

Transfer in Vietnamese-English bilingualism:  
Prosody effects in the interpretation of relative clauses

By  
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**Abstract**

This thesis examined the interpretation of ambiguous sentences with relative clauses (RCs) in English as a second language (L2). In *Jimmy met the brother of the engineer who has a smart dog*, the RC *who has a smart dog* can refer to either the first noun phrase (NP1; *the brother*) or the second one (NP2; *the engineer*). Previous research has shown that, although L2 learners of English often transfer their interpretation for these sentences from their first language (L1), they can use prosodic cues, such as pauses, to infer their intended meaning. However, most of the previous studies focused on L1-L2 pairings with different default interpretation preferences. It is unclear what learners' interpretations are when L1 and L2 have the same default interpretation preference. This thesis addresses this gap by examining how Vietnamese learners of English interpret RCs, using a sentence interpretation task with auditory stimuli. In both Vietnamese and English, the default interpretation is the one where the RC refers to NP2. In the task, participants (16 English native speakers, 15 Vietnamese learners of English) were presented with ambiguous sentences containing RCs recorded in three ways: with no pauses, with a pause after NP1, or with a pause after NP2. While a pause after NP1 is more likely to yield the interpretation that the RC attaches to NP2, a pause after NP2 is more likely to yield the interpretation that the RC attaches to NP1. The results indicate that English native speakers and advanced learners, but not intermediate learners, showed sensitivity to the use of pauses for disambiguation. For sentences with no pauses, both native speakers and learners preferred the interpretation where the RC refers to NP2, consistent with the literature.

April 24<sup>th</sup>, 2023

# Transfer in Vietnamese-English bilingualism: Prosody effects in the interpretation of relative clauses<sup>1</sup>

Chau (Clara) Tran

## I. Introduction

In the English language, we can observe some ambiguities when interpreting the meaning of sentences. One of those would be the ambiguous attachment of a relative clause (RC) to the noun it modifies. This is the case of sentences with the structure NP1 of NP2 RC, where NP corresponds to noun phrase, as exemplified in (1).

(1) *Jimmy met the brother of the engineer who has a smart dog.*

The sentence in (1) has two possible interpretations: the RC *who has a smart dog* can modify either NP1 (*the brother*) or NP2 (*the engineer*). The interpretation in which the RC is attached to the second NP is referred to as low attachment (LA), whereas attaching the RC to the first NP is called high attachment (HA).

By default, English native speakers show a slight preference for LA (Cuetos & Mitchell, 1988). However, preferences may be affected by the presence of prosodic cues, when such ambiguous sentences are presented auditorily to a listener (Fernández, 2005; Goad et al., 2021). For example, if we put a break (i.e., a pause) after NP2, we can predict there will be a higher probability of HA

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<sup>1</sup> I would like to express my greatest gratitude to my supervisor – Dr. Natália Brambatti Guzzo for her invaluable companionship and her precious feedback. Special thanks to Hannah Markert for recording the stimuli and Minxuan “Jo” He for helping with recruiting participants. I am also grateful for receiving technical support with R from Song Hà Phó and Shaun Nguyễn. I would like to acknowledge all the participants in my study for taking part in my experiment. Thanks to Dr. Egor Tsedryk for reading the thesis. And lastly, I would be remiss if I did not mention my family and friends, whose mental support and belief in me has kept my motivation going.

interpretations (e.g., ‘the brother has a smart dog’ in the sentence above), since now the RC forms a prosodic constituent (an intonational phrase, following Prosodic Theory; Nespor & Vogel 1986) on its own. In contrast, listeners may prefer LA when the break is placed after the NP1 (‘the engineer has a smart dog’), since now the NP2 and the RC form an intonational phrase together.

In this thesis, I report the results of a sentence interpretation task investigating the extent to which the use of prosodic cues (specifically, breaks) influences speakers’ interpretations of ambiguous relative clauses. In particular, this study examines whether native speakers and second language (L2) learners of English are sensitive to these cues. As will be detailed below, this study focuses on L2 learners of English whose first language is Vietnamese.

