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The interplay of information structure, semantics, prosody, and word ordering in Spanish intransitives

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A production experiment was run to examine how information structure and verbal semantics affect word ordering and nuclear stress placement in intransitive sentences in Venezuelan Spanish. Unaccusative verbs in Spanish are said to be more likely to be subject final (VS order) than unergative verbs, while in languages like English, this is marked with stress shift (i.e., Sv, caps show the nuclear stress). It has long been contended, however, that the semantic factors underlying split intransitivity actually affect information structure, rather than syntax directly. If so, then the effect of verbal semantics on word ordering/nuclear stress placement should be able to be overridden by information structure. Venezuelan Spanish speakers described pictures using a printed unaccusative or unergative verb in response to a question manipulating the information structure type of the subject, i.e., broad focus, theme, QUD-focus, or contrastive focus. Results showed that QUD- and contrastively focused subjects were more likely to carry nuclear stress. Subject stress was also more likely for unaccusatives, but this effect was weaker. Overall stress shift was much more frequent than subject final placement, with neither information structure type nor verb type affecting the likelihood of either response type. These results raise challenges for standard assumptions about the relationship between information structure and unaccusativity, and between final subject placement and stress shift.

Keywords: intransitives; Spanish; prosody; information structure; unaccusative/unergative

1. Introduction

The phenomenon of split intransitivity offers a particularly interesting case to see how information structure (IS), semantics, syntax, and prosody interact with each other in regulating spoken sentence production. To start with some simple examples, in transitive sentences in broad focus contexts in Spanish, word order is usually Subject-Verb-Object (SVO) with nuclear stress falling on the final word (Büring & Gutiérrez-Bravo, 2001; Contreras, 1976; Zagona, 2002; Zubizarreta, 1998); for example (in all the examples in this paper *italics* show the nuclear stressed word):

- (1) Q: ¿Qué pasó?
‘What happened?’
A: La chica se comió una *manzana*.
‘The girl ate an *apple*.’

This is also the case with some intransitives. Word order is SV, with final nuclear stress, for example (Hertel, 2003; Lozano, 2006; Zubizarreta & Nava, 2011):

- (2) Q: ¿Qué pasó?
‘What happened?’
A: La chica *brincó*.
‘The girl *jumped*’

However, for another group of intransitive sentences, the realization in broad focus is said to be different (Hertel, 2003; Lozano, 2006; Zubizarreta & Nava, 2011):

- (3) Q: ¿Qué pasó?
‘What happened?’
A: Apareció el *gato*.
‘The *cat* appeared’

That is, nuclear stress is still final, but the word order has reversed, to VS, which we will call *final subject placement*. In other languages, like English, a very similar set of sentences is marked not by reversal of word order, but by initial nuclear stress, as can be seen in the translation of the answer in (3), which we will call *stress shift* (Faber, 1987; Ladd, 2008; Zubizarreta & Nava, 2011). In both cases the result is nuclear stress on the subject in broad focus. This distinction in realization between groups of intransitive sentences is called split intransitivity.

Accounting for the alternation between nuclear stress on the subject and the verb raises a number of interesting questions. When and why does the nuclear stress occur on the subject? This has been argued to be because of syntactic properties of the verb, and semantic properties of the verb and subject (Levin & Rappaport-Hovav, 1995; Perlmutter, 1978; Sorace, 2000; Zubizarreta & Nava, 2011, see Section 1.2.1). Alternatively, it has been argued that these syntactic and semantic properties are related to IS, which in turn affects nuclear stress placement and word ordering (Bolinger, 1954, 1972; Gussenhoven, 1983; Hirsch & Wagner, 2011; Kratzer & Selkirk, 2007, see Section 1.2.2). Information structure is well-established to affect nuclear stress placement and word ordering in transitive sentences in Spanish (Bolinger, 1954; Büring & Gutiérrez-Bravo, 2001; Zubizarreta, 1998, see Section 1.1).

Another question is the relationship between stress shift and final subject placement. Since both result in nuclear stress on the subject, are they equivalent? It is often claimed that this is related to the ‘plasticity’ of the language (Vallduví, 1992), so this is an inter-language distinction. However, we will show below that, in American varieties of Spanish at least, stress shift is common (Bolinger, 1954; Face & D’Imperio, 2005; Gabriel, 2010), so are these equivalent *within* a language or language variety, or is there a functional distinction between them? The experiment presented here aimed to explore these questions.

As there has been very little experimental work on nuclear stress placement and word ordering in intransitives in Spanish, below we begin by reviewing research on the realization of IS in transitive sentences in Spanish, concentrating on the effects on nuclear stress placement and how this interacts with word ordering. We then look at nuclear stress placement and word ordering in intransitives. We briefly review syntactic and semantic approaches to split intransitivity. We then discuss how we might distinguish between a syntax/semantic-based and IS-based explanation for nuclear stress placement in Spanish intransitives, drawing on the available evidence about nuclear stress placement and word order in this sentence type. Sections 2–4 describe the production experiment reported here. Section 5 discusses the results in relation to the issues raised below.

1.1. Effect of IS on nuclear stress and word order

There are two distinct threads in the literature on IS marking in Spanish. In work largely from a syntactic perspective, Spanish has traditionally been seen as a ‘word order’ language when it comes to the marking of focus (Büring & Gutiérrez-Bravo, 2001; Contreras, 1976; Zubizarreta, 1998). Prosody has only been considered relevant in that sentence-final placement of the focus has been argued to be prosodically motivated (‘p-movement’) by the need to have the nuclear stress final in the intonation phrase (Zubizarreta, 1998). This work has largely been based on introspective or grammaticality judgments. Work from a prosodic perspective within the Autosegmental-Metrical framework has looked at nuclear stress placement and choice of pitch accent type in relation to the IS of the sentence (see Astruc, Mora, & Rew, 2010; Beckman, Díaz-Campos, McGory, & Morgan, 2001; Hualde, 2002; Prieto & Roseano, 2010; Sosa, 1999). This work has largely used read sentences and therefore not looked at the interaction of nuclear stress placement with word ordering and choice of syntactic construction (cf. Face, 2000; Vanrell & Fernández-Soriano, to appear). It is only more recently that there has been experimental work looking at the interaction of prosody and word ordering in IS realization in Spanish (Face, 2000; Face & D’Imperio, 2005; Feldhausen & Vanrell, 2014, 2015; Gabriel, 2010; Gabriel, Feldhausen, & Pešková, 2009; Hoot, 2012; Muntendam, 2009, 2013; Vanrell & Fernández Soriano, 2013; Vanrell & Fernández-Soriano, to appear). This work has revealed considerable variation in the marking of IS between varieties of Spanish. For the purposes of this paper, we summarize the main findings in relation to nuclear stress placement and word ordering/syntactic construction. We also mention findings on pitch accent type; however, this is somewhat orthogonal to explaining the interaction of nuclear stress placement and word ordering.

The literature on IS is wide, with much contradictory use of terminology for similar underlying phenomena (e.g., see Kruijff-Korbayová & Steedman, 2003). For the purposes of this article, we will simply present the framework to be adopted here, making links to existing descriptions of IS in Spanish. This framework recognizes that there are two orthogonal dimensions to IS which are often subsumed under the notion of ‘focus’: the ‘quantificational’ distinction between *contrast* (C) and *background*, and the ‘organizational’ distinction between *theme* and *rheme* (see Calhoun, 2010a; Halliday, 1967; Steedman, 2000, 2014; Vallduví & Vilkuna, 1998).

The *rheme* (ρ , also called the comment) is the part of the utterance which updates the common ground, or is new in relation to the current question-under-discussion (QUD) (rather than the discourse as a whole), while the *theme* (θ , also called topic) establishes a link between the current utterance and the common ground or what the current QUD is (see Vallduví, 2016). A broad focus utterance like the answer in (4) is all-rheme, as the context (the question) does not establish any part of the utterance as the QUD. In broad focus, the nuclear stress falls on the last word in the sentence, and can take a range of pitch accent types depending on the variety of Spanish and the pragmatic function of the sentence (Hualde & Prieto, 2015). Content words earlier in the sentence will usually also be pitch accented; these are less prominent than the nuclear stress accent and have a different pitch accent type (usually L* + H) (Hualde & Prieto, 2015).

(4) Q: ¿Qué pasó?
‘What happened?’

A: [La chica se comió la *manzana*] ρ .
‘[The girl ate the *apple*] ρ .’

In (5) and (6) the question sets up the object and the subject, respectively, as the rheme of the sentence, while the rest of the utterance links back to the context and is hence

thematic. We will call the rheme here the *QUD-focus* (also called presentational or new information focus). As can be seen in (6), it is traditionally claimed that the QUD-focus is always sentence-final in Spanish, so that when the subject is the QUD-focus, it is placed in sentence-final position. According to Zubizarreta (1998), subject final placement is prosodically motivated by the need to have the nuclear stress final in the intonational phrase ('p-movement'). Note that in the English translation subject focus is marked by stress shift.¹

- (5) Q: ¿Qué se comió la chica?
'What did the girl eat?'
A: [La chica se comió]_θ [la *manzana*]_ρ.
'[The girl ate]_θ [the *apple*]_ρ.'
- (6) Q: ¿Quién se comió la manzana?
'Who ate the apple?'
A: [Se comió la manzana]_θ [la *chica*]_ρ.
'[The *girl*]_ρ [ate the apple]_θ.'

