.

<table>
<thead>
<tr>
<th>Definite Subject</th>
<th>Question:</th>
<th>¿Por qué dejó de hablar el maestro? (&quot;Why did the teacher stop talking?&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unaccusative</td>
<td>José salió (&quot;José left&quot;)</td>
<td></td>
</tr>
<tr>
<td>Unergative</td>
<td>José gritó (&quot;José yelled.&quot;)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indefinite Subject</th>
<th>Question:</th>
<th>¿Qué pasó en el teatro? (&quot;What happened in the theater?&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unaccusative</td>
<td>Una actriz llegó (&quot;An actress arrived&quot;)</td>
<td></td>
</tr>
<tr>
<td>Unergative</td>
<td>Una actriz actuó (&quot;An actress performed&quot;)</td>
<td></td>
</tr>
</tbody>
</table>

Filler sentences were also included in order to obscure the experimental purpose of this task and as an additional measure to gauge whether participants were paying attention to the task. There were a total of three categories of fillers, for a total of 24 filler items. Filler items were also contextualized with a question eliciting broad focus, and were also presented with two word order variants: cardinal word order and inverted word order. The first category had simple transitives presented with either SVO or OSV word order. The second had a prepositional phrase that either occurred as SVOPP (standard word order) or SVPPO (inverted word order). Finally, there were also ditransitive constructions that occurred either as S-V-DO-IO, which tends to be regarded as the standard order, and as S-V-IO-DO, as the inverted word order variant. Examples to illustrate these three categories can be found in Table 4.16 below:
The set of 96 test items was divided into two lists, for a total of 48 test items in each list. Lists were divided along word order, so that each participant saw only one word order variant of each question. There was an equal number of SV and VS tokens in each list. Participants only completed one of these two lists. All filler items were included in both lists, which meant participants completed a total of 72 items.

Participants completed this task on Qualtrics. They were first given a set of instructions that contained examples illustrating how word order can vary in Spanish, demonstrating that a sentence can be grammatically correct even if it might not seem like the appropriate response to a specific question (though it might be a better response to a different question). Participants were then asked to rate how likely they thought they would answer the given question with the sentence provided, with 1 indicating that they were not at all likely to use this sentence to answer the preceding question and 5 indicating that they were very likely.

This survey was made available on Amazon Turk, and it was restricted to IP addresses located in Mexico, Puerto Rico, and Spain. This was done because it reflected the reported origins of many of the L1-Spanish speakers who teach Spanish to L1 English speakers at the particular university where participants were being recruited. This was done as the Spanish teachers at this university were potential future participants for the production task in this study, and because it was thought that, since it reflected the population of Spanish teachers, it would also reflect input more similar to what the L2 learners are receiving. Participants completed a background questionnaire in order to confirm their status as a native speaker of Spanish.

A total of 60 participants completed the sentence norming task. 34 people completed the first list and 26 completed the second list. Of the 60 responses, 14 had to be deleted, with 7 eliminated from each list, which left a total of 46 for analysis. 10 responses were eliminated since they were repeats from participants who had completed both the first and second list. In this case, only their first response was retained for analysis. Three participants were deleted since they reported close contact to a language other than Spanish, such as English or French and reported growing up in
English or French speaking countries. The final participant was eliminated because the responses to the background questionnaire were nonsensical, making it difficult to trust they took the survey seriously.

Three participants reported being born and raised in Colombia. Eight participants reported being born and raised in Mexico. Spain was the country of origin for the majority of participants, with a total of 33 reported being born and raised in Spain. The final two participants reported being born in Venezuela but growing up in Spain. All participants reported Spanish as their native language and the language spoken in the home while they were growing up. The majority reported only Spanish as their native language and language in the home, though there were four participants who reported another native language in addition to Spanish. These included Arabic, Catalan, and Galician.

4.5.1.2 Results

In order to calculate the results, a by-subject analysis was conducted, in which means were calculated for each condition. The simple transitive fillers were examined largely to determine whether participants were paying attention. The OSV word order in these items is known to be infelicitous in broad focus contexts, so if participants are paying attention to the task they should be awarding high ratings to the standard word order and low ratings to the inverted word order variants. In order to evaluate participants’ performances, the distance between the rating for SVO and OSV word order was calculated. If the mean was less than 1 for any participant, they were eliminated from the final analysis. This would ensure that participants are giving sentences with SVO order higher ratings than those sentences in OSV word order. It would eliminate participants who are awarding the same ratings to all stimuli, which would be indicated through a mean of less than 1. After this was calculated, 5 participants were further eliminated, for a total of 41 participants who were included in the final analysis.

The means by each condition were calculated (definiteness x verb type x word order). It had been decided that if a condition received an average score below three it would not be included in the analysis. However, all conditions were rated at an average of 3 or above. Stimuli with unergative verbs (with both definite and indefinite subjects) were given the lowest ratings overall, which was predicted, but these were still slightly more than 3. Results are depicted in Table 4.17. Because of this, it was decided that all conditions would be retained for the oral production task.
Table 4.17: Mean ratings of intransitive stimuli by definiteness, verb type and word order

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definite</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unaccusative</td>
<td>SV</td>
<td>4.2</td>
</tr>
<tr>
<td></td>
<td>VS</td>
<td>3.88</td>
</tr>
<tr>
<td>Unergative</td>
<td>SV</td>
<td>4.3</td>
</tr>
<tr>
<td></td>
<td>VS</td>
<td>3.14</td>
</tr>
<tr>
<td><strong>Indefinite</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unaccusative</td>
<td>SV</td>
<td>3.82</td>
</tr>
<tr>
<td></td>
<td>VS</td>
<td>3.96</td>
</tr>
<tr>
<td>Unergative</td>
<td>SV</td>
<td>3.93</td>
</tr>
<tr>
<td></td>
<td>VS</td>
<td>3.11</td>
</tr>
</tbody>
</table>

4.5.2 Oral Production Experimental Design

The Oral Production task consisted of the same materials as the Word Order Task. The contextual questions were exactly the same. For this task, however, participants were presented with only one sentence that they were asked to read aloud. The stimuli for the intransitives had a 2x2x2 design in which they were manipulated for verb type (unaccusative versus unergative), definiteness of the subject, and word order (SV versus VS). There were 12 token sets for each subject definiteness condition, which, when crossed with verb type (with two levels) and word order (with two levels), resulted in a total of 96 items. The token sets for the narrow focus conditions also had a 2x2 design in which both focus type (informational versus contrastive) and word order (SV versus VS) were manipulated. There was a total of 12 token sets for the narrow focus condition. When crossed with focus type (two levels) and word order (two levels), there was a total of 48 items. Finally, filler items were also included, but the target sentences for these were only presented in SVO word order. There was a total of ten filler items. There were only few filler items since the intransitive stimuli and narrow focus stimuli could act as additional filler items for each other. With a total of 96 items in the broad focus intransitive conditions, a total of 48 in the narrow focus conditions, and ten additional filler items, there was a total of 156 tokens. The test items were divided into two lists when presented to participants, which meant that each participant encountered 83 tokens throughout this part of the experiment. Each list was divided by word order so that participants did not see the same question and answer with only word order varied. Both lists contained an equal number of SV and VS responses.

The procedure for the Oral Production Task for the Spanish Experiment was very similar to that in the English Experiment. The task was administered on a computer through *Psychopy 1.84.2* (Peirce, 2007; 2009). Participants were able to read the contextual question that was presented at the top of the screen and which was also read aloud. They were then asked to read the target sentence that appeared at the bottom of the screen as if they were responding to the preceding question. Presentation of the items was randomized for each participant. After reading each sentence out loud, the participant could click through to the next sentence.

Participants completed this task in a sound-attenuated booth with a head-mounted microphone.
4.5.3 Data Analysis

The data from the Oral Production Task for the Spanish Experiment was collected, segmented and quantitatively analyzed in a similar vein as that in the English Experiment. First, each recorded utterance was segmented in its own sound file. For each of the sound files, the vowel of the stressed syllable of both the first and final content word was segmented so acoustic measures could be extracted.

The procedure for segmenting vocalic portions of the stressed syllables of the two content words was the same for the Spanish Experiment as is described in the English Experiment (Chapter 3). Separating the sonorant of /r/ in this case was mainly relevant for the L2 speakers who would often transfer the English rhotic into their L2 Spanish instead of producing a trilled or flapped Spanish /r/, which was much easier to segment.

Tokens were eliminated at this time if there were disfluencies in the utterance or if there was a pause effectively putting the two words into separate intonational phrases. It was also noted at this time that there were a number of word stress errors produced by participants in the L2 speaker group. Tokens with misplaced or ambiguous word stress on the target words were also eliminated from the final analysis.

There were a total of 1095 test items presented to the L1 speaker group. Of these, 27 were eliminated which means 97.53% were retained for analysis. 720 of these tokens that were presented were from the intransitives conditions, of which 10 were eliminated for a total of 98.61% of tokens retained for analysis. 375 tokens were presented to participants from the focus conditions. Of these, 17 were eliminated and 95.47% were retained for analysis.

There were a total of 1533 test items presented to the L2 speaker group. Of these, 226 were eliminated which left 85.26% of the remaining tokens to be included in the analysis. 1008 of the tokens presented were from the intransitives conditions. Of these, 146 were eliminated and 85.52% were included in the analysis. 504 tokens from the focus conditions were presented, of which 59 were eliminated, which means 88.29% was kept for analysis.

The measurements that were taken included pitch (mean pitch, maximum pitch and pitch range) and intensity. These measurements were extracted using ProsodyPro 6 (Xu, 2013). The procedure for this followed that in Sec. 3.4.1.3. The only difference is that there were two measurements for each recorded sentence. The measurements from the second word were subtracted from the measurements of the first word. These values were then z-normalized to account for any inter- and intra-speaker differences not related to the research questions at hand.

After the measurements from the data were collected and processed, the data was divided into SV tokens and VS tokens and the intransitives and narrow focus conditions were both examined within each word order variant were examined separately (i.e. SV tokens were compared across conditions, as were VS). Although some studies have compared values across SV and VS word orders (e.g. Calhoun et al., 2018), it was decided that this was too difficult given the two speaker groups. As was confirmed by the Word Order Task in this study, VS word order is dispreferred by learners, which leads to questions about how well the L2 speakers will be able to produce such
sentences, which has implications for the prosodic structure of VS utterances, more so than we see for SV sentences. This makes the output from any model containing word order as a predictor more difficult to understand or interpret. By isolating the SV word orders from the VS word orders, it was hoped that the comparison the L2 speaker group to the L1 speaker group would be more straightforward. This method of analysis also helps ensure that items being compared were more similar. This was especially the case for verb-final sentences, since it was more difficult to control for the phonological make-up of the nouns.

Within the SV conditions, the broad focus intransitives and narrow focus were first examined separately, to see if there were any within-category differences. Afterwards, both the intransitives and narrow focus sentences were collapsed across their conditions and were examined together. The first analysis allowed us to examine whether there were any differences across conditions between the two categories. The second step allowed us to better examine NA shift across categories since it is predicted that narrow focus contexts (especially contrastive focus) will elicit NA shift when the word order is constrained to an SV word order and the focus falls on the subject. While it is predicted that broad focus SV intransitive constructions will have final NA placement on the verb, some findings have suggested that this may be more flexible than previously thought (Calhoun et al., 2018). Comparing the two allows us to better make a case for NA shift.

Before statistic models were run, the data was inspected and outliers more than three standard deviations from the mean were removed. These were assumed to be errors in measurement as it is quite possible to obtain through Praat scripts despite manually checking the measurements. This is done to avoid having false measurements skew the data points.

Pitch range was found not to be a reliable measure, so instead only the measures of maximum pitch and mean pitch were used, which has been used in previous studies (Kim, 2016; van Maastricht et al., 2016). It may be interesting to conduct a Principal Component Analysis to confirm that pitch range does not contribute to explaining the variation in the data. However, this was not conducted at the moment, as the results from the other measurements agreed with each other overall. This may be an approach to consider at a later date.

In order to evaluate the effects of category and either speaker group (L1 versus L2) or proficiency score (L2 only) on the data, a linear mixed effects model was run on each acoustic dimension of measurement. The final model was selected using the drop1 function in R. In this approach all fixed effects and interactions were included in the model. The drop1 function then evaluates each model and indicates whether a fixed effect or interaction can be dropped as it is found not to contribute to the model. The model is updated, dropping the interaction or fixed effect one at a time until there are no longer any that can be dropped, meaning everything included in the model contributes significantly. The random effect of token was included in models, but random slopes were not due to issues of convergence. The final models and their results are detailed in the sections below.
4.5.4 Predictions

L1 Speakers For sentences with SV word order, it is predicted that native speakers will mark contrastive focus prosodically. The prosodic marking of contrastively focused subjects given SV word order in Spanish has been well documented (e.g. Zubizarreta, 1998; Hualde, 2005) so it is assumed subjects in the contrastive focus conditions will be accented. This will be evidenced with higher values of acoustic measurements in sentences with a contrastively focused subject than the other conditions since the dependent variables are all based on differences between the stressed syllables of Word 1 and Word 2 (in this case, S minus V). The prosodic status of subjects with informational focus given SV word order is less clear, as some of the experimental findings contradict previous theoretical claims. Previous theoretical work (e.g. Zubizarreta, 1998) has stated only subjects with contrastive focus may be accented in-situ whereas words with informational focus may not. Recent experimental work, however, has been providing evidence that utterance non-final words with informational focus may actually be marked in-situ (e.g. Hoot & Leal, 2020) or prosodically augmented (Kim, 2016). If L1 speakers mark subjects with information focus prosodically, which would be in line with more recent experimental findings, then we will not expect to see a difference between SV sentences with a contrastively focused subject versus those with a subject in information focus. If, however, subjects with informational focus are not prosodically augmented when occurring in SV word order, then the subtracted values for the informational focus condition will be smaller than those in the contrastive focus condition. Predictions for the focus conditions is summarized below:

**Contrastive focus:**

Prediction: marked prosodically

Evidence: large subtracted acoustic values (S-V)

**Informational Focus:**

if marked prosodically:

Subtracted values from informational focus = subtracted values from contrastive focus

If not marked prosodically:

Subtracted values from informational focus < subtracted values from contrastive focus

It is predicted that overall, L1 speakers will be less likely to prosodically augment the subject of a broad focus SV sentence with an intransitive verb regardless of verb type. This will be evidenced with similar values for all SV intransitives, across both word type and subject type, when they are compared to each other. If, however, it is possible to shift NA to the subject in intransitives, as suggested by Calhoun et al. (2018), then we would expect to see this with unaccusative verbs.
only. This would be evidenced when examining the intransitive data by looking at the effect of verb type. If speakers are shifting NA to the subject in SV sentences with an unaccusative verb, the subtracted values will be higher than those for sentences with unergative verbs. There is no reason to expect that definiteness of the subject influences NA placement in intransitives, and it is therefore predicted that this factor will not have an effect. Subtracted values for intransitives with a definite subject are expected to not differ from those with an indefinite subject. The predictions for the intransitive conditions are summarized below:

**Intransitives with definite subject:**

If unaccusatives are marked prosodically

Subtracted values for unaccusative > subtracted values for unergatives

If verb type has no effect and NA is consistently utterance-final

Subtracted values for unaccusative = subtracted values for unergatives

**Intransitives with indefinite subject:**

If unaccusatives are marked prosodically

Subtracted values for unaccusative > subtracted values for unergatives

If verb type has no effect and NA is consistently utterance-final

Subtracted values for unaccusative = subtracted values for unergatives

**Intransitives with definite versus indefinite subject:**

Subtracted values for intransitives with definite subjects = subtracted values for intransitives with indefinite subjects

In order to better evidence NA shift, or the lack thereof, the narrow focus and broad focus intransitives will be compared to each other. As previously stated, contrastively focused subjects in SV word order are expected to be prosodically augmented. If conditions are expected to occur without NA shift (such as the intransitives) then the subtracted values for those without NA shift to the subject are expected to be lower than those with NA shift (especially contrastive focus in particular).