## II. Past studies

### 1. *Interpretation of relative clauses*

The interpretation of ambiguous sentences with RCs has been examined from several perspectives. Previous research on RC attachment has shown the effect of silent reading by including orthographic stimuli in their sentence interpretation tasks. Fodor (2002) proposed the Implicit Prosody Hypothesis, according to which people will assign mental rhythm (i.e., implicit prosody) to a syntactically ambiguous construction. In other words, unless there are other cues that help with disambiguation, readers will use their default prosodic profile from their first language (L1). This proposal can be extended to L2 acquisition: when reading in their L2, L2 learners may transfer the default prosodic structure for ambiguous sentences from their L1, so their interpretations of such sentences may be different from those of native speakers.

Fodor (2002) notes that the default attachment preference for ambiguous RCs varies across languages. Languages such as Spanish, German, and French have HA as their default preference, whereas English, Romanian, and Brazilian Portuguese have LA.

HA by default	LA by default
Afrikaans, Croatian, Dutch, French, German, Italian (?), Russian, Spanish	Brazilian Portuguese, Egyptian Arabic, English (American) (?), English (British), Norwegian, Swedish

*Table 1: Classification of languages by their default preference (adapted from Fodor 2002:210)*

Regarding RC attachment ambiguity parsed by English L2 learners, a majority of studies focused on languages that favour HA, like Spanish. Though transfer from L1 is expected in L2 interpretation, this is not necessarily the case. Frazier (1979), along with Frazier and Fodor (1978), discussed and proposed Late Closure, the principle according to which parsers will favour attachments to phrases lower in the structure tree. This suggests that LA will be the default preference for L2 learners of English, regardless of their L1.

One of the studies where transfer of RC attachment preferences was observed is Fernández (2002). Participants in Fernández’s study were English-Spanish bilinguals that were divided into English-dominant and Spanish-dominant ones. There were two tasks in the study: an on-line reading task in which participants were presented sentences disambiguated by number-verb agreement (as reading time was measured), and an off-line questionnaire in which participants were asked to interpret sentences with ambiguous RC attachment. Bilingual participants were tested in both English and Spanish. One major finding from the off-line data shows that the Spanish-dominant bilinguals favoured HA in both languages more than English-dominant ones

did, indicating that parsers' behaviours are language-independent and their preferences are derived from their dominant language.

On the other hand, Dussias (2003) tried to find out whether L2 learners of a language adopt the same RC attachment preference as monolinguals of that language. She included both Spanish learners of English (L1 Spanish – L2 English) and English learners of Spanish (L1 English – L2 Spanish) as the experimental groups in her study. One of the experiments involved participants reading ambiguous RC sentences that had NP1-*of*-NP2 structure. Results from that experiment suggest that while English learners of Spanish parsed the Spanish sentences using LA preference from L1, there was a shift from HA to LA preference for the L1 Spanish – L2 English group when they processed the ambiguous constructions not only in the L2, but also in the L1. Despite looking at the same Spanish-English contrast, these studies (Fernández, 2002; Dussias, 2003) had different findings for L1 Spanish – L2 English bilinguals, possibly owing to participants having dissimilar linguistic profiles in each study, since Dussias didn't look at language dominance.

## *2. Prosodic cues and RC interpretation*

A few papers looked at the use of prosody for disambiguation. One of them is Fernández (2005). Her research question was whether English-Spanish bilinguals are able to produce different prosody to disambiguate RC constructions. To answer that, she conducted a task in which participants were asked to read a stimulus triplet, either in English or Spanish, and then combine them into a complex sentence. Bilingual participants were grouped by their self-reported language dominance: English-dominant, Spanish-dominant, or balanced. Though the

bilinguals' pitch movements were less extreme than those of the monolinguals in her study, she found that bilinguals displayed variability in the prosodic cues used for disambiguation. In particular, the bilingual group used different break phrasings that were absent from the monolingual one (Fernández 2005:128).

In another study involving prosody, Goad et al. (2021) combined break and constituent size (i.e., whether the RC matched NP1 or NP2 in size) into their sentence interpretation task to see the difference in attachment preferences between Spanish learners of English and English native speakers. Their stimuli involved the manipulation of prosodic break or RC length in the way that these target items favour either HA or LA. The results showed that Spanish learners of English were sensitive to prosodic cues such as break and constituent size, although the effect of break was stronger (Goad et al., 2021:98). Especially when learners' proficiency was higher, they were more sensitive to the break cues (i.e., they had more HA responses when the break indicated HA and more LA responses when the break indicated LA).