This claimed pattern of focus-related movement draws mainly from introspective or grammaticality judgments. In more recent experimental work, it has been shown that there are considerable differences in focus marking between varieties of Spanish (Face, 2000; Face & D'Imperio, 2005; Feldhausen & Vanrell, 2014, 2015; Gabriel, 2010; Gabriel et al., 2009; Hoot, 2012; Muntendam, 2009, 2013; Vanrell & Fernández Soriano, 2013; Vanrell & Fernández-Soriano, to appear). For Peninsular Spanish, Face (2000) found that while QUD-focused words were usually sentence final, speakers use nuclear stress in situ to mark QUD-focus 30% of the time, as in the English translation of (6), although Feldhausen and Vanrell (2014) found nuclear stress in situ was used to mark QUD-focus in Madrid Spanish only 15% of the time. In Latin American varieties of Spanish, on the other hand, nuclear stress in situ may be the primary means to mark QUD-focus. Gabriel et al. (2009) and Gabriel (2010) show nuclear stress in situ was used for QUD-focused subjects in 75–95% of cases in Argentinian Spanish. Similar results were found for Andean Spanish (Muntendam, 2009, 2013) and Mexican Spanish (Hoot, 2012). Nuclear stress in situ has also been found to be more common than final subject placement for other regional varieties of Peninsular Spanish (Vanrell & Fernández Soriano, 2013). There are also differences in the realization of the nuclear stress accent between QUD-focus and broad focus (whether in situ or in phrase-final position): In QUD-focus the nuclear accent is generally produced with greater pitch range and an earlier pitch peak (Hualde & Prieto, 2015). There seems to be variation as to whether post-focal accents are deleted entirely in the case of focus marked by nuclear stress in situ early in the sentence, or whether they are realized with a lower pitch range (Hualde & Prieto, 2015; Vanrell & Fernández-Soriano, to appear); however, in all varieties the nuclear stress shifts to the focal word.

In (7) and (8) the theme-rheme structure is the same as in (5) and (6) respectively. However, here we see the operation of the second dimension of IS: Contrast (C)/Background (following Steedman, 2014); Contrast is marked with C, background is unmarked. The notion of Contrast draws on Rooth's (1992) alternative-semantics definition of focus, i.e., Contrast-marking introduces a presupposition of alternatives to the contrastive element,

¹ In both Spanish and English, the non-contrastive thematic nouns in these examples could be realized as pronouns. We will leave this aside here, as this paper is principally concerned with word ordering and nuclear stress placement.

which needs to be resolved in the context, in this case an explicit contrast between *la banana* and *la manzana* in (7) and *el chico* and *la chica* in (8). We will call this *contrastive focus* (which includes corrective focus). It is debated whether all rhemes necessarily contain a Contrast (see discussion in Calhoun, 2010a; Vallduví, 2016), e.g., it could be argued that there is an implicit alternative set to the rheme in (5) and (6).

- (7) Q: La chica se comió la banana, ¿es verdad?
 ‘The girl ate the banana, right?’
 A: (No,) [la chica se comió]_θ [[la *manzana*]_c]_ρ.
 ‘(No,) [the girl ate]_θ [[the *apple*]_c]_ρ.’
- (8) Q: El chico se comió la manzana, ¿es verdad?
 ‘The boy ate the apple, right?’
 A: (No,) [[la *chica*]_c]_ρ [se comió la manzana]_θ.
 ‘(No,) [[the *girl*]_c]_ρ [ate the apple]_θ.’

It has traditionally been claimed that contrastive focus can be marked with stress shift in Spanish, as in (8), while QUD-focus cannot (Domínguez, 2004; Zubizarreta, 1998). As outlined above, however, in many varieties, stress shift can also mark QUD-focus. No consistent differences have been found in pitch accent type or realization between QUD-focus and contrastive focus (Hualde & Prieto, 2015; Vanrell & Fernández-Soriano, to appear).

Production studies have further found that, in both Peninsular and Latin American varieties of Spanish, contrastive focus is usually marked with clefts, with nuclear stress on the cleft (Feldhausen & Vanrell, 2014; Gabriel, 2010), for example (for contrastive focus on the subject):

- (9) Fue la *chica* la que se comió la manzana.
 ‘It was the *girl* who ate the apple.’

Clefts had previously been noted as a means of marking contrastive focus in Spanish and other languages (see Guitart, 2013; Lambrecht, 2001; Sedano, 1990). However, they were not usually discussed as the primary means of focus marking in Spanish. Both Feldhausen and Vanrell (2014) for Peninsular Spanish, and Gabriel (2010) for Argentinian Spanish, found that both simple clefts, as in (9) and pseudo-clefts, as in (10) were used to mark contrastive focus, again with nuclear stress on the focus.

- (10) La que se comió la manzana fue la *chica*
 ‘The one who ate the apple was the *girl*.’

Feldhausen and Vanrell (2015) further found that for Peninsular Spanish, simple clefts and pseudo-clefts were also frequently used to mark QUD-focus (cf. Moreno Cabrera, 1999), with pseudo-clefts more frequent than simple clefts for QUD-focus, although this was not found by Gabriel (2010) for Argentinian Spanish.

In all of the examples above, the theme is all background, and it is often not possible to distinguish the background of the rheme from the theme in terms of prosody or word ordering, e.g., (4), (5), and (7) all have the same nuclear stress placement and word order. There is often no Contrast in the theme, as the question-under-discussion is usually established, and so alternatives are not evoked. However, as (11) shows, where there are competing questions-under-discussion, there can be a Contrast within the theme as well as the rheme. We will call this *contrastive theme* (also called contrastive topic, see Büring,

2003; Calhoun, 2010a; Steedman, 2000, 2014; Vallduví, 2016). In this case, *el chico* and *la chica* may be more prosodically prominent than if they were not contrastive. Hualde (2005) reports that the pre-nuclear accent on such initial themes may be produced with a later peak than standard pre-nuclear accents, and the initial topic may be separated into a separate intermediate phrase with a H- phrase tone (see also Hualde & Prieto, 2015).

- (11) C: Ambos, el chico y la chica tenían hambre,
y dejaron el tazón sin frutas.
'Both the boy and the girl were hungry,
so they emptied the fruit bowl.'
- A: [[El chico]_C se comió]_θ [[la banana]_C]_ρ,
y [[la chica]_C se comió]_θ [[la manzana]_C]_ρ.
'[[The boy]_C ate]_θ [[the banana]_C]_ρ,
and [[the girl]_C ate]_θ [[the apple]_C]_ρ.'

There is one further aspect of IS relevant to the present study. Spanish is generally held not to apply 'anaphoric deaccenting,' as languages like English do, i.e., avoiding putting the nuclear stress on a word which is given in the immediate context (Hualde & Prieto, 2015; Ladd, 2008; Nava & Zubizarreta, 2010; Zubizarreta, 1998). This can be seen in (12):

- (12) Q: La manzana estaba sobre la mesa. ¿Qué pasó con ella?
'The apple was on the table. What happened to it?'
- A: [La chica se comió la manzana]_ρ.
'[The girl ate the apple]_ρ.'

The most natural way to say the reply in English would be *The girl ate the apple*, i.e., avoiding putting the nuclear stress on the given *apple*. Likewise, Spanish is said not to shift stress to mark the most informative or least predictable word within the rheme (Ladd, 2008; Nava & Zubizarreta, 2010). However, it is claimed that there is a preference to put given information before new in a sentence (e.g., see Zubizarreta, 1994). For example, a perhaps more natural response to the question in (12) would be *La chica se la comió* 'The girl ate it' (at least in Venezuelan Spanish). Note here the given pronoun *la* comes before the verb.

In summary, it is traditionally claimed that QUD-focus on the subject in Spanish is marked by final subject placement, while contrastive focus is marked by stress shift. Experimental studies on varieties of Latin American Spanish suggest that stress shift is most common to mark QUD-focus, and clefting contrastive focus. However, these studies also show considerable variation in focus marking within and between varieties of Spanish. To our knowledge, there has been less experimental work on marking of contrastive themes, and anaphoric deaccenting (or lack thereof).

1.2. Nuclear stress placement and word ordering in intransitives

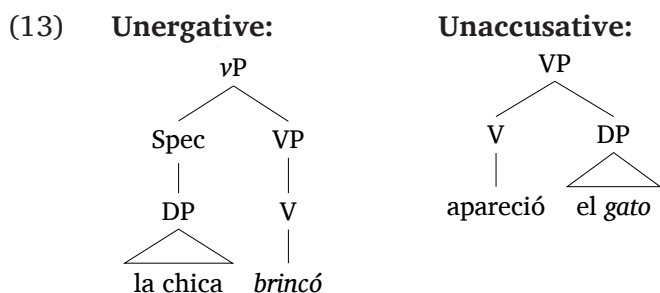
In intransitives, there is only one noun, the subject. If these follow the same patterns as for transitive sentences in Spanish, as outlined above, we would expect broad focus to be realized sV (where capitals show the nuclear stress), QUD-focus to be realized through final subject placement, i.e., vS, and contrastive focus by stress shift, i.e., Sv. As outlined above, for Latin American varieties like Venezuelan Spanish, stress shift seems to be more likely for QUD-focus, i.e., Sv, and a simple cleft for contrastive focus, i.e., *fue Sv* (*fue* indicates the cleft). However, the situation with intransitives is not so straight-forward: Syntactic and semantic features of the verb and subject also affect nuclear stress placement

and word ordering. How then do these factors interact with each other? One possibility is that IS and semantic factors are competing influences on word ordering and nuclear stress placement. However, it has been often claimed that the semantic factors said to underlie split intransitivity actually do so because they change the default IS organization of utterances (Allerton & Cruttenden, 1979; Bolinger, 1954, 1972; Contreras, 1976; Faber, 1987; Féry, 2011; Gussenhoven, 1983; Hatcher, 1956; Hirsch & Wagner, 2011; Irwin, 2012; Kratzer & Selkirk, 2007; Schmerling, 1976). We discuss that literature here, and relate it to existing experimental research that has manipulated both unaccusativity and IS in Spanish.