Finally, it is predicted that VS sentences will consistently be produced with NA at the end of the sentence, regardless of condition.

**L2 Speakers** It is predicted that L2 speakers will mark subjects with both contrastive and informational focus prosodically. It has been shown that L1 speakers of English (and of other plastic languages) have brought this strategy of marking narrow focus from English into their L2 of Spanish (e.g. Kim, 2016). If this is the case we expect to see similar values for SV sentences with both types narrow focus. This prediction is summarized below:
Narrow focus for L2 speakers

Subtracted values for contrastive focus = subtracted values for informational focus

Less is known about whether native speakers of English transfer prosodic patterns of intransitives into their L2 of Spanish. If speakers do transfer this prosodic pattern, it would be expected only for the unaccusatives, similar to what was seen for the results in the English experiment. If no transfer occurs, it is expected that the final verb will receive NA across contexts. In this case, there will be no effect of verb type when comparing the intransitive stimuli. Moreover, we should see an effect of focus type when comparing broad focus intransitives to the sentences with narrow focus. Specifically, SV sentences with narrow focus on the subject will have higher values than SV broad focus intransitive sentences. These predictions are summarized below:

Broad focus intransitives

If transfer occurs:
Subtracted values for unaccusatives > subtracted values for unergatives (regardless subject type)

If there is no transfer:
Subtracted values for unaccusatives = subtracted values for unergatives (regardless subject type)

Broad focus intransitives versus narrow focus

If no transfer occurs in intransitives:
Subtracted values for narrow focus items > subtracted values for intransitives

If transfer occurs in intransitives:
Subtracted values for narrow focus items > subtracted values for unergatives only

Of course it is also possible that learners do not transfer NA shift from their L1 at all (or do not learn that it can occur in Spanish in contexts such as contrastive focus). In this case, we would expect no difference among the various conditions.

How learners acquire prosody in VS word orders is also very unknown and this study will likely be only exploratory in nature. It is expected that this could be a difficult prosodic pattern for L2 speakers, as the Word Order Task confirms that learners prefer SV word order over VS word order across conditions. It may be expected that learners must acquire the syntax before they can successfully incorporate these words into a prosodic phrase and assign a main prominence. It is predicted that if speakers do not show a preference for VS word order then they will struggle with the production of VS sentences. This would be evidenced through a higher rate of errors than found in the SV conditions. If speakers are able to produce VS sentences, however, it is predicted that producing them with final NA on the subject will be relatively straightforward. In this case, we would expect to see no differences in production from the L1 speaker group.
4.5.5 SV Word Order Results

4.5.5.1 Narrow Focus

The final linear mixed effects regression model for each acoustic measurement consisted of the main effect of speaker group only and token as a random effect. There was no significant main effect of focus type (contrastive versus informational) and no interaction between focus type and speaker group. The data for intensity is represented in Figure 4.5 and the output for the regression model is given in Tables 4.18 and 4.19. Measurements of maximum pitch are illustrated in Figure 4.6 while the output from the regression model is provided in Tables 4.20 and 4.21. Finally, the data for mean pitch measures are illustrated in Figure 4.7 and the output from the regression model is found in Tables 4.22.

Figure 4.5: Normalized mean differences of intensity for SV sentences (Word 1 - Word 2) by focus type and speaker group (Word 1 = S, Word 2 = V; Contrastive = contrastive focus)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.13</td>
<td>.36</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.58</td>
<td>.76</td>
</tr>
</tbody>
</table>

Table 4.18: Output for linear mixed effects regression for intensity measures of narrow focus (SV only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.89</td>
<td>0.1</td>
<td>36.86</td>
<td>9.16</td>
<td>&lt;.05*</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>-0.23</td>
<td>0.083</td>
<td>328.85</td>
<td>-2.87</td>
<td>&lt;.05*</td>
</tr>
</tbody>
</table>

Table 4.19: Variance of random effects for intensity measures in narrow focus (SV only)
Figure 4.6: Normalized differences of max pitch for SV sentences (word 1 - word 2) by focus type and speaker group (Word 1 = S, Word 2 = V; Contrastive = contrastive focus)

Table 4.20: Output for linear mixed effects regression for max pitch measures of narrow focus (SV only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.5</td>
<td>0.1</td>
<td>42.68</td>
<td>5.02</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>-0.45</td>
<td>0.09</td>
<td>326.21</td>
<td>-4.79</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 4.21: Variance of random effects for max pitch measures in narrow focus (SV only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.11</td>
<td>.34</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.75</td>
<td>.87</td>
</tr>
</tbody>
</table>

Figure 4.7: Normalized differences of mean pitch of SV sentences (word 1 - word 2) by focus type and speaker group (Word 1 = S, Word 2 = V; Contrastive = contrastive focus)
Table 4.22: Output for linear mixed effects regression for mean pitch measures of narrow focus (SV only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.61</td>
<td>0.1</td>
<td>43.43</td>
<td>6.06</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>-0.48</td>
<td>0.1</td>
<td>324.4</td>
<td>-4.92</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 4.23: Variance of random effects for mean pitch measures in narrow focus (SV only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.12</td>
<td>.35</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.77</td>
<td>.88</td>
</tr>
</tbody>
</table>

These results indicate that both types of narrow focus, informational and contrastive, are being treated similarly by both speaker groups in that both sentences with both a contrastively focused subject and an informationally focused subject are treated similarly prosodically. It is interesting to note that the values for the L2 speakers are significantly lower than those for the L1 speakers. However, neither group makes a distinction between the two focus types, at least prosodically since there is no significant effect of focus type, nor a significant interaction between focus type and speaker groups, which would indicate that two speaker groups are treating the two focus types differently.

L2 Proficiency Effects In order to examine whether production results could vary by proficiency, the L2 data was modeled evaluating focus type and proficiency score as predictor variables. However, across all acoustic measures, neither of these variables were shown to be significant and were therefore dropped from the model, leaving only the random effects. The output from these models is shown in Tables 4.24 and 4.23 for intensity, Tables 4.26 and 4.27 for maximum pitch and Tables 4.28 and 4.29 for mean pitch:

Table 4.24: Output for linear mixed effects regression for intensity measures for L2 speaker group only for narrow focus (SV only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.63</td>
<td>0.09</td>
<td>21.78</td>
<td>6.66</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 4.25: Variance of random effects for intensity measures for L2 speakers only in narrow focus (SV only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.14</td>
<td>.37</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.59</td>
<td>.77</td>
</tr>
</tbody>
</table>
Table 4.26: Output for linear mixed effects regression for max pitch measures for L2 speaker group only for narrow focus (SV only)

<table>
<thead>
<tr>
<th>(Intercept)</th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.05</td>
<td>0.1</td>
<td>24.05</td>
<td>0.53</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Table 4.27: Variance of random effects for max pitch measures for L2 speakers in narrow focus (SV only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.09</td>
<td>.29</td>
</tr>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>.08</td>
<td>.29</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.58</td>
<td>.76</td>
</tr>
</tbody>
</table>

Table 4.28: Output for linear mixed effects regression for mean pitch measures for L2 speaker group only for narrow focus (SV only)

<table>
<thead>
<tr>
<th>(Intercept)</th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.14</td>
<td>0.11</td>
<td>26.7</td>
<td>1.29</td>
<td>0.21</td>
</tr>
</tbody>
</table>

Table 4.29: Variance of random effects for mean pitch measures for L2 speakers in narrow focus (SV only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.12</td>
<td>.34</td>
</tr>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>.06</td>
<td>.25</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.64</td>
<td>.8</td>
</tr>
</tbody>
</table>

Results indicate that there is no effect of proficiency. Speakers’ performances appear to be similar across proficiency levels.

4.5.5.2 Intransitives

For the regression models for the intransitive stimuli, verb type, subject type (definite versus indefinite) and speaker group were evaluated as main effects as were the interactions between them. For the acoustic measurements of mean pitch and maximum pitch, only speaker group as a main effect was found to be significant and included in the respective models. The regression model for intensity included an interaction between subject type and speaker group, as this was found to be significant. Both token and participant were included in the models as random effects.

Figures 4.8 and 4.9 illustrate the data from the measurements of maximum pitch and mean pitch respectively. Tables 4.30 and 4.31 show the output for the regression model for maximum pitch measures. Tables 4.32 and 4.33 show the output for the regression model for mean pitch measures.
Figure 4.8: Normalized max pitch differences of SV sentences (word 1 - word 2) in intransitives by subject and verb type and speaker group (Word 1 = S, Word 2 = V)

Table 4.30: Output for linear mixed effects regression for max pitch measures of intransitives (SV only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.2</td>
<td>0.09</td>
<td>59.2</td>
<td>2.23</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>-0.37</td>
<td>0.09</td>
<td>34.04</td>
<td>-4.4</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 4.31: Variance of random effects for max pitch measures in intransitives (SV only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.18</td>
<td>.42</td>
</tr>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>.02</td>
<td>.16</td>
</tr>
<tr>
<td>Residual</td>
<td>(Intercept)</td>
<td>.77</td>
<td>.88</td>
</tr>
</tbody>
</table>

Figure 4.9: Normalized mean pitch differences of SV sentences (word 1 - word 2) in intransitives by subject and verb type and speaker group (Word 1 = S, Word 2 = V)
Table 4.32: Output for linear mixed effects regression for mean pitch measures of intransitives (SV only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.22</td>
<td>0.09</td>
<td>50.48</td>
<td>2.45</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>-0.39</td>
<td>0.1</td>
<td>34.77</td>
<td>-3.92</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 4.33: Variance of random effects for mean pitch measures in intransitives (SV only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.11</td>
<td>.34</td>
</tr>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>.04</td>
<td>.21</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.81</td>
<td>.9</td>
</tr>
</tbody>
</table>

As was already mentioned, there was a significant interaction between subject type and speaker group in intensity. This is illustrated in Figure 4.10 below:

Figure 4.10: Normalized intensity differences in SV sentences (word 1 - word 2) in intransitives by subject and verb type and speaker group (Word 1 = S, Word 2 = V)

The output for this model is found in Tables 4.34 and 4.35 below. As indicated by both the visual data and the regression output, the values for intransitives with an indefinite subject are lower for the L2 speaker group than those with a definite subject. This same effect is not seen in the L1 speaker group. Instead, values are similar across the two conditions. Values are not affected by verb type across speaker groups and subject type conditions.

Table 4.34: Output for linear mixed effects regression for intensity measures of intransitives (SV only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.27</td>
<td>0.14</td>
<td>73.55</td>
<td>1.94</td>
<td>.06</td>
</tr>
<tr>
<td>Subject Type Indefinite</td>
<td>-0.16</td>
<td>0.18</td>
<td>62.46</td>
<td>-0.89</td>
<td>0.38</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>-0.16</td>
<td>0.11</td>
<td>61.97</td>
<td>-1.42</td>
<td>0.16</td>
</tr>
<tr>
<td>Subject Type Indefinite : Speaker Group L2</td>
<td>-0.23</td>
<td>0.12</td>
<td>693.53</td>
<td>-2</td>
<td>&lt; 0.05*</td>
</tr>
</tbody>
</table>
Table 4.35: Variance of random effects for intensity measures in intransitives (SV only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.29</td>
<td>.54</td>
</tr>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>.05</td>
<td>.22</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.63</td>
<td>.79</td>
</tr>
</tbody>
</table>

Subsequent pairwise comparisons were conducted to investigate the interaction. The results for these confirm that L2 speakers are producing lower values for intransitive SV sentences with indefinite subjects than they are in intransitive SV sentences with definite subjects. The output from the pairwise comparison are shown in Table 4.36 below:

Table 4.36: Output for pairwise comparisons for intensity measures in SV intransitives (significant results denoted with a *)

<table>
<thead>
<tr>
<th>Contrast</th>
<th>Estimate</th>
<th>SE</th>
<th>df</th>
<th>t ratio</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject Type = Definite L1 - L2</td>
<td>0.16</td>
<td>0.11</td>
<td>66.77</td>
<td>1.4</td>
<td>.17</td>
</tr>
<tr>
<td>Subject Type = Indefinite L1 - L2</td>
<td>0.39</td>
<td>0.11</td>
<td>66.83</td>
<td>3.47</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group = L1 Definite - Indefinite</td>
<td>0.16</td>
<td>0.18</td>
<td>65.13</td>
<td>0.87</td>
<td>0.39</td>
</tr>
<tr>
<td>Speaker Group = L2 Definite - Indefinite</td>
<td>0.39</td>
<td>0.18</td>
<td>59.63</td>
<td>2.2</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Results from the intransitives section of the Oral Production Task indicate that L1 speakers are not distinguishing between verb types, at least prosodically, which diverges from the previous findings of Calhoun et al. (2018). L2 speakers have significantly lower values overall, but more relevantly, they are performing similarly to the L1 speakers in that they are not prosodically distinguishing between sentences with unaccusative versus unergative verbs. The only context in which there is a significant difference is based on definiteness. The L2 speaker group has larger values when the subject is definite versus when it is indefinite in SV sentences, regardless of verb type, whereas the L1 speaker group shows no effect of definiteness on the prosodic realization of these sentences.

L2 Proficiency Effects  Further mixed effects models were built for each acoustic measurement evaluating the effect of proficiency for the L2 speaker group only. For both pitch measures, mean pitch and maximum pitch, none of the predictor variables, including proficiency level, verb type and subject definiteness, were shown to be significant. The output for the regression model for max pitch can be found in Tables 4.37 and 4.38 and the output for the model for mean pitch can
be found in Tables 4.39 and 4.40:

Table 4.37: Output for linear mixed effects regression evaluating L2 proficiency effects for max pitch measures of intransitives (SV only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-0.02</td>
<td>0.08</td>
<td>34.92</td>
<td>-0.2</td>
<td>0.84</td>
</tr>
</tbody>
</table>

Table 4.38: Variance of random effects for max pitch measures in SV intransitives (L2 speaker group only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.17</td>
<td>.41</td>
</tr>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>.01</td>
<td>.1</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.82</td>
<td>.91</td>
</tr>
</tbody>
</table>

Table 4.39: Output for linear mixed effects regression evaluating L2 proficiency effects for mean pitch measures of intransitives (SV only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-0.00026</td>
<td>0.09</td>
<td>36.79</td>
<td>-0.003</td>
<td>0.998</td>
</tr>
</tbody>
</table>

Table 4.40: Variance of random effects for mean pitch measures in SV intransitives (L2 speaker group only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.15</td>
<td>.39</td>
</tr>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>.04</td>
<td>.2</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.81</td>
<td>.9</td>
</tr>
</tbody>
</table>

Only the regression model for intensity measures was found to have significant predictors. This model included both proficiency score and subject type as main effects, both which were found to be significant. The output for this regression model can be found in Tables 4.41 and 4.40:

Table 4.41: Output for linear mixed effects regression evaluating L2 proficiency effects for intensity measures of intransitives (SV only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-0.13</td>
<td>0.19</td>
<td>34.68</td>
<td>-0.67</td>
<td>0.5</td>
</tr>
<tr>
<td>Subject Type : Indefinite</td>
<td>-0.39</td>
<td>0.17</td>
<td>45.9</td>
<td>-2.31</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Proficiency</td>
<td>0.04</td>
<td>0.02</td>
<td>16.87</td>
<td>2.53</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>
Table 4.42: Variance of random effects for intensity measures in SV intransitives (L2 speaker group only))

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.26</td>
<td>.51</td>
</tr>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>.02</td>
<td>.15</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.67</td>
<td>.82</td>
</tr>
</tbody>
</table>

The intensity results indicate that as proficiency increases, so does the difference score between the first and last word. It is possible that higher proficiency speakers are prosodically augmenting the subject of intransitives, across verb type, when the subject is indefinite. However, there are no pitch measurements to corroborate this claim. This is a finding which could use further investigation.