For the case in which L1 favours LA and L2 HA, Dekydtspotter et al. (2008) examined whether English learners of French have different interpretations of ambiguous NP1-*de*('of')-NP2 RCs when exposed to cues related to either constituent size (sentence interpretation task with written stimuli), intonation contour (sentence interpretation task with auditory stimuli), or context (timed reading task). In the prosody-relevant task, they found that among 87 L2 learners of French, thirty were sensitive to the disambiguating boundary contour, while the rest favoured attachments to NP1 (e.g., HA; Dekydtspotter et al., 2008:472). The effect of proficiency was also observed in their written task: compared to learners who took two semesters of French, fourth-semester learners showed sensitivity to RC lengthening (2008:469).

Liljestrand-Fultz (2007) conducted an auditory judgment task to investigate the influence of prosody (manifested in terms of intonation contour and break) and constituent size on the interpretation of ambiguous prepositional phrase (PP) attachment and RC attachment. Participants were English learners of French that were divided into three proficiency groups: second-semester, fourth-semester, and fifth/sixth-semester. Their results pointed out that L2 learners can use prosody for disambiguation, but they had different responses regarding type of attachment and constituent size: while the second-semester group showed no significant sensitivity to prosody, the fourth-semester one did in short RCs, and the fifth/sixth-semester one did in both RC lengths. The results from this study were also in line with Dekydtspotter et al. (2008) and Goad et al. (2021) with reference to proficiency since the increase in proficiency also contributed to higher success in using prosodic cues to parse complex structures.

These studies about prosody in the disambiguation of sentences with RCs looked primarily at languages that have a contrast in their default attachment preferences. They showed that L2 learners are sensitive to the presence of prosodic cues for disambiguation, despite usually behaving differently from native speakers. However, it is not clear whether the same sensitivity will also be exhibited by L2 learners of English whose L1 also favours LA, or whose L1 does not share the same RC structure with English, both of which are the case of Vietnamese.

### *3. Relative clauses in Vietnamese*

In this section, I describe the position of Vietnamese modifiers (including RCs) relative to the NPs they modify, as a way to highlight major differences in clause structure between Vietnamese



and English. In Vietnamese, non-clausal modifiers (like adjective *đen* ‘black’ in (2a) or noun *hóa học* ‘chemistry’ in (2b)) follow the NP they modify (*mái tóc* ‘CLASSIFIER (CL) + hair’ and *giáo viên* ‘teacher’, respectively), which is different from English, where such modifiers typically precede the NP they modify.

(2)

- a. *Cô ấy có mái tóc đen.*  
 she have CL hair black  
 ‘She has black hair.’
- b. *Cô ấy là giáo viên hóa học.*  
 she be teacher chemistry  
 ‘She is a chemistry teacher.’

Đinh (2001) stated that Vietnamese does not have RCs. Instead, the structure equivalent to an RC in English starts with *mà*, a prepositional (P) marker. Therefore, the Vietnamese RC would correspond to a prepositional phrase modifying the preceding noun, as in (3).

- (3) *ông<sup>2</sup> bác sĩ mà đang khóc*  
 CL doctor P PROG cry  
 ‘the doctor who is crying’

On the other hand, Miller (1976) proposed that preposition *mà* can have multiple functions, one of which is as INDEPENDENT CLAUSE COORDINATOR (ICC), which yields an RC interpretation. Under

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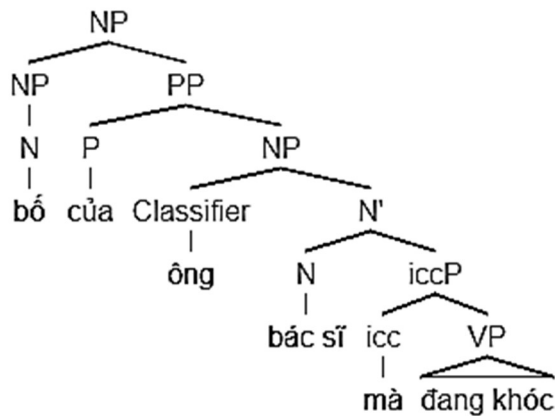
<sup>2</sup> In a study about vocatives in Vietnamese, Truong (2002) pointed out that these addressing forms, along with pronouns, are derived from nouns related to kinship (e.g., *ông* ‘grandfather’, *chú* ‘uncle’, *cô/dì* ‘aunt’). Therefore, I assume that some of them can also be used as classifiers preceding nouns, whose functions also possibly include specifying gender, age, social status, etc. For example, take NP2 *ông bác sĩ* ‘CL + doctor’ from the sentence in (3): CL *ông* indicates gender as male (opposed to *bà* ‘grandmother’), and it also indicates that the person is relatively old (as opposed to *anh* ‘brother’).

this analysis, the ICC *mà* acts as a mediator to connect the VP *đang khóc* ‘is crying’ with NP *bác sĩ* ‘doctor’, presupposing that ‘the doctor is crying’, as indicated in (4).