1.2.1. Syntactic and semantic approaches to split intransitivity

According to the unaccusativity hypothesis, it has long been argued that intransitive verbs in many languages can be split into two classes depending on the syntactic properties of their single argument (Levin & Rappaport-Hovav, 1995; Perlmutter, 1978; Sorace, 2000; Zubizarreta & Nava, 2011). The key difference is whether the verb selects an argument which is external to the VP: These are *unergative verbs*; or an argument which is the complement of the verb within the VP: These are *unaccusative verbs*. The reflexes of this distinction vary across languages, and have been shown to include auxiliary selection (in languages including Italian, German, and Dutch) (Sorace, 2000), as well as word ordering and nuclear stress placement in broad focus (see further Verhoeven & Kùgler, 2015). We will be concerned with the latter two reflexes here.

According to syntactic approaches, the underlying difference in the position of the verb’s argument can explain the observed tendency in unaccusatives to show final subject placement (in Spanish) and stress shift (in English), while unergatives show neither. The exact mechanism by which the syntax-to-prosody mapping occurs differs across frameworks; however, the basic idea is that the nuclear stress is assigned to the most deeply embedded node in the underlying structure (Chomsky & Halle, 1968; Zubizarreta, 1998) (for details of how this can be worked out in a phase-theoretical approach, see Kratzer & Selkirk, 2007). This results in the nuclear stress on the verb in unergatives, and on the argument in unaccusatives, as follows with examples from (2) and (3):



In the case of final subject placement, the order of the words in the surface realization matches that in the underlying structure. In the case of stress shift, the argument moves out of the VP for case-checking or other reasons (before Spell Out, in phase-theoretical terms), but crucially, it carries the nuclear stress with it (see Kahnemuyipour, 2009; Kratzer & Selkirk, 2007).

In its original form, it was assumed within the unaccusativity hypothesis that there was a one-to-one correspondence between argument position (external or internal to the VP) and the thematic role of the argument (agent or patient respectively) (Baker, 1988; Perlmutter, 1978). However, it was soon shown that this correspondence breaks down in a significant number of cases (for a review see Sorace, 2000). This variability has been

argued to show that the unaccusative-unergative distinction is semantically determined and syntactically encoded (Levin & Rappaport-Hovav, 1995; Sorace, 2000), with a number of factors being relevant to the semantic determination. In particular, Sorace (2000) has argued that there is a hierarchy of aspectual/thematic verb types, with those at either ends of the scale consistently showing unaccusative and unergative reflexes respectively, while those in the middle are more variable.

Table 1 shows the percentage of intransitive verbs in Spanish realized in VS order in a study by Nava (2007), classified according to Sorace's (2000) verb type hierarchy. The data are from oral narrations of picture prompts by 13 monolingual speakers of Mexican Spanish.² The hierarchy of verb types generally follows that set out in Sorace (2000), with verbs at the unergative end of the scale (the top) largely realized in SV order, while those at the unaccusative end are more frequently VS. However, it should be noted that even the 'most' unaccusative verbs (anti-causatives) are still produced in SV order more than a quarter of the time, and the counts for all but the change of location verbs are low.

A number of interrelated semantic factors have been argued to explain the hierarchy of verb types, as shown in **Table 1**. As discussed by Sorace (2000), these include the extent to which the argument is dynamically affected by the action of the verb, or whether the verb involves a change of state or transition for the argument: For both process verbs and change of state/location the argument is affected, but only for the latter does the argument undergo a change of state or transition. Another factor is the degree of agentivity of the argument: For controlled processes the argument is usually also the agent, whereas for change of state/location verbs this is not implied, and for anti-causatives the argument is implied not to be the agent. For English, stress shift has been argued to be less likely for typically unaccusative verbs when they have agentive subjects (Faber, 1987; Hirsch & Wagner, 2011).

1.2.2. Information structure and split intransitivity

We have seen that both IS and verb and event semantics can affect nuclear stress placement and word ordering in intransitives. These could be competing influences; however, it has been argued that verb and event semantics influence IS, which in turn directs prosodic and syntactic realization. To our knowledge this work is based on English and other Germanic languages; it is yet to be known if the evidence for this view applies more broadly across other languages including Spanish.

Table 1: Percentage of intransitive verbs produced in VS order by Sorace's (2000) verb types, along with the total count (N) for each type; data from Nava (2007).

Type	Example	% VS Order (N)
Uncontrolled process	<i>estornudar</i> ('to sneeze')	0% (3)
Controlled process (non-motional)	<i>reír</i> ('to laugh')	0% (8)
Controlled process (motional)	<i>brincar</i> ('to jump')	22% (9)
Existence of state	<i>existir</i> ('to exist')	13% (8)
Continuation of pre-existing state	<i>permanecer</i> ('to stay')	27% (15)
Change of state	<i>nacer</i> ('to be born')	62% (21)
Change of location	<i>salir</i> ('to leave')	69% (117)
Anti-causative	<i>partirse</i> ('to break')	73% (11)

² Bilingual Spanish-English speakers of varying degrees of proficiency were also recorded, but those results are not included here.

One way the interrelationship between IS and verb semantics has been conceived is that the realization of intransitives is determined by the relative ‘newsworthiness’ or predictability of the verb and its argument (Allerton & Cruttenden, 1979; Bolinger, 1954, 1972; Navarro Tomás, 1926). For instance, Allerton and Cruttenden (1979) claim that, in English, the subject in an SV sentence is nuclear stressed when it is more newsworthy than the verb. When the verb is more newsworthy, or the verb and subject are equally newsworthy, the nuclear stress falls on the verb. For example, with ‘empty’ verbs like ‘The *sun*’s shining’ or ‘The *telephone*’s ringing,’ the verb is highly predictable from the subject, as opposed to, e.g., ‘The sun’s *flying*’ or ‘the telephone’s *jumping*.’ Recent experimental work has shown that there is indeed a strong preference for subject stress when the verb is predictable for unergative verbs in German; however, for unaccusative verbs, verb predictability had only a weak effect on the overall preference for subject stress (Verhoeven & Kügler, 2015). Allerton and Cruttenden (1979) also argue that with verbs of (dis)appearance, e.g., *to appear* and *to leave*, the subject is more newsworthy than the verb. These evidently make up a large number of Sorace’s class of change of location verbs. Bolinger (1954) has also claimed that both word ordering and nuclear stress placement are determined by the relative informativity of the subject and the verb in Spanish intransitives, according to a hierarchy Sv > vS > sV > Vs from the subject being the most informative to the least (relative to the verb) (see also Navarro Tomás, 1926).

The other main way this interrelationship has been conceived is that the realization of intransitives is determined by whether or not the argument is a theme (or topic) (Contreras, 1976; Faber, 1987; Féry, 2011; Gussenhoven, 1983; Hatcher, 1956; Irwin, 2012; Kratzer & Selkirk, 2007; Schmerling, 1976). That is, the ISs of (2) and (3) in ‘out-of-the-blue’ contexts are as follows:

(14) [La chica]_θ [*brincó*]_ρ,
 ‘[The girl]_θ [*jumped*]_ρ,’

(15) [Apareció el gato]_ρ,
 ‘[The cat appeared]_ρ,’

The argument goes that even though the discourse context does not establish any part of the utterance as the QUD, the properties of the argument and/or the event do. Where there is a theme (14), this precedes the rheme, as in all the examples in Section 1.1. In the all-rheme case (15), the verb and argument fall in the same information unit, and the nuclear stress preferentially falls on the NP, which in Spanish arguably must be final within the unit (see Contreras, 1976; Nava & Zubizarreta, 2010). This distinction has also been framed in terms of a distinction between ‘categorical’ and ‘thetic’ sentences (e.g., Sasse, 1987), and ‘stative’ and ‘eventive’ sentences (e.g., Gussenhoven, 1983). As has been argued elsewhere, these largely draw on the same factors said to underlie the two information structural configurations, theme-rheme and all-theme, used here (Gussenhoven, 1983; Jäger, 2001; Kratzer & Selkirk, 2007).