4.5.5.3 Narrow Focus versus Broad Focus Intransitives

Because there were no real significant differences within the narrow focus and intransitives categories discussed above, these categories were collapsed into two broader categories defined by the type of focus: narrow focus and broad focus. Doing this allowed us to compare the two to see if there was evidence of NA shift in either one.

Figures 4.11 - 4.13 illustrate the means and distributions of the data for intensity (Fig. 4.11), max pitch (Fig. 4.12) and mean pitch (Fig. 4.13).

Figure 4.11: Normalized intensity differences (word 1 - word 2) in all categories (collapsed) by focus and speaker group speaker group
Figure 4.12: Normalized maximum pitch differences (word 1 - word 2) in all categories (collapsed) by focus and speaker group speaker group

![Normalized maximum pitch differences (word 1 - word 2) in all categories (collapsed) by focus and speaker group](image)

Figure 4.13: Normalized mean pitch differences (word 1 - word 2) in all categories (collapsed) by focus and speaker group speaker group

![Normalized mean pitch differences (word 1 - word 2) in all categories (collapsed) by focus and speaker group](image)

Visually, a slight difference can be seen between the narrow focus and broad focus items for both speaker groups, with higher values for the difference between the subject (Word 1) and the verb (Word 2) for the narrow focus than for the broad focus items. The existence of a difference between the means is further evidenced statistically. Again, for each acoustic dimension, a linear mixed effects model was run. Each model included focus (broad versus narrow) and speaker group as main effects. Each of these were significant as a main effect, but there was no significant interaction between the two and no interaction was included in the model. Token was included as a random effect. The output for the regression model for intensity can be found in Tables 4.43 and 4.44, output for the regression model for maximum pitch can be found in Tables 4.45 and 4.46. Finally the output for the regression model for mean pitch can be found in Tables 4.47 and 4.48.
Table 4.43: Output for linear mixed effects regression for intensity measures of all categories by focus (SV only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.27</td>
<td>0.08</td>
<td>85.92</td>
<td>3.34</td>
<td>&lt;.05*</td>
</tr>
<tr>
<td>Focus Narrow</td>
<td>0.64</td>
<td>0.13</td>
<td>70.15</td>
<td>4.83</td>
<td>&lt;.05*</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>-0.26</td>
<td>0.05</td>
<td>1056.78</td>
<td>-5.55</td>
<td>&lt;.05*</td>
</tr>
</tbody>
</table>

Table 4.44: Variance of random effects for intensity in all categories (SV only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.24</td>
<td>.49</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.61</td>
<td>.78</td>
</tr>
</tbody>
</table>

Table 4.45: Output for linear mixed effects regression for max pitch measures of all categories by focus (SV only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.1</td>
<td>0.07</td>
<td>97.49</td>
<td>1.34</td>
<td>0.18</td>
</tr>
<tr>
<td>Focus Narrow</td>
<td>0.37</td>
<td>0.11</td>
<td>68.5</td>
<td>3.22</td>
<td>&lt;.05*</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>-0.4</td>
<td>0.05</td>
<td>997.28</td>
<td>-7.37</td>
<td>&lt;.05*</td>
</tr>
</tbody>
</table>

Table 4.46: Variance of random effects for max pitch in all categories (SV only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.16</td>
<td>.39</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.76</td>
<td>.87</td>
</tr>
</tbody>
</table>

Table 4.47: Output for linear mixed effects regression for mean pitch measures of all categories by focus (SV only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.2</td>
<td>0.07</td>
<td>109.1</td>
<td>3.05</td>
<td>&lt;.05*</td>
</tr>
<tr>
<td>Focus Narrow</td>
<td>0.38</td>
<td>0.1</td>
<td>69.37</td>
<td>3.65</td>
<td>&lt;.05*</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>-0.42</td>
<td>0.06</td>
<td>989.49</td>
<td>-7.46</td>
<td>&lt;.05*</td>
</tr>
</tbody>
</table>

Table 4.48: Variance of random effects for mean pitch in all categories (SV only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.11</td>
<td>.34</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.82</td>
<td>.91</td>
</tr>
</tbody>
</table>

These results provide evidence that both L1 and L2 speakers are marking narrow focus prosodically through NA shift, while keeping the verb accented in broad focus intransitives. Across speaker
groups, there are higher values for the narrow focus conditions, indicating that the subject is being prosodically augmented. The fact that the measures for the narrow focus differ significantly from the intransitive conditions suggests that broad focus intransitives with SV word order are realized with utterance-final NA placement on the verb, regardless of verb type or speaker group.

**L2 Proficiency Effects** Finally, the effect of proficiency for the L2 speaker group was also evaluated. A linear mixed effects regression model was built with each acoustic measurement and both focus type (narrow versus broad) and proficiency were evaluated. For both maximum and mean pitch measures, only focus type was found to be significant. Proficiency was found to have no effect. The output from the regression model for maximum pitch can be found in Tables 4.49 and 4.50 below and the output for mean pitch can be found in Tables 4.51 and 4.52:

Table 4.49: Output for linear mixed effects regression evaluating L2 proficiency effects for max pitch measures of all categories by focus (SV only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-0.27</td>
<td>0.06</td>
<td>28.68</td>
<td>-4.46</td>
<td>&lt; 0.05*</td>
</tr>
<tr>
<td>Focus Narrow</td>
<td>0.33</td>
<td>0.08</td>
<td>566.7</td>
<td>4.07</td>
<td>&lt; 0.05*</td>
</tr>
</tbody>
</table>

Table 4.50: Variance of random effects for max pitch in all categories for L2 speaker group (SV only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>.03</td>
<td>.18</td>
</tr>
<tr>
<td>Residual</td>
<td>.84</td>
<td>.91</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.51: Output for linear mixed effects regression evaluating L2 proficiency effects for mean pitch measures of all categories by focus (SV only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-0.19</td>
<td>0.07</td>
<td>29.52</td>
<td>-2.85</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Focus Narrow</td>
<td>0.36</td>
<td>0.08</td>
<td>559.73</td>
<td>4.21</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 4.52: Variance of random effects for mean pitch in all categories for L2 speaker group (SV only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>.05</td>
<td>.22</td>
</tr>
<tr>
<td>Residual</td>
<td>.9</td>
<td>.95</td>
<td></td>
</tr>
</tbody>
</table>

The regression model for intensity measures included the main effects of focus type and proficiency as well as an interaction between the two. Both main effects were found to be significant, while the interaction reached marginal significance. The output for this regression model can be found in Tables 4.53 and 4.54 below:
Table 4.53: Output for linear mixed effects regression evaluating L2 proficiency effects for intensity measures of all categories by focus (SV only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-0.34</td>
<td>0.17</td>
<td>32.22</td>
<td>-1.94</td>
<td>0.06</td>
</tr>
<tr>
<td>Focus Narrow</td>
<td>1.003</td>
<td>0.24</td>
<td>362.57</td>
<td>4.23</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Proficiency</td>
<td>0.04</td>
<td>0.02</td>
<td>22.5</td>
<td>2.39</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Focus Narrow : Proficiency</td>
<td>-0.05</td>
<td>0.02</td>
<td>543.69</td>
<td>-1.988</td>
<td>.05</td>
</tr>
</tbody>
</table>

Table 4.54: Variance of random effects for intensity in all categories for L2 speaker group (SV only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.26</td>
<td>.51</td>
</tr>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>.03</td>
<td>.17</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.62</td>
<td>.79</td>
</tr>
</tbody>
</table>

As can be seen in the figure below, it appears that the distinction between the narrow focus and broad focus items is greater for lower proficiency speakers than they are for high proficiency speakers.

Figure 4.14: Difference in intensity values (word 1 - word 2) for L2 speaker group in all categories (collapsed) by focus and proficiency level

While these results could indicate that speakers’ performances are changing over proficiency levels, the fact that this finding is not found in the pitch measures and the fact that the interaction effect reaches only marginal significance rather suggests that speakers performance is fairly similar across proficiency levels.

4.5.5.4 Summary of SV Word Order Results

Results overall indicate that both the L1 and L2 speaker groups show similar patterns. Neither are making distinctions between verb type in intransitive verbs, regardless of whether the subject is definite or indefinite. While there is a difference in the values of Word 1 minus Word 2 (i.e. subject
- verb) between intransitives with a definite subject versus those with an indefinite subject for the L2 speaker group, this is confined to intensity measures only.

Both groups show similar patterns in that they have higher values for SV sentences with narrow focus on the subject as opposed to sentences in broad focus. This suggests that for both groups we see NA shift to the subject when it is focused. There is little if any evidence of NA shift in intransitives for either speaker group, suggesting that L2 learners do not transfer prosodic NA marking of the subject into L2 Spanish.

Significant differences were found between the L1 and L2 speaker group across conditions in SV word order. Specifically, values for the L2 speaker group tend to be lower than the L1 speaker group, which was seen largely for the narrow focus conditions as well as in the results comparing the broad and narrow focus items with each other. There could be several possible explanations for this. Firstly, it could indicate that the L1 speakers as a whole are more consistently shifting NA to the subject to mark focus than the L2 speaker group, which would result in lower values overall for the L1 speaker group versus the L2 speaker group. It is also possible that the L1 speakers are prosodically augmenting the subject more when it is focused by expanding the acoustic values to a larger extent than the L2 speakers. Finally (and maybe somewhat relatedly to this last point), it is possible that the L2 speakers are producing each word with more equal prominence than L1 speakers. This could result in a prosodic structure where the subject of a narrow focused SV sentence is prosodically augmented compared to how it would be realized in a broad focus sentence. However, it is possible that despite this prosodic marking of the subject, the verb is not completely decompressed as it would be in the L2 speakers’ L1 or even compared to the L1 speaker group in Spanish. It may be that, while L2 speakers have few, if any, issues acquiring the phonological prosodic system of L2 Spanish, the acquisition of the phonetic realization lags behind the phonology. This would be an interesting avenue of future research, examining the acquisition trajectory of both the phonology and the phonetics of these constructions.

The lack of findings supporting an effect of proficiency support the claim that L1-English/L2-Spanish speakers have little difficulty acquiring NA placement in L2 Spanish. According to these findings, learners have learned to consistently produced utterance-final nuclear accent in broad focus intransitives. There is no evidence of transfer in intransitives from L1 English. Transfer is evidenced in contexts of narrow focus. Learners may not learn to inhibit transfer in this context, as the L1 speaker group is found to mark focus in these contexts as well.

4.5.6 VS Word Order Results

Nuclear accent placement in VS sentences is not expected to vary as VS word order by itself is enough to convey the meaning that the subject is new or contrastive information. Because of this, no additional prosodic enhancement or NA shift is expected. Instead, we can assume the default utterance-final NA placement throughout these sentences. However, it is still interesting to examine L2 performance in these sentences to better examine whether they are performing similarly to native speakers. The narrow focus and intransitives conditions were once again analyzed separately since
they consisted of a different number of levels. Results are presented in the following sections.

4.5.6.1 Narrow Focus

Measurements of intensity, maximum pitch and mean pitch are illustrated in Figures 4.15, 4.16, 4.17 respectively. As can be seen in the boxplots, the means between sentences with contrastive versus informational focus appear not to differ from each other for both speaker groups. This trend appears across each acoustic measurement. It appears though, at least visually, that the values for the L2 speaker group may be overall higher than those for the L1 speaker group.

The final linear mixed effects regression model for each acoustic measurement consisted of the main effect of speaker group only and both participant and token as a random effects. There was no significant main effect of focus type (contrastive versus informational) and no interaction between focus type and speaker group. The output for the regression model is given in Tables 4.55 and 4.56. The output from the regression model for maximum pitch is provided in Tables 4.57 and 4.58. Finally, the model output for mean pitch is found in Tables 4.59 and 4.60.

Figure 4.15: Normalized mean differences of intensity for VS sentences (Word 1 - Word 2) by focus type and speaker group (Word 1 = V, Word 2 = S; Contrastive = contrastive focus)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-0.58</td>
<td>0.13</td>
<td>31.28</td>
<td>-4.47</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>0.23</td>
<td>0.09</td>
<td>34.17</td>
<td>2.63</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 4.55: Output for linear mixed effects regression for intensity measures of narrow focus (VS only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Intercept)</td>
<td>.02</td>
<td>.14</td>
</tr>
<tr>
<td></td>
<td>(Intercept)</td>
<td>.31</td>
<td>.55</td>
</tr>
<tr>
<td></td>
<td>.57</td>
<td>.75</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.56: Variance of random effects for intensity measures in narrow focus (VS only)
Figure 4.16: Normalized differences of max pitch for VS sentences (word 1 - word 2) by focus type and speaker group (Word 1 = V, Word 2 = S; Contrastive = contrastive focus)

Table 4.57: Output for linear mixed effects regression for max pitch measures of narrow focus (VS only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-0.49</td>
<td>0.13</td>
<td>41.6</td>
<td>-3.91</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>0.41</td>
<td>0.12</td>
<td>32.99</td>
<td>3.42</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 4.58: Variance of random effects for max pitch measures in narrow focus (VS only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>.07</td>
<td>.26</td>
</tr>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.18</td>
<td>.42</td>
</tr>
<tr>
<td>Residual</td>
<td>(Intercept)</td>
<td>.6</td>
<td>.78</td>
</tr>
</tbody>
</table>

Figure 4.17: Normalized differences of mean pitch of VS sentences (word 1 - word 2) by focus type and speaker group (Word 1 = V, Word 2 = S; Contrastive = contrastive focus)
Table 4.59: Output for linear mixed effects regression for mean pitch measures of narrow focus (VS only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-0.52</td>
<td>0.11</td>
<td>38.98</td>
<td>-4.68</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>0.29</td>
<td>0.12</td>
<td>33.01</td>
<td>2.44</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 4.60: Variance of random effects for mean pitch measures in narrow focus (VS only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>.07</td>
<td>.26</td>
</tr>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.1</td>
<td>.32</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.57</td>
<td>.76</td>
</tr>
</tbody>
</table>

As can be seen from the results above, L1 speakers are making no distinction between informational and contrastive focus conditions, as was predicted. The same trend is seen for the L2 speaker group, whose means for the subtracted values between the two conditions do not differ. The learner group consistently produces higher subtracted values across all acoustic measurements compared to the L1 speaker group, which results in significant results between the two speaker groups across all measurements.

4.5.6.2 Intransitives

The regression models for the intransitive stimuli with VS word order evaluated verb type, subject type (i.e. subject definiteness) and speaker group as main effects. Interactions between these fixed effects were also evaluated. Both Participant and Item were included as random effects.