(4) *ông bác sĩ mà đang khóc*  
 CL doctor ICC PROG cry  
 ‘the doctor who is crying’

This bridging role of the ICC has a limit – in a syntactically ambiguous structure, it is difficult for ICCs to attach the so-called RC to a higher NP if there is a lower one. In other words, Vietnamese seems to have LA as the default preference for sentences of the type NP1 of NP2 RC. In (5), the VP *đang khóc* ‘is crying’ can only be attached to NP2 *bác sĩ* ‘doctor’ through the ICC *mà*, but not to NP1 *bố* ‘father’.

(5) *bố của ông bác sĩ mà đang khóc*  
 father of CL doctor ICC PROG cry  
 ‘[<sub>NP</sub> the father of [<sub>NP</sub> the doctor who is crying]]’



Additionally, it should be noted that there are many kinds of ambiguous structures in Vietnamese due to its flexibility in both syntactic interface (i.e., a sentence can have multiple

structures) and lexical interface (i.e., a word can have multiple meanings). One way for the native speakers to disambiguate these structures involves the use of prosody. For example, there are three ways to interpret the Vietnamese construction in (6), depending on where speakers decide to put a prosodic break. Note that // indicates where the break is.

(6) (Nguyễn, 2002:181-2)

*Khi uống bia không được pha đường.*  
when drink beer NEG/only able put sugar

a. *Khi uống bia // không được pha đường.*

‘When drinking beer, don’t put sugar.’

b. *Khi uống bia không // được pha đường.*

‘When drinking beer only, you can put sugar.’

c. *Khi uống bia không được // pha đường.*

‘When you can’t drink beer, put sugar.’

Furthermore, certain nouns in Vietnamese seem to function as resumptive pronouns (RE-PRO) in specific structures that have RC interpretation. However, a resumptive pronoun (if any) needs to resemble the classifier of its corresponding NP. In (7a), the combination of a prosodic break with a resumptive pronoun can produce a sentence with HA interpretation: *icc mà* links VP *đang khóc* ‘is crying’ with RE-PRO *người* ‘person’, while this pronoun refers to NP1 *bố*, whose classifier is not mandatorily spelled out in the sentence. Alternatively, a resumptive pronoun corresponding to the NP2 can reinforce LA as in (7b), where the resumptive noun is duplicated from the classifier of NP2. It is therefore possible to create an ambiguous RC construction in Vietnamese, if the two NPs take the same classifier, as in (7c).

(7)

a. Forcing HA:

*(ngườ*i*)*      *bố*    *của*    *ông*    *bác sĩ* //    *ngườ*i**    *mà*    *đang*    *khóc*  
CL            father of    CL    doctor    RE-PRO ICC    PROG    cry  
'[<sub>NP</sub> the father of [<sub>NP</sub> the doctor], the one who is crying]'

b. Forcing LA:

*(ngườ*i*)*      *bố*    *của*    *ông*i**    *bác sĩ* //    *ông*i**    *mà*    *đang*    *khóc*  
CL            father of    CL    doctor    RE-PRO ICC    PROG    cry  
'[<sub>NP</sub> the father of [<sub>NP</sub> the doctor, the one who is crying]]'

c. Ambiguous:

*ông*i**    *bố*    *của*    *ông*j**    *bác*    *sĩ*    //    *ông*i/j**    *mà*    *đang*    *khóc*  
CL    father of    CL    doctor    RE-PRO ICC    PROG    cry  
'the father of the doctor, the one who is crying'

From the examples above in this section, it is noteworthy that Vietnamese tends to favour LA overall since the RC seems to be structured in general like other modifiers in this language. However, some semantic constraints are still able to force HA as in (7a) or yield an attachment ambiguity as in (7c).

#### 4. *Motivation of the current study*

As mentioned above, previous research focused on English L2 learners whose native languages tend to favour HA (Spanish, French, etc.), but the results were unclear whether L1 grammar influences their L2 acquisition. One question that arises is thus the following: How do English L2 learners whose L1 also seems to favour LA (like Vietnamese) interpret ambiguous RCs?