Very similar semantic properties to those argued to explain split intransitivity as a semantic-syntactic phenomenon can be argued to explain why some intransitives need a theme in broad focus contexts and others do not. If the argument is dynamically affected by the action of a verb, such as a change of location or state, it is more likely to be new information or information that updates the common ground (Gussenhoven’s 1983 ‘eventive’ sentences); whereas for process verbs the argument is likely to be already established, and hence the theme, while the process itself is the new information. In

experimental work, Hirsch and Wagner (2011) showed that nuclear stress on the verb (i.e., the theme-rheme pattern) was more likely for verbs of disappearance than appearance in English. As they argue, this is consistent with an information structural approach: If something disappears, it is more likely that it was already established in the discourse context, whereas when something appears, it is likely to be new. With regard to the semantic properties of the argument, it is well-established that agents are more likely to be encoded as topics (themes) (e.g., see Givón, 1976). It therefore follows that the theme-rheme pattern should be preferred when the intransitive argument is agentive (Faber, 1987) (for experimental evidence see Hirsch & Wagner, 2011). On the other hand, patients are unlikely to be topics in a discourse, and are therefore more likely to be part of the rheme (Irwin, 2012).

There are only a few previous studies we are aware of which have manipulated IS and semantic verb type in Spanish. Hertel (2003) and Lozano (2006) looked at marking of broad focus and QUD-focus for unergative and unaccusative verbs in a written production study and a rating study of written sentences respectively. Hertel's study involved native Spanish speakers living in the US, and Lozano's native Spanish speakers living in the UK from a variety of countries (and who were hence bilingual with English). They found that VS order was more common/acceptable for unaccusative than unergative verbs in broad focus; however, this preference was far from categorical. QUD-focus largely overrode the effect of verb type, with VS equally common/acceptable under QUD-focus for both verb types. As these were studies of written language, they could not investigate stress. Nava's study (see **Table 1** above) looked at the effect of verb type and the information status of the subject (given/new) in intransitives in oral narrations (see also Zubizarreta & Nava, 2011). However, the main aim of that study was to investigate the extent to which L1 English-L2 Spanish speakers of differing proficiency used VS order compared to monolingual speakers, and hence did not report the interaction of verb type and information status, nor nuclear stress placement in the intransitives. Hence, there is currently a lack of experimental research on how verb type and IS interact in the realization of intransitives in Spanish.

2. Research questions and predictions

The experiment reported below sought to address the following research questions:

- (i) Do IS type (broad focus, QUD-focus, contrastive focus, theme) and verbal semantics (unergative/unaccusative) affect the likelihood of nuclear stress on the subject (versus verb) in Spanish intransitives, and if so, how do these effects interact?
- (ii) Do IS type and verbal semantics affect the likelihood of stress shift versus final subject placement in the case of nuclear stress on the subject, and if so, how do these effects interact?

We investigated these questions through a production experiment involving speakers of Venezuelan Spanish. The experiment involved descriptions of pictures of events in response to oral questions. The events involved either unergative or unaccusative verbs. The questions sought to induce different IS types on the subject. With regard to research question (i), from the literature, we expect unergative verbs in broad focus to be produced sV, and unaccusatives vS. Following the standardly held pattern (for Peninsular Spanish at least), we expect QUD-focus to be realized vS, contrastive focus Sv, and for theme subjects sV. However, if Venezuelan Spanish follows the pattern for other varieties of Latin American Spanish, Sv should be the most common pattern for QUD-focus and contrastive focus, although contrastive focus may be realized through clefts. If IS and

verb type independently influence the realization of intransitives, then we should expect to see the two verb types realized differently in all IS conditions. If, however, the effect of verb type is only seen in the broad focus condition, this is consistent with the view that IS type and verb type in fact have the same underlying basis, so that IS type largely overrides verb type.

With regard to research question (ii), one strand in the literature suggests that final subject placement and stress shift are equivalent across languages, or varieties of a language (such as between Peninsular and Latin American Spanish), e.g., subject final placement in Peninsular Spanish is equivalent to stress shift in Latin American Spanish in marking QUD-focus. Another strand suggests they mark different kinds of focus within a variety, i.e., final subject placement QUD-focus and stress shift contrastive focus. Yet another view is that they convey different levels of informativity. Given this diversity of views, it is difficult to make clear predictions, so this part of the study was exploratory, seeking to see which, if any, factors or interaction of factors, differentially affected the likelihood of final subject placement or stress shift.

3. Method

The method used was a picture description task, involving descriptions of intransitive events where the type of verb (unergative/unaccusative) was varied. A cueing question was used to vary the IS type of the subject noun phrase.

3.1. Participants

The participants were students of Universidad Valle del Momboy, in Valera, Venezuela. There were four male and five female participants. Their average age was 22 years old (min = 19, max = 36). All participants were monolingual native speakers of Spanish and had lived in the area most of their lives. The participants reported normal hearing and normal or corrected to normal sight. They received course credit in recognition of their participation.

3.2. Materials and Design

Five unergative and five unaccusative verbs were used (see **Table 2** for the list of verbs). The verbs were chosen to be from either end of the unergative/unaccusative spectrum (Sorace, 2000): The unergative verbs were all process verbs (uncontrolled and controlled), which were usually produced in SV order in Nava's study (see **Table 1**), while the unaccusative verbs were change of state or location verbs, which showed a high proportion of VS order in Nava's study (see **Table 1**). The verbs also needed to denote actions which were easily picturable, as it was a picture description task. In order to maximize the number of intransitive sentences produced, we decided not to include anti-causative/passive verbs using the *se* particle, as these could be produced as their transitive equivalents (Matte Bon, 1992; Suárez, 2003; Torrego, 1997). The frequency of the verbs was controlled so

Table 2: List of verbs used in the experiment by verb type.

Unergative	Unaccusative
<i>reír</i> ('to laugh')	<i>salir</i> ('to leave')
<i>gritar</i> ('to cry')	<i>aparecer</i> ('to appear')
<i>brincar</i> ('to jump')	<i>nacer</i> ('to be born')
<i>estornudar</i> ('to sneeze')	<i>aterizar</i> ('to land')
<i>bostezar</i> ('to yawn')	<i>desaparecer</i> ('to disappear')

that there was not a significant difference in frequency between the unaccusative and unergative verbs. Frequencies for the items used was calculated using 1900's subsection of the Corpus del Español (Davies, 2002, 100 million words, see the table in the Appendix for the frequencies of each verb). The mean frequency per million words for the unaccusative verbs was 244.14 ($SD = 233.79$) and for unergatives ones was 40.43 ($SD = 50.39$). Raw frequency values were transformed to the Zipf scale. This and all calculations and statistical analyses reported in the paper were done using R (R Core Team, 2017). Lexical frequencies are well known to follow a Zipf scale, so this follows their distribution better. Also the Zipf scale avoids presenting word frequencies that are less than 1 (as in the case of word per million frequencies). Moreover, with the Zipf scale it is not necessary to know the actual number of words in a corpus. Therefore, the use of the Zipf scale facilitates classification between low and high frequency words. In this scale, numbers equal or close to 1 represent low frequency words, numbers close to 6 very high frequency content words, and numbers close to 7 function words (van Heuven, Mandera, Keuleers, & Brysbaert, 2014). The mean for unaccusatives was 5.09 ($SD = 0.71$) and 4.1 ($SD = 0.82$) for unergatives. A poisson regression showed that there was no significant difference in Zipf scale values between unaccusative and unergative verbs, $\beta = -0.1911$, $z = -0.616$, $p = 0.53$.

Two scenes were produced for each verb, on Powerpoint slides. Each scene consisted of the intended subject doing the action of the verb, and the intended verb printed in the top right corner (in infinitive form); see example in **Figure 1** (a description of all the scenes is given in the Appendix). It was decided to include the printed verb to maximize the number of intransitives produced, and try to lessen the variability in the responses, while still allowing participants to choose the syntactic form of their response (which they could not do if reading sentences).

On the slide preceding each scene, there was a sound file embedded which had a question relating to the scene. The sound file was also available as an icon to click in the top left of each scene slide (see **Figure 1**). The questions were said by one of the authors (a male native speaker of Venezuelan Spanish). The question was intended to elicit different IS types on the subject noun, as follows:

- (16) **Broad focus:**
 ¿Qué pasó?
 'What happened?'



Figure 1: Example Powerpoint slide, to prompt, e.g., *la chica brincó* ('the girl jumped').

- (17) **QUD-focus:**
¿Quién brincó?
'Who jumped?'
- (18) **Contrastive focus:**
El joven brincó, ¿es verdad?
'The young man jumped, right?'
- (19) **Theme:**
El chico y la chica se subieron al muro. ¿Qué pasó después?
'The boy and girl climbed up the wall. What happened next?'

The QUD-focus condition always involved a *quién* ('who') or *qué* ('what') question. The contrastive focus condition always involved the participant correcting the subject in the question (which was a plausible alternative). The theme condition always set up a context with two possible referents that could be involved in the scene the participants were to describe. This context sets up the subject as the theme in the participant's response, i.e., it is part of the common ground, and hence the question-under-discussion. Two possible referents were used, as it was found in pilot testing that if only one referent were mentioned in the context, participants would usually omit the subject altogether. Responses consisting of just the verb would not have allowed us to analyse the subject-verb ordering and nuclear stress relationship we were interested in.

There were a total of 80 scene slides, two scenes for each of the ten verbs, in four information conditions. The experiment followed a full within-subjects design, so all participants saw all scenes within all IS conditions. The scenes were divided into eight blocks of ten, with one scene for each verb in each block. There were no fillers. The IS conditions were balanced across blocks according to a Latin Square design. The order of the scenes within each block was pseudo-randomized, so that there were not two scenes with the same verb type or IS type in a row. Two orderings of the blocks were used to counterbalance for order of presentation across participants.