Figure 4.18 below illustrates the means and distribution of the subtracted values for each speaker group by subject definiteness and verb type. Visually, we see that values for sentences with an indefinite subject appear higher than for those with definite subjects across verb types for both speaker groups.
The final model for subtracted intensity values in VS sentences included definiteness and speaker group as main effects. The output for this model is found in Tables 4.61 and 4.62 below. Results confirm that intransitives with an indefinite subject have higher subtracted values compared with those with a definite subject across speaker groups, and the L2 speaker group has overall higher values than the L1 speaker group.

Table 4.61: Output for linear mixed effects regression for intensity measures of intransitives (VS only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-0.3</td>
<td>0.14</td>
<td>66.31</td>
<td>-2.16</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>SubjectType Indefinite</td>
<td>0.37</td>
<td>0.17</td>
<td>47.62</td>
<td>2.14</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>0.24</td>
<td>0.1</td>
<td>32.14</td>
<td>2.37</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 4.62: Variance of random effects for intensity measures in intransitives (VS only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token (Intercept)</td>
<td></td>
<td>.32</td>
<td>.57</td>
</tr>
<tr>
<td>Participant (Intercept)</td>
<td></td>
<td>.06</td>
<td>.24</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.59</td>
<td>.77</td>
</tr>
</tbody>
</table>

Figure 4.19 illustrates the data from the measurements of maximum pitch. Again, at least visually, the subtracted values for the indefinite subject conditions seem to be higher than those with a definite subject. This time it appears there could also be an effect of verb type, as the values for unergatives are higher, especially for the L2 speaker group.
The final model for the dependent variable of maximum pitch in VS sentences included the main effects of subject type, verb type and speaker group. There were no significant interactions. The output for this model is seen in Tables 4.63 and 4.64.

Table 4.63: Output for linear mixed effects regression for max pitch measures of intransitives (VS only)

<table>
<thead>
<tr>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-0.54</td>
<td>0.13</td>
<td>61.5</td>
<td>-4.1</td>
</tr>
<tr>
<td>SubjectType Indefinite</td>
<td>0.46</td>
<td>0.14</td>
<td>48.09</td>
<td>3.32</td>
</tr>
<tr>
<td>VerbType Unergative</td>
<td>0.28</td>
<td>0.14</td>
<td>48.12</td>
<td>2.02</td>
</tr>
<tr>
<td>Speaker Group L2</td>
<td>0.34</td>
<td>0.08</td>
<td>35.64</td>
<td>4.05</td>
</tr>
</tbody>
</table>

Table 4.64: Variance of random effects for max pitch measures in intransitives (VS only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.18</td>
<td>.43</td>
</tr>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>.03</td>
<td>.16</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.69</td>
<td>.83</td>
</tr>
</tbody>
</table>

The subtracted values for mean pitch measurements across speaker group, verb type and subject type are shown in Figure 4.20 below. Visually, it appears that values across all conditions are similar for the L1 speaker group. For the L2 speaker group, on the other hand, the subtracted values for the intransitives with an indefinite subject appear to be higher than those with a definite subject. Within the intransitives with an indefinite subject, sentences with an unergative verb seem to be higher than those with an unaccusative verb.
The final model for the dependent variable of mean pitch included a three way interaction between subject type, verb type and speaker group. This means two-way interactions between all of the variables were also included in the model, as was each factor as a main effect. The three-way interaction was significant, as were both Speaker Group and Subject Type as main effects. The output for this regression model is shown in Tables 4.65 and 4.66 below.

Table 4.65: Output for linear mixed effects regression for mean pitch measures of intransitives (VS only)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>df</th>
<th>t value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-0.42</td>
<td>0.13</td>
<td>99.95</td>
<td>-3.16</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>SubjectType Indefinite</td>
<td>0.39</td>
<td>0.18</td>
<td>95.13</td>
<td>2.21</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>VerbType Unergative</td>
<td>0.07</td>
<td>0.18</td>
<td>93.36</td>
<td>0.33</td>
<td>.74</td>
</tr>
<tr>
<td>SpeakerGroup L2</td>
<td>0.37</td>
<td>0.14</td>
<td>200.61</td>
<td>2.58</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>SubjectType Indefinite: VerbType Unerg</td>
<td>-0.1</td>
<td>0.25</td>
<td>96.94</td>
<td>-0.4</td>
<td>.69</td>
</tr>
<tr>
<td>SubjectType Indefinite: SpeakerGroup L2</td>
<td>-0.19</td>
<td>0.18</td>
<td>671.99</td>
<td>-1.04</td>
<td>.3</td>
</tr>
<tr>
<td>VerbType Unerg: SpkrGrp L2</td>
<td>0.06</td>
<td>0.18</td>
<td>676.25</td>
<td>0.32</td>
<td>.75</td>
</tr>
<tr>
<td>Subj Indef: VerbType Unerg: SpkrGrp L2</td>
<td>0.57</td>
<td>0.26</td>
<td>673.53</td>
<td>2.17</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

Table 4.66: Variance of random effects for mean pitch measures in intransitives (VS only)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name</th>
<th>Variance</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>(Intercept)</td>
<td>.08</td>
<td>.29</td>
</tr>
<tr>
<td>Participant</td>
<td>(Intercept)</td>
<td>.03</td>
<td>.18</td>
</tr>
<tr>
<td>Residual</td>
<td></td>
<td>.78</td>
<td>.88</td>
</tr>
</tbody>
</table>

Subsequent pairwise comparisons indicate that the subtracted values for the L1 speaker group are higher for intransitives with an indefinite subject versus with a definite subject. This trend holds across verb type. Intransitives with an indefinite subject are also higher for the L2 speaker...
group, however, the values for unergative verbs for the L2 speakers are significantly higher than they are for unaccusative verbs. This is illustrated in Figure 4.21 below:

Figure 4.21: Interaction plot for estimated marginal means for mean pitch by subject type and verb type (L1 versus L2)

Output from the pairwise comparisons is shown in Table 4.67 below:
Table 4.67: Output for pairwise comparisons for mean pitch measures in VS intransitives (significant results denoted with a *)

<table>
<thead>
<tr>
<th>Contrast</th>
<th>Estimate</th>
<th>SE</th>
<th>df</th>
<th>t ratio</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject Type = Definite</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1 - L2</td>
<td>-0.4</td>
<td>0.11</td>
<td>77.19</td>
<td>-3.53</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Subject Type = Indefinite</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1 - L2</td>
<td>-0.49</td>
<td>0.11</td>
<td>82.86</td>
<td>-4.28</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group = L1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definite - Indefinite</td>
<td>-0.34</td>
<td>0.13</td>
<td>105.64</td>
<td>-2.62</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group = L2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definite - Indefinite</td>
<td>-0.44</td>
<td>0.13</td>
<td>89.95</td>
<td>-3.47</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Verb Type = Unaccusative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1 - L2</td>
<td>-0.27</td>
<td>0.11</td>
<td>77.16</td>
<td>-2.43</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Verb Type = Unergative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1 - L2</td>
<td>-0.62</td>
<td>0.12</td>
<td>82.55</td>
<td>-5.34</td>
<td>&lt; .05*</td>
</tr>
<tr>
<td>Speaker Group = L1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unaccusative - Unergative</td>
<td>-0.01</td>
<td>0.13</td>
<td>105.6</td>
<td>-0.05</td>
<td>.96</td>
</tr>
<tr>
<td>Speaker Group = L2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unaccusative - Unergative</td>
<td>-0.35</td>
<td>0.13</td>
<td>90.28</td>
<td>-2.79</td>
<td>&lt; .05*</td>
</tr>
</tbody>
</table>

4.5.6.3 Summary of VS Word Order Results

Findings from the VS word order stimuli indicate that L2 learners have consistently higher subtracted values than do L1 speakers. This is seen in both narrow focus stimuli and broad focus intransitives, and is seen across acoustic measurements.

There is no difference across the two narrow focus categories for either L1 or L2 speaker group, which is to be expected. However, the intransitive conditions were found to deviate from predictions. There is an effect of subject type across speaker groups in that intransitives with an indefinite subject have higher subtracted values than those with a definite subject. This implies that either the utterance-initial verb, when followed by an indefinite subject, is acoustically augmented when followed by a definite subject; or it implies that definite subjects are acoustically weaker when utterance final than indefinite subjects. This latter hypothesis may be more likely and this could potentially be an effect of the differing syllable structures of the two phrase types. Because the indefinite subject NP consisted of an indefinite article (which itself is 1-2 syllables long) which preceded a two to five syllable-long noun, these sentences tended to have more syllables between the predicted prenuclear accent on the verb and second nuclear accent on the subject than sentences
with a definite NP. The definite NP was a name, which consisted of anywhere between 1-4 syllables (but was probably on average only 1-2 syllables long). It could be that the difference in subtracted values in the indefinite subject conditions reflects the fact that there was more time for downstepping in utterances with more syllables, resulting in naturally lower acoustic measures than is seen in the definite subject conditions. Syllable length may be difficult to control for when comparing definite versus indefinite NPs, but it may be necessary for any future studies examining a similar phenomenon.

What is less explicable through the natural and common process of downstepping is the effect of verb type, especially for the L2 speaker group. Unergative verbs, especially those with indefinite subjects, tended to have higher subtracted values than unaccusative verb. What is interesting is that this is seen only in the pitch measurements, and is not reflected in intensity measures. It is possible (and in fact could likely be expected), that in this case, the subtracted values in pitch measurements are reflecting more prosodic phenomena than just NA placement. Since VS sentences are new to L2 learners, it is reasonable to assume such sentences could be difficult to produce. It is possible that the L2 speakers are inserting a prosodic boundary between the verb and the following subject, reading the sentence on a word-by-word basis as opposed to a singular phrase, as was likely the case for the SV sentences. The presence of a phrase boundary could be captured by pitch measures, which would explain why we do not see the same patterns for the intensity measures. Additionally, this could potentially explain why the subtracted values for the L2 speakers are significantly higher across the board than they are for the L1 speaker group. For the intransitives specifically, it is possible that many of the unergative verbs chosen for this study were less frequent than the unaccusative verbs. Learners could be more likely to struggle to produce VS sentences if both the verb and the syntax are unfamiliar to them. If it is the case that the pitch measures reflect prosodic boundaries as opposed to nuclear accent, these findings have no bearing on the question to NA placement, but rather evidence a different prosodic organization of the phrase compared to the L1 speaker group. Because this was not the design on the original research project, this is a question that could be answered in a future study, and we can only make observations based on the data that could be make for an interesting study to be conducted at a later date.

4.6 Summary of Spanish Experiment

Given the findings in the preceding sections, the research questions laid out at the beginning of this chapter can now be addressed. With regards to the use word order inversions for L1 speakers of Spanish the following questions can be addressed:

RQ3 To what extent do L1 speakers of Spanish use subject inversion in intransitives?

RQ4 To what extent do L1 speakers of Spanish use subject inversion to mark focus, both contrastive and informational?
The word order task demonstrated that native speakers utilized word order inversions in both broad focus intransitives and narrow focus constructions. Findings indicated that speakers preferred VS to SV word order in broad focus intransitives when the verb was unaccusative, especially when the unaccusative verb occurred with an indefinite subject. When an unaccusative verb occurred with a definite subject, L1 speakers showed an equal preference for SV and VS word orders. Inverted VS word order was preferred across both subject types for sentences with unaccusative verbs at higher rates than for sentences with unergative verbs.

L1 speakers also preferred VS word order when the subject had narrow focus. Inverted VS word order was preferred to SV word order when the subject had either informational and contrastive focus, though there was a slightly higher preference rate of VS for contrastively focused subjects than for informationally focused subjects.

Regarding the prosodic realization of focus, the results from the oral production task of this study can bear on the following research question:

**RQ5** To what extent do L1 speakers of Spanish use prosody to mark focus? Are prosodic means more likely to be used to mark contrastive focus as compared to informational focus?

While in written form, L1 speakers of Spanish demonstrated a preference for marking a subject as focused through inverted word order, findings also indicated that, prosodic means can also be used as a focus marker when given SV word order. There is evidence that L1 speakers prosodically augment a subject when it is focused, regardless of whether the focus is contrastive or informational.

Finally the research questions regarding L2 acquisition of both word order and prosody can be addressed.

Firstly, this study examined L2 speakers’ acquisition of word order in both intransitive and narrow focus constructions in order to address the following research question:

**RQ10** a. Do L1 English speakers use subject-verb inversion in broad focus intransitive clauses in L2 Spanish?

b. Do L1 English speakers move the subject to the end of the sentence in L2 Spanish to express narrow focus?

Results indicated that L2 learners were far less likely to employ word order inversion in both narrow focus and intransitive constructions compared to L1 speakers. Instead, they showed a strong preference for SV word order as was predicted. However, there was evidence of learning as well. When the L2 speaker group exhibited a preference for inverted word order, they did so following the same pattern that was seen as for the L1 speaker group, just to a lesser extent. For broad focus intransitives, this meant that L2 speakers preferred VS word order in intransitive sentences with unaccusative verbs compared to those with unergative verbs. Learners even showed slightly higher preference rates in sentences with an unaccusative verb and an indefinite subject (versus a definite subject), similar to the results for the L1 speaker group. Preference for VS word order in these contexts increased as proficiency increased. For the conditions with narrow focus, the L2 speakers
were slightly more likely to select VS for a sentence with a contrastively focused subject compared to when the subject had informational focus, as was also seen with the L1 speaker group.

With regards to prosody in L2 Spanish the following research question can be addressed:

**RQ8**

a. Do L1 English speakers mark intransitives prosodically by shifting NA to the subject of intransitive verbs in L2 Spanish?

b. Do L1 English speakers mark narrow focus constructions (both informational and contrastive) prosodically in L2 Spanish?

Prosodically, L2 speakers performed very similarly to L1 speakers of Spanish. Given a focused subject and SV word order, L2 speakers were likely to mark the subject prosodically. Given SV word order in broad focus intransitives, on the other hand, L2 learners demonstrated no tendencies to transfer NA shift in contexts where it would occur in their L1, namely in sentences with unaccusative verbs. Instead, there was evidence that the nuclear accent was utterance-final in all broad focus intransitives, regardless of verb type. The prosodic patterns of the L2 speaker group held across proficiency levels, indicating that speakers of varying proficiencies produced similar prosodic patterns.

It would be interesting to further investigate both L1 and L2 speakers’ use of prosodic versus syntactic means of marking prosody. Because the production task in this experiment consisted of contextualized sentences that were read aloud, the findings evidence the existence of the prosodic marking of focus as a grammatical tool available to and utilized by both speaker groups. However, these findings have no bearing on the question as to which method to mark focus (either syntactic or prosodic) would be preferred, and whether this would vary between the two speaker groups. One could predict that it would. Since the L1 speaker group showed a much higher preference for VS word order than the L2 speaker group, we could expect to see higher rates of VS sentences in both broad focus intransitives and sentences with a narrow focused subject for L1 speakers of Spanish in comparison to L1-English/L2-Spanish learners. Because acquiring VS word order is difficult for L2 speakers, and because the L2 speakers would be able to draw upon a prosodic focus-marking strategy from their L1, we could predict that the L2 speakers would show an overwhelming preference for SV word order with focus marked prosodically in-situ. Because both syntactic and prosodic strategies of focus marking are available to L1 speakers of Spanish, we might expect to see utilization of both strategies. This could be potentially something that is speaker-specific, task-specific, or something that varies dialectically. Factors that promote the use of syntactic means of prominence marking over prosodic means (or vice versa) can still be explored in L1 Spanish.

Lastly, these findings can bear on the final research question regarding the relationship between L2 acquisition of prosody and word order:

**RQ11** What is the relationship between the L2 acquisition of word order and prosody in expressing focus and intransitives? Is there evidence that the acquisition of one precedes the other?

When examining the results of the SV sentences from the production task to the results of the word order task, it is apparent that L2 speakers are able to learn the prosodic patterns before they
acquire word order inversions. This is evidenced by the results that there was a difference between
speaker groups in the word order task. That is, L1 speakers showed a much stronger preference for
VS word order in the predicted conditions than did the L2 speakers. In comparison, although there
were significant differences between the L1 and L2 speaker groups in the production task, there were
no significant interactions between categories and speaker group, indicating that the L2 speakers
are patterning similarly to the L1 speakers. NA is likely shifting to the subject when in narrow
focus, but likely utterance-final in broad focus intransitives. This patterning provides evidence
that L1 speakers of English are transferring their default SV word order into L2 Spanish, but learn
relatively quickly not to transfer NA shift in broad focus intransitives with an unaccusative verb.

L1 speakers of English perform similarly to L1 speakers of Spanish due to the fact that they can
use a strategy similar to what is found in their L1 to mark focus (i.e. shifting NA to the subject).
This is one reason it would be interesting to examine marking of focus in a more spontaneous
speaking task in order to better understand their preferred focus marking strategy and to better
understand the relationship between the acquisition of the two.

The largest prosodic differences between the L1 and L2 speakers of Spanish were found in the
VS utterances instead of the SV utterances. L2 speakers differed quite drastically from the L1
speakers of Spanish in both maximum pitch and mean pitch measures. However, this is likely not
due to nuclear accent misplacement, but rather due to difficulty with the prosodic organization of an
unfamiliar structure (unfamiliar as evidenced through the word order task). It is thought that the
pitch values in the VS sentences could be capturing the insertion of a boundary tone as speakers
read aloud sentences in a syntactic form they are unaccustomed to producing. If spontaneous
productions from learners were collected, it would be interesting to look at the VS productions
from such as data set, as they would be produced only by speakers who have acquired word order
inversions. In this case, it could be predicted that these differences would disappear.
5 Conclusion

5.1 Summary of Findings

This study examined the L2 acquisition of nuclear accent across different categories in the hopes of contributing to our understanding of how L2 speakers acquire various prosodic constructions. One of the major research questions addressed in this study was the difficulty level of the acquisition of a prosodically plastic language versus the acquisition of a prosodically non-plastic language. To better examine this question, data from two different speaker groups were collected. Firstly, L1 speakers of Spanish who were learning L2 English were collected in the English Experiment in Chapter 3. This experiment was designed to offer more insight into how speakers of a non-plastic L1 acquire a plastic L2. Secondly, data were also collected from L1 speakers of English who were learning Spanish as an L2 in the Spanish Experiment in Chapter 4, which provided insight into L2 acquisition of a non-plastic language by speakers with a plastic L1. Comparing the findings from both the English Experiment and the Spanish Experiment provides more information about the L2 acquisition of plastic versus non-plastic language respectively, allowing us to compare across the two types and investigate whether one is more difficult.

Since a number of studies have already examined L2 acquisition of plastic versus non-plastic languages (e.g. Rasier & Hiligsmann, 2009; van Maastricht et al., 2016) this study expanded on previous research by including more categories in which NA retraction (or word order inversions) is predicted. The English Experiment examined NA placement and shift across different five categories: in contrastive focus constructions, in utterances ending in indefinite pronouns, in two types of compounds and in intransitives. The goal of including an assortment of categories was to better understand whether NA shift was acquired in certain categories before others, as L2 acquisition of a more flexible NA placement algorithm is still poorly understood. The addition of the intransitive stimuli in the English Experiment allowed for better investigation of the factors that influence L1 NA placement and shift in simple intransitive sentences. This experiment looked at factors of both verb type and expectedness to see whether they influenced NA placement. In addition to this, it examined how L2 speakers acquire this complex system.

The Spanish Experiment examined NA placement in L2 Spanish across different categories, including in narrow focus contexts and in broad focus intransitives. NA placement in both these contexts by L1-English/L2-Spanish speakers has only been investigated to a limited extent (Zubizarreta & Nava, 2011). This experiment also included a Word Order Task which examined the
relationship between L2 acquisition of subject inversion and NA placement, two prominence-lending strategies that are closely linked to one another and that have as of yet been fully investigated as most studies usually examined only one or the other.

This chapter will outline the findings from both experiments described above and will discuss how the findings bear on the research questions this study was addressing.

5.1.1 Summary of Findings for English Experiment

The English Experiment consisted of two sub-experiments, the Accent Shift experiment, which included the following categories:

1. Contrastive Focus
2. Utterance-final indefinite pronouns versus utterance-final NPs
3. Phrase versus compounds
4. Left- versus right-stressed compounds

Each of these categories contained tokens that contrasted in predicted NA placement, with half of the tokens predicted to have final, rightmost NA placement and the other half predicted to have leftwards retracted NA placement. The purpose of this design was to compare the two NA placement contrasts to see if speakers were differentiating between the two across categories.

The English Experiment also consisted of an Intransitives sub-experiment designed to test the effect of verb type and expectedness on NA placement and shift. A group of L1 speakers and a group of L2 speakers both completed these experiments.

5.1.1.1 L1 Speakers

Overall, the L1 speakers performed as expected across the categories in the Accent Shift experiment. This was evidenced through acoustic measurements and through the perceptual annotation results. Results deviated most from predictions in the perceptual annotation results for the two compound categories. There was a high percentage rate of identified leftwards retracted accent across these two categories when the NA was predicted to fall on the rightmost element. However, due to the fact this finding is not supported by the acoustic measurements and the fact that the raters had especially high disagreement rates for these categories, it is thought that these unpredicted findings could be more reflective of the perception process (which could be driven by other factors, such as structural factors) and less reflective of how speakers produced these sentences and which word was accented, especially for the right- versus left-stressed compounds category. The phrase versus compounds category was also likely affected by a more variable focus structure than was intended, which could have resulted in more variability in both perception and production.

The Intransitives sub-experiment was designed to address with following research questions:
RQ1 What effect does verb type have on NA placement in English intransitive clauses?

RQ2 What effect does the pragmatic factor of expectedness have on NA placement in English intransitives?

There was evidence that both verb type and expectedness had an effect on NA placement and shift in L1 English. Unaccusative verbs were more likely to trigger NA retraction to the subject, especially in the expected conditions. There was a large distinction within the unaccusative verbs between the expected and unexpected tokens. This distinction was seen less clearly for the unergative verbs, which by and large were produced with utterance-final NA. These findings were evidenced by both the perceptual annotation results as well as by acoustic measurements.

5.1.1.2 L2 Speakers

The L2 speakers showed a greater level of indeterminacy and variability than the L1 speakers in that there was less of a distinction between the two NA placement distinctions across categories. This was evidenced by the fact that the distance between the means for the two NA placement types was less clear than it was for the L1 speaker group. One research question that can now be addressed concerned transfer and whether L1 speakers of Spanish would transfer elements from their L1 into their L2 of English:

RQ7 Do L1 Spanish speakers transfer strategies of NA placement in intransitives, contrastive focus constructions, compounds and indefinite pronouns in L2 English?

Transfer was defined through evidence of producing L1-like prosodic structures in the L2 (i.e. in this case, showing a preference for utterance-final NA placement regardless of context). The results from this experiment indicate that there may be transfer, as there tends to be an overall preference for rightmost NA placement across all categories, as indicated by the perceptual annotation results. However, the results cannot be explained by transfer alone, as there was evidence of learning as there was both acoustic and perceptual evidence of NA retraction across categories.

Secondly, this study examined the effects of category and whether NA retraction in certain categories were easier to acquire than in others, which is shown in RQ9 below:

RQ9 Which categories of NA placement are easier to acquire for L2 learners?

Overall, results indicate that L2 speakers acquire NA retraction in compounds before they acquire NA retraction in any of the other categories. This was evidenced in the perceptual annotation results where these two categories had the highest identified percentage of retracted NA when predicted. It was also evidenced through the acoustic measures. NA retraction in the Focus category seemed to follow, as indicated by the perceptual annotation results. NA retraction in sentences with utterance-final indefinite pronouns were shown to be more reliably produced only by higher proficiency speakers. This was seen both acoustic measures and in the perceptual annotation results. NA shift in simple intransitives were also evidenced to be acquired later and only by higher
proficiency speakers. Perceptual annotation results indicated a strong preference for rightmost NA placement across conditions in the intransitives, though the condition with the highest identified NA placement on the subject was in intransitives with an unaccusative, expected verb. There was an effect of proficiency in that the higher a participant’s proficiency score, the more likely they were to implement identifiable NA retraction to the subject. These trends were supported by the acoustic measurements. The results, taken together, would suggest that learners are learning. However, based on the finding that NA retraction in some constructions appears only in speakers of high proficiency levels, it seems that learners may acquire NA retraction at the level of the word (i.e. in compounds) before they are acquiring it at a phrasal level.

5.1.2 Summary of Findings for Spanish Experiment

The Spanish Experiment tested the use of both word order and prosody in marking the subject of a sentence with narrow focus and in broad focus intransitives in both L1 and L2 speakers.

5.1.2.1 L1 Speakers

The following research questions were asked for the L1 speaker group:

**RQ3** To what extent do L1 speakers of Spanish use subject inversion in intransitives?

**RQ4** To what extent do L1 speakers of Spanish use subject inversion to mark focus, both contrastive and informational?

**RQ5** To what extent do L1 speakers of Spanish use prosody to mark focus? Are prosodic means more likely to be used to mark contrastive focus as compared to informational focus?

The Word Order Task demonstrated that L1 speakers of Spanish can use subject inversion to mark both narrow and contrastive focus on the subject. Subject inversion was also found in broad focus intransitives with speakers more likely to prefer VS word order with unaccusative verbs versus with unergative verbs. VS word order was also preferred with an indefinite subject compared to with a definite one.

The Oral Production Task indicated that L1 speakers have the additional option to prosodically augment the subject of a sentence with SV word order when that subject had narrow focus. Findings indicate that both informational and contrastively focused subjects were accented by speakers. While such findings deviate from traditional theoretical accounts (e.g. Zubizarreta, 1998) which propose that only contrastive focus can be marked in-situ, they support the trends of more recent theoretical findings that informational focus can also be prosodically marked in-situ. Findings from the Oral Production Task also indicate a lack NA shift in broad focus intransitives, even for those with SV word order. While such findings correspond to much of the previous literature (e.g. Zubizarreta & Nava, 2011), they differ from Calhoun et al.’s (2018) findings of NA shift in simple intransitives when the verb is unaccusative. This area could potentially benefit from more extensive research, including the effect of dialect on the prosody of intransitives.
5.1.2.2 L2 Speakers

The Spanish Experiment was designed to address the following research questions regarding L2 acquisition of both word order inversion and prosody:

RQ8  
   a. Do L1 English speakers mark intransitives prosodically by shifting NA to the subject of intransitive verbs in L2 Spanish?  
   b. Do L1 English speakers mark narrow focus constructions (both informational and contrastive) prosodically in L2 Spanish?

RQ10  
   a. Do L1 English speakers use subject-verb inversion in broad focus intransitive clauses in L2 Spanish?  
   b. Do L1 English speakers move the subject to the end of the sentence in L2 Spanish to express narrow focus?

RQ11 What is the relationship between the L2 acquisition of word order and prosody in expressing focus and intransitives? Is there evidence that the acquisition of one precedes the other?

The Word Order Task indicated that, as predicted, L1 speakers of English showed an overwhelming preference for SV word order. There is some evidence of learning in that higher rates of VS preference are shown for broad focus intransitives when the verb is unaccusative, and even more so when the subject is indefinite, similar to the findings for the L1 speakers (albeit to a significantly lesser degree), and higher rates of VS when the subject has narrow focus, especially for contrastively focused subjects.

The Oral Production Task suggested that L1-English/L2-Spanish speakers can employ NA shift in marking the subject of an SV clause with narrow focus, both contrastive and informational. This may be relatively easy for them as it is similar to the strategy they would use in their L1. The findings from the production task also suggested that L1 speakers of English tend to produce utterance-final NA across broad focus SV intransitives in L2 Spanish, even with unaccusative verbs, even though in their L1, speakers would be employing NA shift. The production results for the L2 speaker group mirrors that of the L1 speaker group. Furthermore, no proficiency effects in NA placement are found. Both these findings suggest learners have little difficulty in acquiring prosodic patterns of L2 Spanish and in learning when to produce utterance-final NA, even when ungrammatical in the L1, and when NA retraction is allowed. These findings suggest that acquiring this non-plastic prosodic system is easier for L2 learners than acquiring subject inversion.

5.2 Acquisition of a prosodically plastic language versus a non-plastic language

A subset of the results from the English Experiment can be compared to results from the Spanish Experiment to reflect on the differences between the L2 acquisition of prosodically plastic language
versus acquisition of a prosodically non-plastic language. In particular, we can examine speakers’ performances in the broad focus intransitives (specifically only the expected broad focus intransitives from the English Experiment) and the narrow focus items from both experiments.

What is interesting is that, even though there is evidence that L1 speakers of Spanish can mark narrow focus items prosodically, that there is little evidence that this is easily transferred into English. There is evidence that speakers do acquire this construction earlier than others (such as NA retraction in intransitives), however, it is still acquired after NA shift in compounds, despite the fact that the stress patterns differ from speakers’ L1. The perceptual annotation results suggest that the focus category has the third lowest rate of identified NA retraction in sentences where NA retraction is predicted. In contrast to these findings, L1 speakers of English seem to have no difficulties prosodically augmenting the subject of an SV clause in L2 Spanish when it has narrow focus.

L1 speakers of Spanish showed a preference for utterance final NA in intransitives in L2 English. This was seen for both unaccusative and unergative verbs, though there is some evidence (both acoustic and perceptual) that NA is retracted to the subject in unaccusatives (specifically the subset of expected unaccusatives) by L2 speakers at high levels of proficiency. In contrast, L1 speakers of English are evidenced to have an easier task in learning a more invariable NA placement in intransitives in L2 Spanish. Their performance in the Word Order Task, on the other hand, indicates a similar trajectory to that of L1 Spanish speakers’ prosody in intransitives. In both these cases there is evidence of transfer from the L1. L1 English speakers show a preference for SV word order in broad focus intransitives, but when they do learn, they did show an understanding that unaccusative verbs trigger subject inversion more so than unergative verbs. A similar trend is seen in the L1-Spanish/L2-English speaker group. While overall, a preference for utterance-final NA placement is evidenced, when speakers do start acquiring NA-retraction in these contexts, NA-retraction is implemented it when the verb is unaccusative, similar to what is seen in the L1 speaker group.

Verb type is not the only driving factor in NA placement in English intransitives or in word order in Spanish. It may be that the evidence here shows that learners are acquiring NA shift or subject inversion based on verb type, but may still have to acquire prominence patterns based on other pragmatic phenomena, such as expectedness. Such factors were not yet tested in the Spanish Experiment, but could be considered for future research. Additionally, because L1 speakers of English had only minimal evidence of an effect of expectedness on unergatives, it is difficult to know whether the L2 speakers have acquired NA shift based on such pragmatic factors. This is also something that could be further investigated in future research studies.