Before the experiment blocks in the Powerpoint presentation there were instructions, followed by three example scenes. These consisted of three intransitives verbs (*sonreír* 'to smile,' *romper* 'to break,' and *ladrar* 'to bark') that were not used in the main experiment, in three different IS conditions (broad focus, QUD-focus, theme). For each an example written response was given (in SV and VS orders for different examples). This was followed by three practice scenes, also involving verbs not used in the main experiment (*llegar* 'to arrive,' *cantar* 'to sing,' and *llorar* 'to cry'), and the same three IS conditions. Participants found the task easy to understand, so this was sufficient in the way of examples and practice.

3.3. Procedure

The experiment sessions were conducted by a male native speaker of Venezuelan Spanish (not one of the authors). The participants did the experiment individually. The recording was carried out in a quiet room using a laptop computer showing the Powerpoint presentation and recording the responses. There were written instructions at the start of the presentation which the experimenter also went through orally. The participants were asked to describe the picture in each slide using the printed verb. The participants were asked to imagine that they were talking to a friend on the telephone, who could not see the picture. They were asked to speak naturally, but to describe each picture using full but simple sentences. The question for each scene played automatically on the slide before the

scene was presented. The participants would then see the picture and respond, although they could choose to click to hear the question again on the slide with the scene before responding. Their responses were recorded using a head mounted microphone directly to hard drive using the Windows Sound Recorder, at a sampling rate of 44100 Hz. The task was self paced and there was no time limit to respond.

4. Results

A total of 720 responses were recorded, 80 sentences from each of the 9 speakers. Out of these, 44 responses were excluded as they were disfluent, including restarts, hesitations, and long pauses between the elements of sentence (e.g., *la chica/pause/estornudó*). As the study was concerned with intransitives, responses with a different syntactic type were excluded. These included 17 single words (e.g., *estornudó*, where the complete response expected would be *La chica estornudó* ‘The girl sneezed’). Three responses were discarded as they were transitive sentences. Finally, 5 responses were excluded as they contained prepositional phrases (e.g., *el hombre sale del bus*, ‘The man gets off the bus’). This left a total of 651 sentences for analysis.

Below we review the coding of the responses for syntactic form and nuclear stress position. We then set out the form of the responses (word order and nuclear stress position) by the IS type and verb type condition, and present a regression analysis showing the factors that affect the response form. Finally, we discuss responses of less common syntactic types in more detail.

4.1. Syntactic coding of responses

The majority of the responses were simple intransitives sentences, SV or VS ($n = 588$), followed by cleft sentences ($n = 37$), and sentences with aspectual phrases ($n = 26$). Cleft sentences were those in which a subordinated clause had been used to focalize an element of the sentence (e.g., *el que nació fue el niño* ‘The one that was born was the boy’). Aspectual phrases were those containing the constructions *acaba de* (‘have just’) or *empezar a* (‘started to’) which function as verb modifiers in Spanish. These were coded separately, as stress shift is noted to be less likely in longer sentences with material between the subject and verb (Ladd, 2008).

As can be seen in **Table 3**, almost all of the cleft sentences occurred in the contrast information condition, and almost all of the sentences with aspectual phrases occurred in the theme condition, although simple sentences were much more common than either type in these conditions. All but one of 26 sentences with aspectual phrases were SV, and 33 out of the

Table 3: Percentage of sentences with each sentence type by IS type and verb type.

IS Type	Verb Type	AspPs	Cleft	Simple	N
broad	unerg	6 (7%)	1 (1%)	78 (92%)	85
	unacc	1 (1%)	0 (0%)	78 (99%)	79
theme	unerg	13 (16%)	0 (0%)	66 (84%)	79
	unacc	2 (3%)	0 (0%)	70 (97%)	72
QUD-focus	unerg	0 (0%)	1 (1%)	89 (99%)	90
	unacc	1 (1%)	0 (0%)	82 (99%)	83
contrast	unerg	1 (1%)	19 (23%)	63 (76%)	83
	unacc	2 (2%)	16 (20%)	62 (78%)	80
Total		26 (4%)	37 (6%)	588 (90%)	651

37 cleft sentences were VS. Since there were relatively few of each type, in the remainder of the analyses (apart from Section 4.6), the sentences with aspectual phrases and cleft sentences were grouped with the simple intransitive sentences according to the order of the subject and main verb. This was necessary as low cell counts are problematic for the statistical models used in Section 4.4. We will discuss these sentence types further in Section 4.6, where it will be shown that this grouping is justified in terms of the patterns found for these sentences.

The responses were also coded for tense, to see if this had an effect on nuclear stress or word order. Most responses were in the past tense (401 simple past, 5 past progressive) and 235 were in the present tense. No distinctive pattern was observed in the use of tense according to IS type or verb type.

4.2. Nuclear stress coding of responses

The responses were coded for the position of the nuclear stress by the three authors using Praat (Boersma & Weenink, 2016). As discussed in Section 1.1, the position of the nuclear stress is the main prosodic cue to the position of focus, and the main prosodic reflex of the unergative/unaccusative distinction, that has been found in previous studies of Spanish for transitive and intransitive sentences. We identified nuclear stress according to criteria compatible with the Spanish Tones and Break Indices (Sp_ToBI) annotation system (Aguilar, de la Mota, & Prieto, 2009; Hualde & Prieto, 2015). Tonal accent type was not annotated. As discussed in Section 1.1, tonal accent type may be relevant to distinguishing between broad focus and QUD-focus in Spanish; however, this is not directly relevant to the research questions in this study. Each response was coded for whether the subject or the verb sounded more prominent, based on auditory perception and the visual display of acoustic information. Annotators could code both the subject and verb as nuclear stressed, for cases where there was clearly a strong phrasal stress on both the subject and the verb, both of which were equally prominent; however, this was used as little as possible.

As they were short, the vast majority of the utterances were produced as a single intonation phrase with a L% boundary tone. In a minority of cases, there was a slight perception of a break after the initial constituent (subject or verb), consistent with a possible H- phrase tone at break index 3 within the Sp_ToBI framework (Aguilar et al., 2009). However, these were not frequent enough to separate out in the analysis.

There were a total of 252 sentences coded with nuclear stress on the initial constituent, 347 coded as final, and 52 with phrasal stress on both the initial and final. As the double stress cases were relatively infrequent, and it would significantly complicate the statistical analysis to have three stress levels (i.e., not binomial), the double stress sentences were dropped from the analysis.

Different participants were coded by different authors, and checked by at least one of the other authors. Two of the three authors are Spanish-speaking; the other author is an expert in prosodic annotation in different languages. Near the start of the annotation process, all three annotators independently coded a sample of 65 sentences, from four of the speakers. Of these, 13 were discarded as being disfluent (i.e., no verb present or a long pause between words) or transitive. Agreement between the annotators was measured for the remaining 53 sentences as to whether each sentence had initial or final nuclear stress (not including double accent cases, i.e., stress on the subject and verb, as these were not included in the main analysis). The agreement rate between the three coders was 82.7% ($N = 53$, $\kappa = 0.697$, $z = 8.71$, $p < .001$). Fleiss, Levin, and Myunghee (2004) consider kappa of 0.41 to 0.75 'fair to good.' Cases of disagreement in this sample were discussed, and then the rest of the samples were independently coded, and checked by at least one of the other authors. When cases of disagreement occurred, these discussed by all three authors. In some cases, a fourth, independent Spanish-speaking listener was consulted.

4.3. Acoustic analysis of nuclear stress coding

In order to confirm that the nuclear stress coding was based on underlying differences in the phonetic prominence of the subject and verb in the responses, we analysed a number of acoustic correlates of prominence in the data, to see whether in sentences annotated as having initial nuclear stress, the initial content word was relatively more prominent than in sentences annotated as having final nuclear stress. Using a Praat script, for the subject and verb in each sentence, the values for word and syllable duration, intensity, maximum F0, mean F0, as well as the time alignment of the peak F0 relative to the lexically stressed syllable, were extracted.

Tables 4–7 show the values for key correlates of prominence in the initial and final content word (subject or verb) in the response sentences. As can be seen in **Table 4**, in sentences coded as having initial nuclear stress, the initial word has considerably higher maximum F0 than the final. In sentences coded as having final nuclear stress, the final word has slightly higher maximum F0 than the initial; this relatively smaller difference can be attributed to declination. **Table 5** shows that in sentences coded as having initial nuclear stress the first lexically stressed syllable is relatively longer than in sentences coded as having final nuclear stress; although the second lexically stressed syllable is always longer in absolute terms (this can be attributed to final lengthening). **Table 6** shows there is no clear difference in intensity between initial and final nuclear stress. **Table 7** shows the peak in the first word is later if it is nuclear stressed. The F0 and duration measures are therefore consistent with the coded prominence difference.

Table 4: Maximum F0 value (in Hertz) during the lexically stressed syllable in the first and second content words in response sentences.

Stress Position	F0.1	sd.1	F0.2	sd.2	N
initial	223.28	67.86	200.04	74.85	252
final	210.98	65.39	210.04	74.59	347

Table 5: Average duration values (in ms) for the lexically stressed syllable in the first and second content words in response sentences.