### 5.3 Theoretical Implications

Results from these two studies have implications for the theory behind L2 acquisition of prosody at the phrase level since they speak to the role of both transfer and universals in the L2 acquisition
of prosody. Transfer was assumed to be evidenced by L1-like behavior in the L2, which has often been the definition utilized in many of the previous studies on L2 acquisition of prosody (e.g. Albin, 2015; Rasier & Hiligsmann, 2009; Zubizarreta & Nava, 2011). There was evidence of transfer in both L2 speaker groups. For the L1-Spanish/L2-English speakers, we see evidence of an overall preference for rightmost NA placement, similar to the prosodic patterns of their L1. This was perhaps most notable for broad-focus intransitives and utterances with a final indefinite pronoun, though all categories showed more variability in NA placement than was seen for the native speaker group. For the L1-English/L2-Spanish speakers, we see a preference for SV word order regardless of the focus type and verb type in the case of broad-focus intransitives. There is also evidence of positive transfer in marking narrow focus subjects prosodically in SV sentences in L2 Spanish.

However, the findings that L1 speakers of English seem to have relatively little difficulty acquiring utterance-final NA placement in broad focus intransitives in L2 Spanish, raise questions about this method of defining transfer. As was discussed in Chapter 2 (Section 2.3.2) Grosser (1993) argues against transfer and rather supports the claim that L2 prosodic acquisition is driven by the influence of universal trajectories. In this approach, learners follow four principles of NA placement. At the beginning, learners are prone to accenting every word, or every other word. Once they start restricting the use of accents, they are prone to accenting only the final word. Learners will only start retracting the nuclear accent leftwards, even overgeneralizing this pattern, only once they have traversed through the other principles. This raises questions about whether rightmost accentual placement in L2 speech is truly reflective of transfer (or of learning in the case of L2 Spanish), or whether it reflects universal principles of L2 acquisition of prosody. In order to overcome this issue, studies on different L1-L2 pairings should be conducted. L1 speakers of Dutch or German learning a non-plastic L2, such as Spanish or Italian could be included for a more comprehensive picture of how L1 speakers of a prosodically plastic language acquire a non-plastic L2. Additionally, it may be interesting to include more longitudinal studies in which accentuation patterns from low levels of proficiency onwards are included to see if there is retraction at any stage (as would be predicted by Grosser).

Such an account of a universal trajectory of the L2 acquisition of NA placement, at least in the form as described above, also does not account for differences in performance of the various constructions in L2 English. A more comprehensive framework is needed in order to make predictions about the levels of difficulty of various constructions in any given L2. It was discussed in the Literature Review in Chapter 2 that there is yet a comprehensive framework that will predict which constructions will pose learners more difficulties, and which will be easier. However, there are some frameworks that could be extended in order to account for these findings.

The Interface Hypothesis has been proposed to explain why certain aspects of an L2 are easier for learners than others. Although the majority of studies in this framework have focused on the acquisition of syntax, it should be able to extend to the acquisition of phonology and prosody as well. If the Interface Hypothesis were to be used to make predictions, we would predict that overall, NA placement in Spanish would be easier to acquire than NA placement in English. In Spanish,
NA placement is calculated purely through phonological rules, and does not require reference to other domains, therefore does not involve other interfaces. The only exception to this is in contexts of contrastive focus. NA placement in English, on the other hand, involves multiple interfaces. NA retraction in the case of utterance-final indefinite pronouns arguably involves an interface between phonology and the lexicon. NA retraction in broad focus intransitives and in contexts of contrastive focus involve interfacing with discourse factors, an external interface. While we do find that Spanish prosody seems to be easier to acquire than English prosody, the findings in L2 English are somewhat surprising. If predictions about the L2 acquisition of English prosody were made based on the Interface Hypothesis, one would expect that both narrow focus and intransitive items would pose the most difficulty for L1 speakers of Spanish. The acquisition of NA retraction in utterances with final indefinite pronouns would not be predicted to exhibit as much difficulty as they did according to the findings of this study as NA retraction in indefinite pronouns involves internal, purely grammatical, interfaces.

The finding that L1 speakers of Spanish reliably place nuclear accent on an utterance-final indefinite pronoun can also be considered in relation to Markedness Differential Hypothesis (Eckman, 1977). While Rasier and Hiligsmann (2009) found support for this approach, the present study offers somewhat contradicting evidence. Rasier and Hiligsmann argued that structural accentuation rules should be easier for learners to acquire than accentuation rules governed by pragmatic principles. While this approach can predict the findings that L2 Spanish prosody is easier to acquire than L2 English prosody (especially concerning focus and intransitive constructions which are driven by pragmatic or discourse principles), it fails to account for the difficulty of acquiring NA retraction in the case of utterance-final indefinite pronouns for L1-Spanish/L2-English speakers.

Based on the findings of the study, it seems that transfer may play an important role in L1-Spanish/L2-English speakers’ productions of NA placement. L2 speakers were shown to transfer patterns of utterance-final NA placement both in the case of intransitives and indefinite pronouns. NA placement in contexts of contrastive focus may be more target-like as speakers have experience with this in their L1. Additionally, compounds may be the most target-like as it simply requires the acquisition of a new word stress pattern as there is nothing in Spanish that conflicts with primary stress on the leftmost constituent in compounds.

Viewed this way, this approach is perhaps most similar to Zubizarreta and Nava’s (2011) competing algorithms approach. Acquiring both NA shift to mark narrow focus and a new word stress pattern involve acquiring new algorithms. While these may not exist in Spanish, they are not incompatible (i.e. there are no rules in direct opposition of these two). Zubizarreta and Nava make the claim that NA shift in English broad-focus intransitives is incompatible with NA placement in Spanish. NA retraction in utterances with final indefinite pronouns could be seen as incompatible too. Spanish grammar explicitly specifies that utterance-final indefinite pronouns are accented, while English grammar specifies the opposite. Such oppositional rules could be considered incompatible. Though incompatibility could still be better defined, it could universally predict which constructions in an L2 are more difficult for speakers of a given L1 to acquire, and are therefore

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more subject to transfer and less likely to be acquired until later stages of proficiency. In order to better test the competing algorithms hypothesis and in order to better define the concept of incompatibility, more rigorous testing of differing L1-L2 pairings must be included. For example, it would be interesting to test L2 acquisition of English prosody by L1 speakers of Chinese, Thai or other tonal languages. For these languages, the presence of nuclear accent is debatable and it likely does not play the same role it does in either English or Spanish. If this is the case, no constructions would be considered incompatible with certain NA placement rules, as we see for the English-Spanish pairing. Despite this, we may still predict more difficulties with some constructions compared with others. In this case, we may see that accent-less utterance-final indefinite pronouns are indeed easier to acquire, as was predicted for the L1 Spanish speakers. It could be further predicted that NA retraction rules that involve pragmatic or discourse factors, such as focus or intransitives, would be difficult for speakers to acquire if such a construction is lacking in their L1.

5.4 Limitations of the Present Study and Future Directions

There are still many questions that can be asked about the L2 acquisition of NA shift, L2 acquisition of word order, and the relation between the two. For English, the factor of expectedness on NA placements in intransitives could be more rigorously tested through a different experimental design in which the focus structure is held more constant. This would perhaps allow a clearer picture of the effect of expectedness on NA placement and shift in intransitives as well as L2 speakers’ acquisition of NA shift based on both verb type and expectedness.

Testing NA placement and shift through a read-a-loud task can be helpful since the context is well controlled, but it also presents shortcomings as it removes the target sentences from the intricate communicative context in which they would usually occur. It is difficult to know if speakers, especially the L2 speakers, were paying attention to the contextual question, or whether they understood or interpreted it the way that was intended, as this could have an effect on the production results. Results from a more communicative, spontaneous speaking task would nicely complement the findings from this study.

Finding a way to better test speakers’ underlying knowledge of NA placement would also be beneficial, especially for understanding L2 speakers’ knowledge of this construction, as any evidence based on production may be obscured by performance issues or by failure to have acquired the phonetics behind implementing NA and NA shift. This could be done through a perception experiment or a task designed to test their intuition. This could also be done by including a better method of testing L2 speakers’ phonetic acquisition of any given structure. If we understand how they realize the prosody of a construction, in the case that they are implementing NA shift, then we can better find evidence of it if we know where to look. This would also provide interesting information about the relationship between the acquisition of the phonology and phonetics of the prosody of a second language.

For both L1 and L2 Spanish, it would be interesting to test speakers’ preferences between
using subject inversion versus NA shift both to mark narrow focus on the subject and in broad focus intransitives. This would likely be done through a more spontaneous speaking task, in which participants are not merely reading words on screen. This would provide us with a better idea as to which method L1 speakers of Spanish prefer and would allow us to better investigate whether L1 speakers of English naturally produce VS utterances, and if so, at what level of proficiency this may occur in L2 Spanish. It would be interesting to examine if this was related to proficiency level, age of acquisition, or amount of immersive exposure, etc.

The measurements used to evidence nuclear accent placement could also be more rigorously controlled in future studies. In the English Experiment, utterance length for the categories with contrastive focus and with utterance-final indefinite pronouns were largely controlled. The two compound categories, however, were not. This was done largely to help create a meaningful context for each test item and also aid in eliciting the correct interpretation, especially for the phrase versus compound category. However, the fact that utterance length was not controlled could have had an effect on the measurements, since direct F0 and intensity measurements were being compared across sentences of unequal length. As discussed in Pierrehumbert (1979), the slope of F0 declination can be affected by utterance length, which could obscure the meaning of the measurements. This was also a question for the stimuli in the Spanish Experiment. Sentences with an intransitive verb and an indefinite subjects tended to be longer, making it more difficult to compare across utterances.

Finally, it would also be interesting to more closely examine the trajectory of prosodic learning in Spanish, or the prosodic learning of a non-plastic language by L1 speakers of a plastic language in general. The results of the Spanish Experiment bring up an interesting question. Speakers do not show evidence of transfer in broad focus intransitives, though they do in narrow focus constructions. Is there a period of transfer in intransitives? Do speakers of a plastic language transfer NA shift into focus constructions from early on? Or is this something that emerges only as proficiency increases? It might be interesting to compare the acquisition of a plastic L2 by speakers of a plastic L1 (e.g. L1 speakers of English learning German or Dutch) to see if in this case they learn to transfer NA shift in intransitives, or whether non-transfer of this prosodic structure could be a universal trajectory as opposed to learning a language-specific property.
References


Appendix A: English Experiment Stimuli

Vocabulary Test

List 1

The following questions are designed to test your knowledge of some vocabulary words. You will be given a term in English and be asked to select the most appropriate Spanish translation to that term. You will be given a total of three choices. You will be told whether your answers are correct or incorrect.

1 Please indicate your participant number:

2 To squawk
   - graznar\(^1\)
   - chirriar
   - rugir

3 To bellow
   - bramar
   - bromear
   - romper

4 To trek
   - dar una caminata
   - viajar
   - escalar

5 To tiptoe
   - ir de puntillas
   - saltar
   - pisar muy fuerte

6 To somersault
   - dar un salto mortal
   - trepar

\(^1\)Participants were given three choices. After completing one page, they were presented with the correct translation. Choices were randomized during the actual task. The correct translation is bolded and presented as the first option in this appendix section for efficiency’s sake.
7 To sleepwalk
   – ser sonámbulo
   – dormirse
   – acostarse

8 To perish
   – perecer
   – admirar
   – perder

9 To tremble
   – temblar
   – retroceder
   – estremecerse

10 To limp
   – cojear
   – caerse
   – brincar

11 To prosper
   – prosperar
   – ganar
   – perecer

12 To wither
   – marchitatar
   – susurrar
   – retroceder

13 To roar
   – rugir
   – chirriar
   – reír
13 To bolt
   – **echar a correr**
   – llegar
   – golpear

14 To belch
   – **eructar**
   – gritar
   – estornudar

15 To drool
   – **babear**
   – soltar
   – dejar

16 To flee
   – **huir**
   – saltar
   – volver

17 To splash
   – **salpicar**
   – dar un salto mortal
   – ahorrar

18 To growl
   – **gruñir**
   – aullar
   – gemir

19 To chirp
   – **piar**
   – eructar
   – gritar

20 To burp
- eructar
- babear
- quemar

21 A robin
- un tipo de pájaro
  - un tipo de pez
  - un tipo de perro

22 The darkroom
- el cuarto oscuro
  - la cocina
  - la sala de clase

23 The blacktop
- el asfalto
  - el parque
  - la azotea

24 The roundtable
- la mesa redonda
  - los muebles
  - la sesión plenaria

25 The bigwig
- el pez gordo
  - el juerguista
  - el tramposo

26 The briefcase
- el maletín
  - la billetera
  - la mochila
**List 2**

List 2 was identical to List 1 with the addition of the following words:

1. The summit
   - la cumbra
   - un tipo de árbol
   - el valle

1. The greenhouse
   - el invernadero
   - el jardín
   - la maceta

**Oral Production Task**

**Accent Shift Experiment**

**Right versus Left-stressed compounds**

*Right-stressed compounds*

1. Q. Do you put anything on your oatmeal?
   [TS] I like to add some brown sugar.

2. Q. Did your team win anything?
   [TS] Yes, they won a gold medal.

3. Q. Where did you put my mug?
   [TS] It’s on the kitchen sink.

4. Q. I heard you saw a hawk on your walk?
   [TS] Actually, it was a bald eagle.

5. Q. Are you going to order the cake for dessert?
   [TS] I think I’ll get the rice pudding.

6. Q. What’s your favorite vacation spot?
   [TS] I like the Grand Canyon.

7. Q. Do you know where I can find this shop?
   [TS] I believe it’s located on Lincoln Avenue.

8. Q. Can you cook meals at your home?
   [TS] Yes, it’s equipped with a gas stove.

9. Q. What did Sally bring to your party?
   [TS] She brought an apple pie

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2 TS = target sentence
Left-stressed compounds

1. Q. Are all the good restaurants on campus?
   [TS] No, they're actually on Green Street.

2. Q. What visual aid do you use when teaching?
   [TS] I write things on the white board.

3. Q. Why was Rita sad?
   [TS] She had lost her wedding ring.

4. Q. Do you ever run at night?
   [TS] No, I prefer to run in the day time.

5. Q. How do you think we should show our data?
   [TS] I think we should use a pie chart.

6. Q. Why is there a wrapper on the table?
   [TS] I was eating a chocolate bar.

7. Q. What are you going to do this Saturday?
   [TS] I think we may go to the football game.

8. Q. What do you usually put on your sandwich?
   [TS] I usually have peanut butter.

9. Q. What did you eat for dessert?
   [TS] I tried an apple cake.

Utterance-final Indefinite pronouns versus full NP

1. Q. I heard you were assigned a difficult math assignment this week. Did you get help with it?
   [TS_1] Yes, I needed help so I met with Doug.
   [TS_2] Yes, I needed help so I met with someone.

2. Q. Rebecca was in a good mood today. Do you know why?
   [TS_1] She saw Tess.
   [TS_2] She saw someone.

3. Q. I heard Rod was pretty mad when he found out that someone vandalized his car. Do you know if he did anything about it?
   [TS_1] He was so mad, he hit Nick.
   [TS_2] He was so mad, he hit someone.

4. Q. It’s about noon. What are you going to do?
   [TS_1] I’m going to eat lunch.
   [TS_2] I’m going to eat something.

5. Q. So you were trying to sleep when you heard a loud noise. Then what happened?
   [TS_1] Then I looked outside and I saw Jeff.
   [TS_2] Then I looked outside and I saw someone.

6. Q. We made it to the mountain! Now what should we do?
We should hike to the summit.
We should hike somewhere.

7. Q. Do you have any plans for Saturday?
   [TS.1] Not yet. Maybe we should do a puzzle.
   [TS.2] Not yet. Maybe we should do something.

8. Q. Andy told me that he was going to start saving more money. Do you know if he’s having money trouble?
   [TS.1] He might be broke now since he bought a Samsung.
   [TS.2] He might be broke now since he bought something.

9. Q. Today I found out that Brice is quitting his job. This shouldn’t be a secret. What should I do?
   [TS.1] You should tell Marissa.
   [TS.2] You should tell someone.

10. Q. We have mice, and we must get rid of them. What should we do?
    [TS.1] We should call Ben.
    [TS.2] We should call someone.

Focus

1. Q1³. Are you wearing your green sweater to the party?
   1. Q2. Are you wearing your purple pants to the party?
      [TS] No, I decided to wear my purple sweater.

2. Q1. I heard your son bought an old house. Did you advise him to do that?
   2. Q2. I heard your son bought a new car. Did you advise him to do that?
      [TS] Actually, we had advised him to buy a new house.

3. Q1. Did you see the small snake?
   3. Q2. Did you see the big bug?
      [TS] No, but I saw a big snake.

4. Q1. Mary must be busy with her three kids.
   4. Q2. Mary must be busy with her four cats.
      [TS] Actually, she has four kids.

5. Q1. I believe tea is best enjoyed on cold days.
   5. Q2. I believe tea is best enjoyed on hot nights.
      [TS] I actually prefer it on hot days.

6. Q1. Do you think students learn best when completing challenging homework?
   6. Q2. Do you think students learn best when completing easy tests?
      [TS] I think they learn best when completing easy homework.

7. Q1. Your car looks very old. You must have had it for at least twenty months!

³Q1 refers to questions eliciting focus on the penultimate word and Q2 is the question designed to elicit focus on the rightmost word.
7. Q2. Your car looks very old. You must have had it for at least ten years!
   [TS] Actually, I’ve only had it for ten months.
8. Q1. Did you climb that small rock?
8. Q2. Did you climb that big tree?
   [TS] No, I climbed that big rock.
9. Q1. Do you have any suggestions for a boring movie to see?
9. Q2. Do you have any suggestions for a good book to read?
   [TS] No, but I have a suggestion for a good movie.
10. Q1. Does that restaurant serve good soup?
10. Q2. Does that restaurant serve good salad?
   [TS] No, it rather serves good soup.

Compounds versus phrases

Phrases (NA Predicted on rightmost word)
Q.1. What type of fruit did you find in the woods?
   [TS] I’m not sure what it is exactly but they were some type of black berries.
Q.2. Do you think you’ll have to stay at the courthouse all day today?
   [TS] No, the trial has no witnesses, so it will be a brief case.
Q.3. Which one is your home?
   [TS] It’s the one right next to the white house.
Q.4. Do you like how Betsy decorated her home?
   [TS] I like her furniture, but the blue curtains were not a good choice in the dark room.
Q.5. What happened to Priscilla? I heard she got hurt.
   [TS] She was hit by a moving van.
Q.6. What is your child playing with?
   [TS] That’s his toy factory.
Q.7. What is this container made of?
   [TS] It’s made of glass, it’s a glass case.
Q.8. What are you going to wear with your new jeans?
   [TS] I’ll wear my black top.
Q.9. Would you like to live in this neighborhood?
   [TS] I like the neighborhood, but I don’t want to live in the green house.
Q.10. Do you like what I’ve done with the kitchen?
   [TS] Those wooden chairs are not a good match for the round table.
Q.11. Can I give the baby a stick to play with?
   [TS] It’s better for the baby to play with a soft ball.
Q.12. Did you get anything for the costume party tonight?
   [TS] I went to the costume store and bought one of the big wigs.
Q.13. Was moving from California to New York difficult?
[TS] The worst part about moving from California to New York is the hard drive.

Compound (NA Predicted on penultimate word)
Q.1. What type of fruit did you put on your cake?
   [TS] I put on some blackberries.
Q.2. I like your bag! What’s it made of?
   [TS] This bag is made of leather, so it could be a briefcase.
Q.3. Where does the president of the U.S. live?
   [TS] The president stays in the White House.
Q.4. Where are all the students in the art class?
   [TS] It’s a photography class so they’re currently in the darkroom.
Q.5. How did you manage to get all your stuff from one place to the other?
   [TS] I hired a moving van.
Q.6. What is this big building? Do they produce something here?
   [TS] Yes, it’s a toy factory.
Q.7. What is this container?
   [TS] It holds glass, so we call it our glass case.
Q.8. Why can’t you drive on the street?
   [TS] There are freshly painted lines on the blacktop.
Q.9. Where were the seedlings for the garden planted?
   [TS] All the seedlings for the garden were planted and grown in the greenhouse.
Q.10. What did you think of the conference you went to?
    [TS] I didn’t like the discussion topic they chose for the roundtable.
Q.11. I want my kids to get involved in sports, but I don’t know where to start.
    [TS] If you’re buying sports equipment for kids, you could start with a softball.
Q.12. Why do your colleagues not like Frank?
    [TS] Frank is always annoying at work because he thinks he’s one of the bigwigs.
Q.13. What’s the most expensive part of the computer?
    [TS] The most expensive part of the computer is the hard drive.

Intransitives Experiment

Unaccusative verbs

Expected
Q.1. What happened at the theater before the show started?
   [TS] An actress arrived.
Q.2. What happened at the zoo? Did anything happen when the zookeeper lowered some food?
Q.3. What happened after the break at school today?
A teacher returned.

Q.4. I saw a bunch of police at the bank today. Then they ran off in that direction. Do you know what happened?

[TS] A robber died.

Q.5. What happened when you were checking out at the store?


Q.7. What happened when the teacher was waiting in the classroom at the preschool?


Q.8. What happened after you hung up your birdfeeder?


Q.9. What was happening when you had gotten to the trailhead in the mountains?

[TS] A hiker arrived.

Q.10. What happened while you were walking around the cornfield? A farmer arrived.

Q.11. What happened at the end of the party?

[TS] A guest left.

Q.12. What happened after you called the electric company once the power went out?


Unexpected

Q.1. What happened at the theater before the show started?


Q.2. What happened at the zoo? Did anything happen when the zookeeper lowered some food?

[TS] A tiger died.

Q.3. What happened after the break at school today?


Q.4. I saw a bunch of police at the bank today. Then they ran off in that direction. Do you know what happened?

[TS] A robber died.

Q.5. What happened when you were checking out at the store?

[TS] A clerk perished.

Q.6. What happened after you called an uber?

[TS] A driver survived.

Q.7. What happened when the teacher was waiting in the classroom at the preschool?


Q.8. What happened after you hung up your birdfeeder?

[TS] A robin ripped.

Q.9. What was happening when you had gotten to the trailhead in the mountains?

[TS] A hiker expired.
Q.10. What happened while you were walking around the cornfield?
   [TS] A farmer vanished.
Q.11. What happened at the end of the party?
   [TS] A guest withered.
Q.12. What happened after you called the electric company once the power went out?
   [TS] An electrician descended.

Unergative verbs

*Expected*

Q.1. What happened at the theater during the show?
   [TS] An actress performed.
Q.2. What happened at the zoo? Did anything happen when the zookeeper lowered some food?
   [TS] A tiger roared.
Q.3. How did the children at school know that recess had ended and they needed to go inside?
Q.4. I saw a bunch of police at the bank today. Then they ran off in that direction. Do you know what happened?
   [TS] A robber bolted.
Q.5. What happened when you were checking out at the store?
   [TS] A clerk helped.
Q.6. What happened after you called an Uber?
   [TS] A driver survived.
Q.7. What happened when the teacher was waiting in the classroom at the preschool?
   [TS] A child played.
Q.8. What happened after you hung up your birdfeeder?
   [TS] A robin chirped.
Q.9. What was happening when you had gotten to the trailhead in the mountains?
   [TS] A hiker trekked.
Q.10. What happened after you trespassed on the cornfield?
   [TS] A farmer bellowed.
Q.11. It was so quiet at the end of the party, I didn’t hear anyone leave but suddenly they were gone. How did that happen?
   [TS] A guest tiptoed.
Q.12. What happened after you called the electric company once the power went out?
   [TS] An electrician worked.

*Unexpected*

Q.1. What happened at the theater during the show?
Q.2. What happened at the zoo? Did anything happen when the zookeeper lowered some food?
A tiger smiled.

Q.3. How did the children at school know that recess had ended and they needed to go inside?


Q.4. I saw a bunch of police at the bank today. Then they ran off in that direction. Do you know what happened?


Q.5. What happened when you were checking out at the store?

[TS] A clerk growled.

Q.6. What happened after you called an Uber?

[TS] A driver sleepwalked.

Q.7. What happened when the teacher was waiting in the classroom at the preschool?


Q.8. What happened after you hung up your birdfeeder?


Q.9. What was happening when you had gotten to the trailhead in the mountains?

[TS] A hiker splashed.

Q.10. What happened after you trespassed on the cornfield?

[TS] A farmer limped.

Q.11. It was so quiet at the end of the party, I didn’t hear anyone leave but suddenly they were gone. How did that happen?

[TS] A guest squawked.

Q.12. What happened after you called the electric company once the power went out?

[TS] An electrician trembled.

Fluency Task

Instructions for the fluency task:

On the following page, you will see a picture of a graph. You are being asked to describe what is depicted in this graph. Once you are ready, push any button to continue and you will see the graph. Take a minute to decide what you want to say and then speak into the microphone as fluently as possible. Once you are done speaking press spacebar.

Press spacebar to continue.
Background Questionnaire

Questionnaire for L1 speakers

Q267 Please indicate your age:

Q268 Please indicate your gender: Female Male

Q269 Where were you born? Please indicate state and country (if outside the US)

Q270 Where did you live during your childhood. Please indicate state and country (if outside the US). If more than 1, please list.

Q271 What is your current place of residence (city and/or state)?

Q272 How many years have you been residing here?

Q273 Do you have more than one native language? Yes

No

Display This Question:

If Do you have more than one native language? = Yes

Q274 Please identify your native languages below:

Display This Question:

If Do you have more than one native language? = No

Q275 What is your native language?

English

Spanish

Other

Figure A.1: adapted from the following website: https://sites.google.com/site/aremenandwomenequal/create-a-graph
If What is your native language? = Other
Q276 What do you consider to be your mother tongue/native language?

Display This Question:
If Do you have more than one native language? = No
Q277 Please rate your proficiency in the language you listed above.
0 = lowest proficiency
100 = highest/native-like proficiency
0 10 20 30 40 50 60 70 80 90 100
Native language proficiency: ()

Display This Question:
If Do you have more than one native language? = Yes
Q278 Please gauge your proficiency level in the language(s) you listed above.
0 = lowest proficiency
100 = high/native-like proficiency
0 10 20 30 40 50 60 70 80 90 100
Language 1 ()
Language 2 ()
Language 3 ()

Q279 How often do you use your native language(s) in daily encounters with people?
Never
Seldom
Sometimes
Often
Most of the time/Always
Q280 Is there anything else you would like to tell me about the use of your native language?

Q281 Have you studied any other languages besides English?
Yes
No

Display This Question:
If Have you studied any other languages besides English? = Yes
Q282 Please list the other languages you have studied.

Display This Question:
If Have you studied any other languages besides English? = Yes
Q283 Please rate your perceived proficiency in the language(s) listed above. If you listed more
than 3 languages, only indicate proficiency levels for the strongest three languages.
0 = lowest proficiency
100 = highest/native-like proficiency
0 10 20 30 40 50 60 70 80 90 100
Language 1 ()
Language 2 ()
Language 3 ()

Q284 Have you lived in any other countries besides the US? Please list location (name of country) and time (in months or years).

**Questionnaire for L2 speakers**

Please indicate your age:

Q1 Please indicate your gender:
Female
Male

Q2 Where were you born? Please indicate region and country.

Q3 Where did you live during your childhood. Please indicate region and country. If more than 1, please list.

Q4 What is your current place of residence (city and/or state)?

Q37 How many years have you been residing here?

Q39 Do you have more than one native language?
Yes
No

Display This Question: If Do you have more than one native language? = Yes

Q40 Please identify your native languages below:

Display This Question: If Do you have more than one native language? = No

Q31 What is your native language?
English
Spanish
Other

Display This Question: If What is your native language? = Other

Q5 What do you consider to be your mother tongue/native language?

Display This Question: If Do you have more than one native language? = No

Q32 Please rate your proficiency in the language you listed above.

0 = lowest proficiency
100 = highest/native-like proficiency

0 10 20 30 40 50 60 70 80 90 100

Native language proficiency: ()

Display This Question:

If Do you have more than one native language? = Yes

Q6 Please gauge your proficiency level in the language(s) you listed above.

0 = lowest proficiency
100 = high/native-like proficiency
Q7 How often do you use your native language(s) in daily encounters with people?
Never
Seldom
Sometimes
Often
Most of the time/Always

Q12 Is there anything else you would like to tell me about the use of your native language?

Q14 How old were you (in years) when you started learning English?

Q15 Did you start learning English by learning it in the classroom (as opposed to learning it from friends or family)?
Yes
No

Display This Question:
If Did you start learning English by learning it in the classroom (as opposed to learning it from fr... = No

Q16 Please explain where and from whom you first started learning English:

Q34 How many years have you formally studied English (i.e. have taken English classes)?

Q19 Have you lived in another English-speaking country?
Yes
No

Display This Question:
If Have you lived in another English-speaking country? = Yes

Q20 Please list the country and number of years you resided there.

Q21 How often do you use English in daily encounters with people?
Never
Seldom
Sometimes
Often
Most of the time/Always

Q25 Please tell me more about your use of English. Who do you use it with? Where do you use English (e.g. at home, only in public)? How often do you use it?

Q26 Please gauge your perceived proficiency in spoken English.
0 = lowest proficiency
100 = highest, native-like proficiency

Q27 Is there anything else you’d like to add about your experience with or use of English?
Q28 Have you studied any other languages besides English?
Yes
No
Display This Question: If Have you studied any other languages besides English? = Yes
Q29 Please list the other languages you have studied.
Display This Question:
If Have you studied any other languages besides English? = Yes
Q30 Please rate your perceived proficiency in the language(s) listed above. If you listed more
than 3 languages, only indicate proficiency levels for the strongest three languages.
0 = lowest proficiency
100 = highest/native-like proficiency
Appendix B: Spanish Experiment Stimuli

Word Order and Oral Production Task

Intransitives with definite subject

Unaccusative verbs

Q.1. ¿Por qué abriste la puerta?
   [SV] Sara llegó.
   [VS] Llegó Sara.

Q.2. ¿Por qué se estaban riendo los niños?
   [SV] Pablo se cayó
   [VS] Se cayó Pablo

Q.3. ¿Qué pasó cuando estabas esperando en el restaurante?
   [SV] Pedro entró.
   [VS] Entró Pedro.

Q.4. ¿Por qué disfrutaste la fiesta?
   [SV] Carolina apareció.

Q.5. ¿Por qué dejó de hablar el maestro?
   [SV] José salió.
   [VS] Salió José.