Stress Position	Duration1	sd1	Duration2	sd2	N
initial	200.06	0.06	249.97	0.07	252
final	198.68	0.08	266.11	0.07	347

Table 6: Average values of intensity (in dB) during the lexically stressed syllable in the first and second content words in response sentences.

Stress Position	Intensity.1	sd.1	Intensity.2	sd.2	N
initial	75.88	10.68	72.24	10.27	252
final	75.56	11.54	72.18	11.72	347

Table 7: Average values delay (in ms) of F0 peak in the first and second content words in response sentences.

Stress Position	Delay.1	sd.1	Delay.2	sd.2	N
initial	0.76	0.53	0.38	0.34	252
final	0.66	0.53	0.43	0.32	347

In order to test whether sentences coded as initially versus finally nuclear stressed could be reliably distinguished based on the acoustic properties of the initial and final content words, we carried out a classification analysis using decision trees.

Decision tree models can be applied to categorical and continuous variables. They are non-parametric methods suitable for non-normal distributions and are not affected by outliers. This type of analysis requires less data cleaning, and does not require normalizing or transformation of continuous variables. A classification tree model recursively splits samples using a series of criteria. A value of a variable is selected and samples are divided into groups, by whether they are above or below this value. Subsequently, this process is repeated using a different variable or a different value of variables already used. Further splitting stops when the remaining samples are homogenous enough.

A classification tree was built to predict the classification of each sentence as initially or finally stressed using the R package *rpart* (Therneau, Atkinson, & Ripley, 2014). The position of the nuclear stress (initial or final) was predicted using the acoustic variables discussed above as well as the categorical variable *Sex*, the speaker sex. Note that we ran these models using raw F0 values, and transformed semitone units. We obtained better model fit with the raw F0 values, and hence report these. First a model was fit with a complexity parameter of 0.001. This model was then optimized (pruned) using a complexity parameter of 0.013 (for details on fitting regression trees see Therneau et al., 2014). **Figure 2** presents the classification tree obtained in the final model. Nodes on this figure show the name of the variable and the value used to split the samples. Options to the left of a node indicate that the sample meets the criteria of the node, while options to the right indicate the sample does not. The terminal nodes (also called leaves) in the graph show the proportion of correct classifications in that node and the percentage of observations in that node.

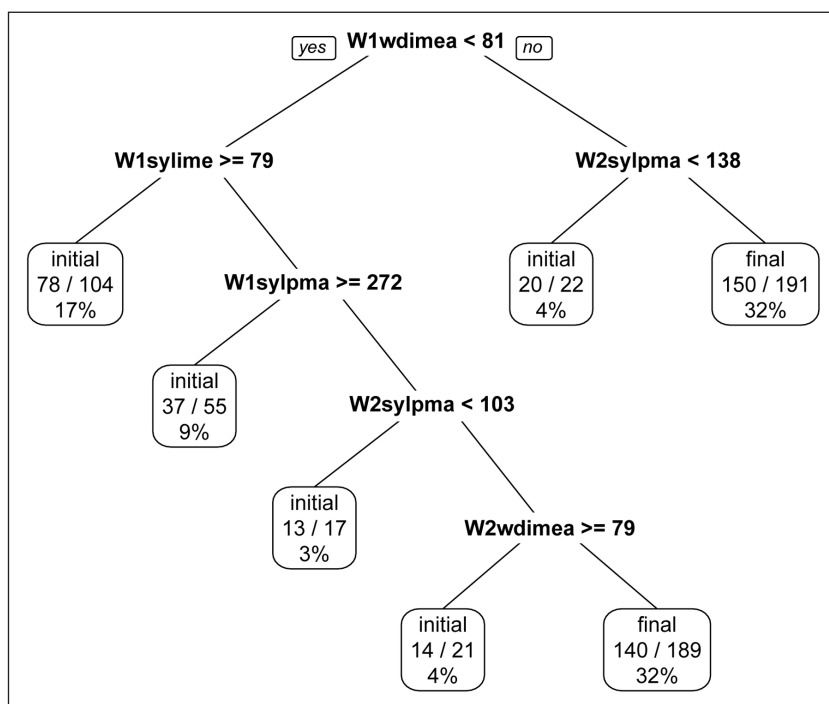


Figure 2: Classification tree for stressed word position (initial versus final). Nodes represent the variables used for classification. The figures in each leaf represent the number of corrected classified cases over the number of observations in that node, and the percentage of the data represented by that node.

The percentage of correct classification obtained with this model was 75.5%. The model was more accurate classifying finally nuclear stressed responses (9.52% misclassified) than initially stressed ones (15.03% misclassified). These results indicate that there is a good relationship between the acoustic cues and the nuclear stress coding, and that therefore the stress annotation is reliable.

4.4. Responses by IS type and verb type

Table 8 shows the form of the responses by IS type and verb type condition. As above, SV and VS show the order of the subject and verb, and the capital letter shows the position of the nuclear stress (e.g., Sv is initial stress). As discussed above, double stressed sentences were omitted from the analysis. There were only 13 cases where the verb was nuclear stressed in verb-subject order, i.e., Vs pattern (out of 99 VS sentences). As cells with counts less than 10 are problematic for statistical modelling (see Courvoisier, Combescure, Agoritsas, Gayet-Ageron, & Perneger, 2011; Hosmer & Lemeshow, 2000), we grouped these with the other verb-subject order sentences in the analysis, so the vS column shows all verb-subject order sentences.

Table 8 shows that the vast majority of sentences were produced in subject-verb order. Of the two strategies for stressing the subject, stress shift (i.e., Sv) was more common than final subject placement (i.e., vS) over all conditions except for broad focus unaccusatives. Among the IS conditions, contrast appeared to have the largest effect on response form, i.e., nuclear stress placement and word order (compared to broad focus), with 21% sV responses (the assumed default). QUD-focus appears to have a similar effect to contrast, although less strong, with a greater proportion of sV responses. The theme condition was similar to broad focus, although with very few vS realizations. As there were a number of low or zero counts in the theme condition, which are problematic for statistical modelling, the broad focus and theme conditions are grouped in the models below. As discussed in Section 1.1, these are expected to be similar in realization.

Table 8: Form of the response (word order and nuclear stress position) by IS type and verb type.

IS	Verb Type	sV	Sv	vS	N
broad	unerg	70 (88%)	6 (8%)	4 (5%)	80
	unacc	37 (54%)	13 (19%)	19 (28%)	69
theme	unerg	66 (88%)	9 (12%)	0 (0%)	75
	unacc	53 (78%)	10 (15%)	5 (7%)	68
QUD-focus	unerg	45 (56%)	26 (32%)	10 (12%)	81
	unacc	32 (42%)	25 (33%)	19 (25%)	76
contrast	unerg	18 (24%)	38 (50%)	20 (26%)	76
	unacc	13 (18%)	42 (57%)	19 (26%)	74
broad		107 (71.8%)	19 (12.8%)	23 (15.4%)	149
theme		119 (83.2%)	19 (13.3%)	5 (3.5%)	143
QUD-focus		77 (49.0%)	51 (32.5%)	29 (18.5%)	157
contrast		31 (20.7%)	80 (53.3%)	39 (26.0%)	150
	unerg	199 (63.8%)	79 (22.4%)	34 (10.9%)	312
	unacc	135 (47.0%)	90 (31.4%)	62 (21.6%)	287
Total		334 (56%)	169 (28%)	96 (16%)	599

Sentences with unaccusative verbs were more likely to be realized with subject stress than unergative verbs (see **Table 8**). Subject stress was more likely to be realized through stress shift than final subject placement. The two verb types were the most distinct in the broad focus condition, more similar in the QUD-focus and theme conditions, while there seems to be no difference between unaccusative and unergative verbs in the contrastive focus condition.

4.5. Modelling the effects of IS type and verb type

We used nested mixed-effect logistic regression modelling for the analysis of the effect of IS type and verb type on the response form (sV versus Sv versus vS). This seemed the best approach given a repeated measures experiment design and a multinomial dependent (Hilbe, 2009; Hosmer & Lemeshow, 2000). Two nested mixed-effects logistic regression models were fitted using the R package *lme4* (Bates, Mächler, Bolker, & Walker, 2015). The first one regressed response form sV (n = 334) and other (a dummy variable for vS and Sv forms, n = 265), while the second model regressed response forms Sv and vS. Both models included response form as the dependent variable and an interaction between IS type and verb type as fixed factors. The models also included random effects for participant and stimulus item. This grouping of the responses directly reflects the research questions: The first model tested the factors that affect the likelihood of nuclear stress on the subject versus the verb (question i); while the second model the factors that affect the likelihood of stress shift versus final subject placement (question ii).

The overall effects of nested models was calculated obtaining significant effects for IS type ($\chi^2 = 114.079(2)$, $p < .001$), verb type ($\chi^2 = 18.166(2)$, $p < .001$), and the interaction between these factors ($\chi^2 = 10.901(4)$, $p < .05$). The analysis of the results for each nested model will be discussed separately.

The first model contrasted verb stress responses (sV) against subject stress (i.e., Sv and vS grouped together). An ANOVA confirmed that there were significant effects of IS type ($\chi^2 = 27.57(2)$, $p < .001$), verb type ($\chi^2 = 14.83(1)$, $p < .001$), and their interaction ($\chi^2 = 9.50(2)$, $p = .008$) in this model. The fixed effects for this model are shown in **Table 9**. **Figure 3** shows the estimated probabilities from the model of a nuclear stressed subject by IS type and verb type, produced using the R package *effects* (Fox, 2003). As can be seen, the likelihood of a nuclear stressed subject is highest in the contrast condition, lowest in the broad focus/theme condition, with QUD-focus in between. The two verb types are clearly distinct in the broad focus/theme condition, with the likelihood of a nuclear stressed subject lower for unergative verbs than unaccusative verbs. However, in the contrast condition, there is no difference between the verb types, with a nuclear stressed subject equally likely for both. The QUD-focus condition is again in between.

Table 9: Fixed effects estimates (in logits) for the first nested model (dependent verb versus subject stress, verb is the reference level). The intercept is broad focus/theme, unergative verb. Participant and Item are the random effects.

	Estimate	SE Error	z value	Pr (> z)
(Intercept)	-5.59	0.95	-5.88	0.00
IS=contrast	3.66	0.66	5.54	0.00
IS=QUD-focus	2.13	0.67	3.17	0.00
VerbType=unacc	2.64	0.62	4.27	0.00
IS=contrast:VerbType=unacc	-2.37	0.78	-3.04	0.00
IS=QUD-focus:VerbType=unacc	-1.08	0.81	-1.34	0.18

Planned comparisons were run to test which levels of the interaction were significantly different from each other using the R package *multcomp* (Hothorn, Bretz, & Westfall, 2008), including only the comparisons relevant to the research questions. In order to run the comparison, the LME model was rerun with the interaction between IS type and verb type as a single factor. Results are shown in **Table 10**. The comparison shows that all three IS types are significantly different from one another for unergative verbs. For unaccusative verbs, only the broad/theme and contrast conditions are significantly different. For the comparison of IS types across verb types the estimates are significantly different in the broad focus/theme condition between unergative and unaccusative verbs, but not in the contrast condition, while in the QUD-focus condition verb type is just significant.

The second nested model was fitted to the responses in which the subject word was nuclear stressed (169 Sv and 96 vS); that is, this model looked at the conditions that would produce final subject placement (as opposed to stress shift). An ANOVA showed that verb type was significant in this model ($\chi^2 = 5.94(1), p = .015$), but not IS type ($p = 0.30$) nor their interaction ($p = 0.21$). The non-significant effects could not be excluded from this model, however, as IS type and the interaction were significant in the overall nested model, as reported above. The fixed effects of this model are shown in **Table 11**. As can be seen, although verb type was significant overall, in the model including the interaction, none of the fixed effects were significant. There was no significant effect of IS type and

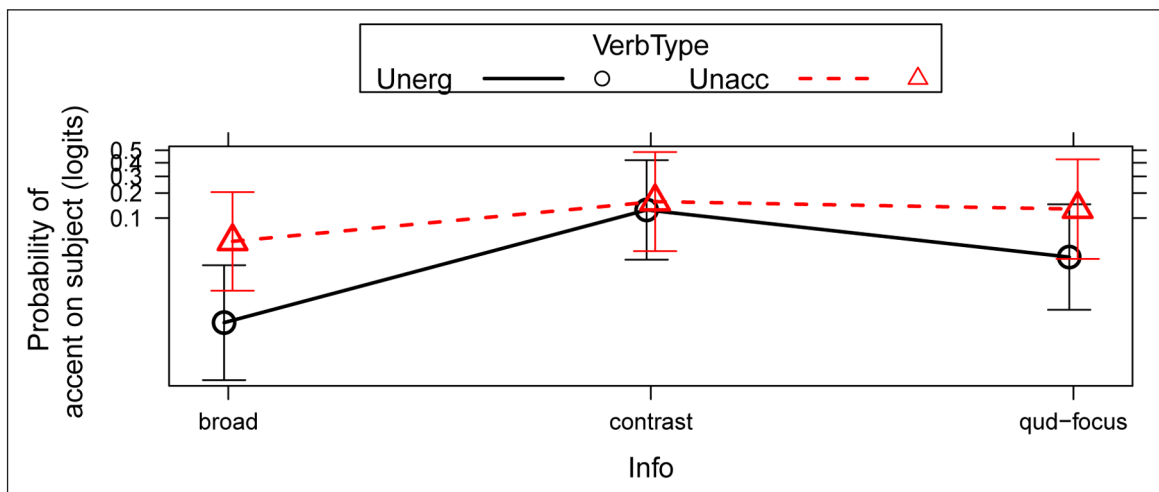


Figure 3: Probability of nuclear stress on subject by IS type and verb type.

Table 10: Planned pair-wise comparisons. Estimates (in logits) for the first nested model.

	Estimate	SE	z value	Pr (> z)
QUD-focus.Unerg – broad.Unerg	2.13	0.67	3.17	0.01
contrast.Unerg – broad.Unerg	3.66	0.66	5.54	0.00
QUD-focus.Unerg – contrast.Unerg	-1.53	0.55	-2.79	0.04
QUD-focus.Unacc – broad.Unacc	1.05	0.46	2.26	0.16
contrast.Unacc – broad.Unacc	1.29	0.47	2.74	0.05
QUD-focus.Unacc – contrast.Unacc	-0.24	0.49	-0.49	0.99
broad.Unacc – broad.Unerg	2.64	0.62	4.27	0.00
QUD-focus.Unacc – QUD-focus.Unerg	1.56	0.56	2.76	0.04
contrast.Unacc – contrast.Unerg	0.27	0.50	0.54	0.99

Table 11: Fixed effects estimates (in logits) for the second nested model (dependent Sv versus vS, Sv is the reference level). The intercept is broad focus/theme, unergative verb. Participant and Item are the random effects.

	Estimate	SE	z value	Pr (> z)
(Intercept)	-1.93	1.37	-1.41	0.16
IS=contrast	-0.12	1.02	-0.12	0.91
IS=QUD-focus	-1.46	1.17	-1.25	0.21
VerbType=unacc	1.54	1.00	1.54	0.12
IS=contrast:VerbType=unacc	-0.90	1.17	-0.77	0.44
IS=QUD-focus:VerbType=unacc	0.97	1.31	0.74	0.46

verb type, or the interaction of these, on the likelihood of final subject placement as opposed to stress shift. Planned comparisons are not reported for this model, as this was not appropriate given the fixed effects were not significant.

4.6. Clefts and sentences with aspectual phrases

As reported in Section 4.1, a small proportion of the responses were clefts or sentences with aspectual phrases (*acaba de/empezar a*), rather than simple intransitives. These were too infrequent to be separated out in the statistical analysis above, but are discussed further here.

As shown in **Table 3**, all but two of the cleft sentences were produced in the contrastive focus condition, as would be expected based on previous findings (see Section 1.1); although simple intransitives were much more common in this condition. Nearly all were vS, i.e., these were predominately pseudo-clefts (cf. Section 1.1). There appeared to be no effect of verb type. All but three of these cleft sentences were produced by two speakers. The choice of cleft versus other means of nuclear stressing the subject appears to be down to speaker choice.

As was also shown in **Table 3**, over half of the sentences with aspectual phrases were produced in the theme condition, with most of the rest in the broad focus condition, although simple intransitives were much more common in both conditions. They also seem to be more common with unergative verbs than unaccusative. Nearly all were sV. The majority of these (62%) were produced by one speaker (a different speaker to the two producing the most clefts). Therefore, although there is a clear association of the use of aspectual phrases with the theme condition, their use is largely idiosyncractic to the speaker. To our knowledge, an association between marked themes and the use of aspectual phrases in Spanish has not been noted before. This could be worth following up in future research.

5. Discussion

With the experiment reported here, we sought to address two main research questions. The first was whether IS type and semantic verb type affect the likelihood of subject stress (i.e., final subject placement or stress shift) in Spanish intransitives, and if so, how these interact. The results of the statistical model showed that IS type (i.e., broad focus/theme, QUD-focus, contrastive focus) and verb type (unaccusative, unergative) do both significantly affect the likelihood of nuclear stress on the subject, and there is an interaction between these effects. In the broad focus/theme condition, verb stress is more likely than subject stress. QUD-focus increases the likelihood of subject stress, and with contrastive focus subject stress is more likely. In the broad focus condition, unergative

verbs are more likely to have verb stress; with unaccusative verbs, the likelihood of subject stress increases. In the QUD-focus condition the difference between the verb types is much smaller, with subject stress somewhat more likely for unaccusative verbs. In the contrastive focus condition, there is no difference between unergative and unaccusative verbs. Likewise, the differences between unaccusative and unergative verbs in the theme condition was very small (see **Table 8**), although this could not be tested in the statistical model because of low cell counts. These results are consistent with the proposals outlined in Section 1.2.2 that verb type is epiphenomenal to IS, i.e., the realization of unergatives is only clearly different to unaccusatives in the case of broad focus, it is much weaker in the case of QUD-focus, and disappears with contrastive focus.

The second research question was about the relationship between final subject placement and stress shift in Spanish. Are these equivalent in terms of the factors manipulated in the experiment? The results of the statistical model suggest that these are equivalent, at least in terms of the factors manipulated in this experiment. There was no effect of IS type or verb type on the likelihood of stress shift as opposed to final subject placement.