Q.6. ¿Por qué dejó de llorar María?
   [SV] Juan regresó.
   [VS] Regresó Juan.

Q.7. ¿Por qué estaban preocupados tus amigos?
   [SV] Camila se cayó.
   [VS] Se cayó Camila.

Q.8. ¿Qué pasó mientras Mariana estaba preparando la cena?
   [SV] David llegó.
   [VS] Llegó David.

Q.9. ¿Qué pasó este fin de semana?
   [SV] Elena regresó.
   [VS] Regresó Elena.

Q.10. ¿Por qué está sonriendo Miguel?
    [SV] Ana entró.

Q.11. ¿Qué pasó después de que Valentina preparó la cena?
    [SV] Amelia vino.
    [VS] Vino Amelia.
Q.12. ¿Qué pasó después de que terminaste de hablar?

[SV] Tomás se fue.
[VS] Se fue Tomás.

_Unergative verbs_

Q.1. ¿Por qué contestaste el teléfono?

[SV] Sara llamó
[VS] Llamó Sara.

Q.2. ¿Por qué se estaban riendo los niños?

[SV] Pablo bailó.
[VS] Bailó Pablo.

Q.3. ¿Qué pasó cuando estabas esperando en el restaurante?

[SV] Pedro estornudó.
[VS] Estornudó Pedro.

Q.4. ¿Por qué disfrutaste la fiesta?

[SV] Carolina cantó.
[VS] Cantó Carolina.

Q.5. ¿Por qué dejó de hablar el maestro?

[SV] José gritó.
[VS] Gritó José.

Q.6. ¿Por qué dejó de llorar María?

[SV] Juan cantó.
[VS] Cantó Juan.

Q.7. ¿Por qué estaban preocupados tus amigos?

[SV] Camila tosió.
[VS] Tosió Camila.

Q.8. ¿Qué pasó mientras Mariana estaba preparando la cena?

[SV] David trabajó.

Q.9. ¿Qué pasó este fin de semana?

[SV] Elena viajó.
[VS] Viajó Elena.

Q.10. ¿Por qué esta sonriendo Miguel?

[SV] Ana se rió.
[VS] Se rió Ana.

Q.11. ¿Qué pasó después de que Valentina preparó la cena?

[SV] Amelia comió.
[VS] Comió Amelia.

Q.12. ¿Qué pasó después de que terminaste de hablar?
Intransitives with indefinite subject

Unaccusative Verbs

Q.1. ¿Qué pasó en el teatro?
   [SV] Una actriz llegó.
   [VS] Llegó una actriz.

Q.2. ¿Qué pasó en el zoológico? ¿Pasó algo cuando el cuidador del zoológico trajo la comida?
   [SV] Un tigre apareció.
   [VS] Apareció un tigre.

Q.3. ¿Qué pasó hoy después del recreo en la escuela?
   [SV] Un maestro volvió.
   [VS] Volvió un maestro.

Q.4. ¿Qué pasó en la tienda?
   [SV] Un empleado se cayó.
   [VS] Se cayó un empleado.

Q.5. ¿Qué pasó después de pedir el Uber?
   [SV] Un conductor vino.
   [VS] Vino un conductor.

Q.6. ¿Qué pasó cuando la maestra esperaba en el salón de clase?
   [SV] Una niña regresó.
   [VS] Regresó una niña.

Q.7. ¿Qué viste afuera de la ventana?
   [SV] Un pájaro apareció.
   [VS] Apareció un pájaro.

Q.8. ¿Qué pasó después de llegar a las montañas?
   [SV] Un alpinista llegó.
   [VS] Llegó un alpinista.

Q.9. ¿Qué pasó cuando estabas esquiando?
   [SV] Un amigo cayó.
   [VS] Cayó un amigo.

Q.10. ¿Qué pasó cuando estabas en la fiesta?
   [SV] Una vecina vino.
   [VS] Vino una vecina.

Q.11. ¿Qué pasó al final de tu día en la escuela?
   [SV] Un niño se fue.
   [VS] Se fue un niño.

Q.12. ¿Por qué hay gente en el estadio aplaudiendo?
[SV] Un cantante entró.
[VS] Entró un cantante.

**Unergative Verbs**

Q.1. ¿Qué pasó en el teatro?
[SV] Una actriz actuó.
[VS] Actuó una actriz.

Q.2. ¿Qué pasó en el zoológico? ¿Pasó algo cuando el cuidador del zoológico trajo la comida?
[SV] Un tigre rugió.
[VS] Rugió un tigre.

Q.3. ¿Qué pasó hoy después del recreo en la escuela?
[SV] Un maestro gritó.

Q.4. ¿Qué pasó en la tienda?
[SV] Un empleado bostezó.
[VS] Bostezó un empleado.

Q.5. ¿Qué pasó después de pedir el Uber?
[SV] Un conductor llamó.
[VS] Llamó un conductor.

Q.6. ¿Qué pasó cuando la maestra esperaba en el salón de clase?
[SV] Una niña jugó.
[VS] Jugó una niña.

Q.7. ¿Qué viste afuera de la ventana?
[SV] Un pájaro voló.
[VS] Voló un pájaro.

Q.8. ¿Qué pasó después de llegar a las montañas?
[SV] Un alpinista caminó.
[VS] Caminó un alpinista.

Q.9. ¿Qué pasó cuando estabas esquiando?
[SV] Un amigo saltó.
[VS] Saltó un amigo.

Q.10. ¿Qué pasó cuando estabas en la fiesta?
[SV] Una vecina cantó.
[VS] Cantó una vecina.

Q.11. ¿Qué pasó al final de tu día en la escuela?
[SV] Un niño bailó.
[VS] Bailó un niño.

Q.12. ¿Por qué hay gente en el estadio aplaudiendo?
[SV] Un cantante cantó.
Cantó un cantante.

Narrow Focus

Q.1.I ¿Quién hizo la pizza?
Q.1.C ¿Mariana hizo la pizza?
[SV] Tomás la hizo.
[VS] La hizo Tomás.
Q.2.I ¿Quién compró el coche?
Q.2.C ¿Daniel compró el coche?
[SV] Lucas lo compró.
[VS] Lo compró Lucas.
Q.3.I ¿Quién usó la computadora?
Q.3.C ¿Isabela usó la computadora?
[SV] Camila la usó.
[VS] La usó Camila.
Q.4.I ¿Quién encontró el dinero?
Q.4.C ¿Amelia encontró el dinero?
[SV] Carolina lo encontró.
[VS] Lo encontró Carolina.
Q.5.I ¿Quién rompió la televisión?
Q.5.C ¿Andrés rompió la televisión?
[SV] José la rompió.
[VS] La rompió José.
Q.6.I ¿Quién ordenó el bistec?
Q.6.C ¿María ordenó el bistec?
[SV] Valentina lo ordenó.
[VS] Lo ordenó Valentina.
Q.7.I ¿Quién recibió el premio?
Q.7.C ¿Alejandro recibió el premio?
[SV] Carlos lo ganó.
[VS] Lo ganó Carlos.
Q.8.I ¿Quién escribió el libro?
Q.8.C ¿Diego escribió el libro?
[SV] Anna lo escribió.
[VS] Lo escribió Anna.
Q.9.I ¿Quién comió la manzana?

4The target sentences for the contrastive and informational focus items were the same, only the contextual sentences differed. Questions that elicit informational focus on the subject are labeled with 'I' while those that elicit contrastive focus are labeled with 'C'.

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Q.9. ¿Santiago comió la manzana?
[SV] Juan la comió.
[VS] La comió Juan.

Q.10. ¿Quién vió la película?
Q.10. ¿Javier vió la película?
[SV] Pedro la vio.
[VS] La vio Pedro.

Q.11. ¿Quién leyó el libro?
Q.11. ¿Renata leyó el libro?
[SV] Emma lo leyó.
[VS] Lo leyó Emma.

Q.12. ¿Quién bebió la cerveza?
Q.12. ¿Daniel bebió la cerveza?
[SV] Alonso la bebió.
[VS] La bebió Alonso.

Fillers for oral production task

Q.1. ¿Qué comió la niña?
[TS] La niña comió pollo.

Q.2. ¿Qué compró la mujer?
[TS] La mujer compró los abrigos.

Q.3. ¿Qué limpió el hombre?
[TS] El hombre limpió las oficinas.

Q.4. ¿Qué quería el perro?
[TS] El perro quería los juguetes.

Q.5. ¿Qué ordenó tu amigo?
[TS] Mi amigo ordenó vino.

Q.6. ¿Qué encontró la maestra?
[TS] La maestra encontró los libros.

Q.7. ¿Qué tomó Andrés?
[TS] Andrés tomó un té.

Q.8. ¿Qué preparó Diego?
[TS] Diego preparó los pasteles.

Q.9. ¿Qué vio Amelia?
[TS] Amelia vio los aviones.

Q.10. ¿Qué vendió Carlos?
[TS] Carlos vendió las casas.

Q.11. ¿Qué rompió Alejandro?
Q.12. ¿Qué vendió Diego?
[TS] Diego vendió los cuadros.

Fillers for word order task

Q.1. ¿Qué comió la niña?
[SV] La niña comió las uvas.  
[VS] Las uvas comió la niña.
Q.2. ¿Qué compró la mujer?
[SV] La mujer compró los abrigos.  
[VS] Los abrigos compró la mujer.
Q.3. ¿Qué limpió el hombre?
[SV] El hombre limpió las oficinas.  
[VS] Las oficinas limpió el hombre.
Q.4. ¿Qué quería el perro?
[SV] El perro quería los juguetes.  
[VS] Los juguetes quería el perro.
Q.5. ¿Qué ordenó tu amigo?
[SV] Mi amigo ordenó los aperitivos.  
[VS] Los aperitivos ordenó tu amigo.
Q.6. ¿Qué encontró la maestra?
[SV] La maestra encontró los libros.  
[VS] Los libros encontró la maestra.
Q.7. ¿Qué tomó Andrés?
[SV] Andrés tomó dos cervezas.  
[VS] Dos cervezas tomó Andrés.
Q.8. ¿Qué preparó Diego?
[SV] Diego preparó los pasteles.  
[VS] Los pasteles preparó Diego.
Q.9. ¿Qué vio Amelia?
[SV] Amelia vio los aviones.  
[VS] Los aviones vio Amelia.
Q.10. ¿Qué vendió Carlos?
[SV] Carlos vendió las casas.  
[VS] Las casas vendió Carlos.
Q.11. ¿Qué rompió Alejandro?
[VS] Los vasos rompió Alejandro.
Q.12. ¿Qué vendió Diego?
[SV] Diego vendió los cuadros.
Fluency Task

Instructions for the fluency task:

On the following page, you will see a picture of a graph. You are being asked to describe what is depicted in this graph. Once you are ready, push any button to continue and you will see the graph. Take a minute to decide what you want to say and then speak into the microphone as fluently as possible. Once you are done speaking press spacebar.

Press spacebar to continue.

Figure B.1: adapted from the following website: https://sites.google.com/site/aremenandwomenequal/create-a-graph

Background Questionnaire

Q1 Participant number:

Q31 Please list your age:

Q32 What is your sex?

female

male

Q33 Where were you born? Please list country and either city or region.

Q34 Which cities and countries did you grow up in? Please list all.

Q35 Where do you live now (city and country)?

Q36 How many years have you lived in this place?
Q37 What is your native language?
- Spanish
- English
- Spanish and English
- Spanish and another language
- English and another language
- A different language

Display This Question:
If What is your native language? = English and another language
Or What is your native language? = Spanish and another language
Or What is your native language? = A different language

Q38 Please list your native languages:

Display This Question:
If What is your native language? = Spanish and another language
Or What is your native language? = English and another language
Or What is your native language? = A different language

Q39 What is your estimated level of proficiency in your native languages? (in order of listing)
- 0 = lowest proficiency
- 100 = highest/native-like proficiency
- 0 10 20 30 40 50 60 70 80 90 100

Display This Question:
If What is your native language? = Spanish
Or What is your native language? = English

Q40 What is your estimated level of proficiency of your native language?
- 0 = lowest proficiency
- 100 = highest/native-like proficiency
- 0 10 20 30 40 50 60 70 80 90 100

Display This Question:
If What is your native language? = Spanish and English

Q41 What is your estimated level of proficiency of your native languages?
- 0 = lowest proficiency
- 100 = highest/native-like proficiency
- 0 10 20 30 40 50 60 70 80 90 100

Spanish ()
English ()

Q31 Where there any other languages spoken in your household when you were growing up?
- Yes
- No

Display This Question:
If Where there any other languages spoken in your household when you were growing up? = Yes

Q32 Please list other languages spoken in your household:

Q43 If there’s anything else you’d like us to know about your native language, please write it here:

Display This Question:
If What is your native language? = English
Or What is your native language? = English and another language
Q49 How old were you when you started learning Spanish?

Display This Question:
If What is your native language? = English
Or What is your native language? = English and another language
Q50 How many years of formal classroom study of Spanish have you had?

Display This Question:
If What is your native language? = English
Or What is your native language? = English and another language
Q51 Do you ever use Spanish outside of the classroom? (e.g. with friends, movies, online). If so, please list where/how you use it and estimate about how many hours per week?

Display This Question:
If What is your native language? = English
Or What is your native language? = English and another language
Q52 Have you ever lived abroad in a Spanish speaking country?

Yes
No

Display This Question:
If Have you ever lived abroad in a Spanish speaking country? = Yes
Q53 Please list countries and length of stay. (e.g. Argentina, 1 year, etc)

Display This Question:
If What is your native language? = Spanish
Or What is your native language? = Spanish and another language
Q54 Please gauge your estimated proficiency in Spanish:

0 = lowest proficiency
100 = highest/native-like proficiency
0 10 20 30 40 50 60 70 80 90 100

Display This Question:
If What is your native language? = Spanish
Or What is your native language? = Spanish and another language
Q55 At what age did you start learning English?
If What is your native language? = Spanish
Or What is your native language? = Spanish and another language
Q56 How long have you lived in the U.S.?
Display This Question:
If What is your native language? = Spanish
Or What is your native language? = Spanish and another language
Q57 Have you lived in any other English speaking countries? If so, please list country name and length of stay (e.g. Australia - 2 years)
Display This Question:
If What is your native language? = Spanish
Or What is your native language? = Spanish and another language
Q58 What is your estimated proficiency level of English?
0 = lowest proficiency
100 = highest/native-like proficiency
0 10 20 30 40 50 60 70 80 90 100
Q44 Have you studied any other languages (besides English or Spanish)?
Yes
No
Display This Question:
If Have you studied any other languages (besides English or Spanish)? = Yes
Q45 Please list the other languages you have studied:
Display This Question:
If Have you studied any other languages (besides English or Spanish)? = Yes
Q46 What is your estimated level of proficiency? (in order of how they were listed)
0 = lowest proficiency
100 = highest/native-like proficiency
0 10 20 30 40 50 60 70 80 90 100
Q47 Have you ever lived abroad in any other countries (not including those already listed)?
Yes
No
Display This Question:
If Have you ever lived abroad in any other countries (not including those already listed)? = Yes
Q48 Please indicate which countries you’ve lived in and for how long (e.g. Germany-2 years; Japan, 6 months, etc)
Display This Question:
If What is your native language? = Spanish
Or What is your native language? = Spanish and another language
Or What is your native language? = Spanish and English
Q30 Have you ever taught Spanish to learners? yes/no