In relation to the findings for both research questions, it should be acknowledged that the sample size in this study was relatively small, with a relatively small number of speakers (nine). It may be that there is more variability in the realization of intransitives in relation to IS type and verb type than was captured in this sample. Further, with the sample size, we were unable to fully investigate the role of more infrequent structures, such as clefts, in marking IS.

The results of this experiment include a number of unexpected results in relation to standard accounts of IS marking in Spanish, although they are more in accord with recent experimental studies. There is little evidence for systematically different ways of marking QUD-focus and contrastive focus, e.g., QUD-focus by final subject placement, and contrastive focus by stress shift, as claimed by Zubizarreta (1998) and others (see Section 1.1). Rather, both QUD-focus and contrastive focus are marked with nuclear stress on the subject, most commonly through stress shift. This is in line with experimental studies on focus marking in other varieties of Latin American Spanish, which found that stress shift was the most common means of focus marking (see Section 1.1), so this could be a dialectal difference from standard Peninsular Spanish. QUD-focus and contrastive focus seem to be largely distinguished by the extent to which they are marked at all: In these data contrastive focus was marked by subject stress in 80% of cases, QUD-focus in 55% of cases. Clefts were more likely to be used with contrastive focus; however, these were a minority of contrastive foci cases, and were mostly from two speakers. This is different from other recent studies of contrastive focus in transitive sentences, e.g., in Argentinian Spanish, which showed a greater proportion of clefts marking contrastive focus (Gabriel, 2010, see Section 1.1). It was also somewhat unusual that these were almost all pseudo-clefts, rather than simple clefts (although both have been previously found to mark contrastive focus; see Section 1.1). The difference between QUD-focus and contrastive focus found in these data fits well with the IS model being used here (see Section 1.1). In both the QUD-focus and contrastive focus conditions, the subject is a rhematic focus; however, contrastive focus carries the extra information that the subject is a contrast. Therefore, contrastive focus is more likely to be marked as it is more informative (Calhoun, 2009, 2010a). In regard to the theme condition, the findings here support the existing literature on Spanish, that speakers strongly prefer to put given information, i.e., thematic, before new (e.g., Zubizarreta, 1994, see Section 1.1).

The results presented here are difficult to reconcile with the standard assumption in the literature that semantic verb type primarily affects word ordering in Spanish,

with unergative verbs usually realized in subject-verb order, and unaccusative verbs verb-subject (see Section 1.2.1). In numerical terms, verb type had a fairly weak effect on word order or nuclear stress placement (see **Table 8**). In broad focus, where the effect of verb type should be strongest, around half of sentences with unaccusative verbs were realized with nuclear stress on the subject, compared with around 20% with unergative verbs. This is a considerably smaller difference between the verb types than found in previous experimental studies, which also involved Latin American varieties of Spanish (see Section 1.2.2). This could be due to task differences, e.g., written versus spoken tasks, narratives versus question-answer. This needs further investigation. Overall stress shift was more common than final subject placement, and verb type did not have a significant effect on this preference (as shown in the second nested model; see Section 4.5). Previous theoretical and experimental work does not note stress shift as a means of marking unaccusativity in Spanish, though it is noted in other languages including English and German (see Section 1.2.2). It seems that, to the extent that semantic verb type is separable from IS, unaccusativity is associated with subject stress, which can be realized through word ordering or stress shift.

While the results here cannot unequivocally show that the unergative/unaccusative divide is epiphenomenal to IS, they are consistent with this view. As reviewed in Section 1.2.2, there have been a range of proposals in the literature that essentially claim that the semantic factors said to underlie split intransitivity actually influence the IS type of the subject. That is, in the ‘unergative’ pattern the subject is the theme, while in the ‘unaccusative’ pattern it is part of the rheme. In the all-rheme case the subject is nuclear stressed. As discussed above, broad focus sentences with unaccusative verbs were considerably more likely to be realized with subject stress than unergative verbs. This can be explained within these proposals. The unaccusative verbs used in the experiment all involved a change of state or location for the subject referent, while the unergative verbs were process verbs where the subject was not dynamically affected (see Section 3.2). As argued in Section 1.2.2, when argument referents are dynamically affected, they are more likely to be conceived by the speaker as part of the rheme, or the information that updates the common ground, as their state changes; whereas for process verbs, the argument referent is more likely to be established in the discourse, and does not change, so is more likely to be conceived as the theme. These associations are not deterministic, hence the variation found in broad focus sentences of both verb types, but they do influence speaker choices. Further, if these proposals are correct, then the effect of verb type should be able to be largely cancelled out by manipulating the discourse context to try to force a theme or rheme interpretation of the subject. This is what was found here: In the theme condition, where the context strongly implies the subject is a theme, the large majority of sentences with both unergative and unaccusative verbs were realized sV, i.e., an underlying theme-rheme structure. Likewise, in the contrastive focus condition, where the context strongly implies the subject is rhematic, the large majority of sentence of both verb types were realized with subject stress. In the QUD-focus condition, sentences with unaccusative verbs were more likely than those with unergative verbs to be realized with subject stress, although the difference was fairly small. In this case, the QUD-focus and the semantics of the verb both reinforce the rhemeness of the subject, and hence the likelihood it needs to be marked with subject stress. It could also be argued that, as unaccusativity and QUD-focus/contrast both have the same effect on realization in intransitives, these are independent, but they overlap in the case of unaccusative QUD-focus or contrast. This cannot be ruled out on the basis of these results; however, this interpretation seems less explanatory. In order to test this further, in future research, it would be interesting to look

at whether the other claimed reflexes of split intransitivity, such as auxiliary selection, are also sensitive to IS. If they are, this would further support the view that these are not independent.

In these results, there were no functional distinctions found between stress shift and final subject placement, as mechanisms for nuclear stressing the subject. As discussed in Section 1, it has long been demonstrated that these are equivalent across languages, or in the case of Spanish across varieties of a language, e.g., both focus and unaccusativity (to the extent these are independent) are marked with stress shift in some languages/varieties and final subject placement in others. However, there is much less discussion of the relationship between stress shift and final subject placement within a language or variety. In these data, stress shift was the more frequent means of rhematic focus marking; however, final subject placement was also used. The question of what functional distinction, if any, there is between these remains open. One possibility is the claim in Bolinger (1954) that these are distinguished by the relative informativity of the subject and the verb according to the hierarchy $Sv > vS > sV > Vs$ (from most to least relatively informative subject; see Section 1.2.2). If this was the case we might expect to see more Sv than vS realizations with contrastive focus, relative to QUD-focus, as contrast is more informative. However, the proportion of Sv and vS responses in each condition was similar. There were also very few Vs realizations in these data, although the informativity of the verb was not manipulated, so the appropriate context may not have occurred. This would be an interesting question to explore in future research, e.g., using corpus data where many more potential functional distinctions could be investigated.

The apparent equivalence of stress shift and final subject placement in Venezuelan Spanish in signalling IS raises deeper questions of how and when these are constructed in the language production process. The results here fit with evidence from other languages that IS influences both morphosyntactic properties and prosodic structure, and hence must be planned before these are generated (e.g., see Fanselow, 2016; Schultze-Berndt & Simard, 2012). These results suggest that verbal semantic factors, thought to directly influence construction of syntactic structure, in fact influence the construction of IS, through the assignment of theme-rheme structure to an event; this in turn influences syntactic structure (cf. discussion above and Section 1.2.2). Further, these results suggest that the syntactic construction and word ordering are planned in conjunction with the overall prosodic structure, to explain why these speakers apparently treat stress shift and final subject placement as equivalent. This fits with a language production model outlined in Calhoun (2010b), where it was proposed that high-level prosodic structure, including placement of nuclear stress, must be part of grammatical encoding, as this interacts with the formation of morphosyntactic structure (see also Keating & Shattuck-Hufnagel, 2002). In standard language production models, prosodic structure generation is assumed to be part of the later phonological encoding process (e.g., Bock & Levelt, 1994; Levelt, 1989). While developing these proposals further is beyond the scope of this paper, these would be interesting avenues for future research.

In conclusion, this study looked at the complex interaction of IS, semantics, syntax, and prosody in sentence production, looking specifically at the production of intransitives in Venezuelan Spanish. To our knowledge, the interaction of IS and verbal semantics had not been looked at in spoken Spanish before. Nuclear stress on the subject was the most common means of marking contrastive focus, QUD-focus, and, to the extent that it is separable from these, unaccusativity. The results of this study also support long-standing proposals, and more recent experimental evidence, that verbal semantics traditionally encoded in the unergative/unaccusative divide in fact influence speakers' formation of IS, rather than influencing syntactic structure directly. The results also suggested that stress shift and final subject placement are equivalent within Venezuelan Spanish, so these

seem to form an integrated system. As discussed above, this has implications for language production models, which need to take more seriously that syntactic construction choice and prosodic structure are closely co-ordinated.

Additional File

The additional file for this article can be found as follows:

- **Appendix.** Details of experiment stimuli. DOI: <https://doi.org/10.5334/labphon.65.s1>

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Competing Interests

The authors have no competing interests to declare.

Author contributions

The idea for this study came out of a student project by the third author, Ana Olssen. All three authors contributed to the experiment design and data analysis. The second author, Erwin La Cruz, carried out most of the statistical analysis. The first author, Sasha Calhoun, drafted most of the paper, with contributions by the second author.

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
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