Secondly, it is uncertain whether speakers from the same language background use the same prosodic profile in silent reading. It is possible that each of them has their own implicit prosodic

cues for disambiguation. In this case, auditory stimuli may outweigh orthographic ones, since they can remove the effects of silent reading.

Thirdly, previous research on the acquisition of English RCs by Vietnamese-speaking learners seems to have mainly focused on representational and structural issues. In particular, research showed that most Vietnamese students, including intermediate Vietnamese learners of English (Vo and Dang, 2022) and university students majoring in English-Vietnamese Translation (Dang et al., 2021), encountered difficulties with relative pronoun choice, restrictive vs. non-restrictive structures, and different types of RC structures. While we are interested in L2 learners' interpretation of ambiguous RC structures rather than their accuracy in RC production or comprehension, it is important to acknowledge these issues so that we can avoid RC structures that are problematic for Vietnamese L2 learners.

In this experiment, some considerations about RC processing were taken into account. On one hand, Keenan and Comrie (1977) proposed the Noun Phrase Accessibility Hierarchy (NPAH), ranking the difficulty accessing different types of RC in most languages. Of those types, Subject RCs, where the relative pronoun functions as the subject, are the least difficult since almost all languages have this structure. On the other hand, Kuno's (1974) Perceptual Difficulty Hypothesis (PDH) proposed that due to limited capacity of working memory, center-embedding clauses are more difficult to process than right- or left-embedding clauses as they impede the continuous parsing of the matrix structure. In other words, clauses embedded in the matrix object position are easier to process than those in the matrix subject one. In agreement with both Keenan and Comrie's NPAH and Kuno's PDH, as will be detailed below, the target stimuli of the present study were designed so that no processing issues should arise given their structure.

Given the observations presented above regarding (a) crosslinguistic preferences in RC interpretation, (b) the role of prosodic cues in RC interpretation, (c) RC-equivalent structures in Vietnamese, and (d) general issues about the processing of RCs, the current study aims to answer the following research questions:

1. Do Vietnamese learners of English use prosodic breaks to interpret ambiguous RCs in the same way as native speakers?
2. Does L2 proficiency influence learners' interpretation preferences?

To answer these questions, I conducted a sentence interpretation task with auditorily presented stimuli, in which target sentences had the shape *Subject Verb NP1 of NP2 Subject-RC* and were produced in three different ways (with no break, with a break after NP1, or with a break after NP2). The next section describes the methodology adopted in this study.

### III. Methodology

#### 1. Participants

There were 31 participants taking part in the experiment, divided into two groups: 16 English native speakers (NS group; mean age: 28.62; range: 18 to 62) and 15 Vietnamese learners of English (L2 group; mean age: 20.87; range: 19 to 27). The L2 group was divided into two proficiency levels based on results of a cloze test<sup>3</sup>: intermediate (n = 8) and advanced (n = 7).

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<sup>3</sup> The cloze test used in this study was taken from Xia et al. (2022).

There was a relatively wide range of proficiency score in each proficiency group. The NS group also did the cloze test, and since only one native speaker was placed in the intermediate level, they weren't split into subgroups.

	Vietnamese learners of English (n = 15)		English native speakers (n = 16)
	Intermediate (n = 8)	Advanced (n = 7)	
Proficiency range	9 – 22	23 - 28	16 – 30
Average score	16.75	25.00	26.88
Standard deviation	4.62	1.63	3.30

*Table 2: Proficiency results*

## 2. Stimuli

To assess speakers' attachment preferences, I developed an auditory sentence interpretation task<sup>4</sup> containing 30 sentences: 20 fillers and 10 target items. Both fillers and target items were recorded by a female Canadian English native speaker with training in Linguistics. The fillers were structured without any ambiguity. The target items were structured as Subject + Verb + NP1 *of* NP2 + Subject RC. The sentence in (1), repeated in (8), is one of the target items in the task. The target items are both pragmatically and semantically neutral. That is, RC attachment in the target sentences depends on neither the context nor the lexical semantics of the sentential constituents. See Appendix B for the complete list of stimuli.

Each target sentence was recorded in three ways.

<sup>4</sup> I obtained approval from Saint Mary's University Research Ethics Board to conduct my experiment, and my study is registered under the number REB # 23-033. See the Certificate of Research Ethics Clearance in Appendix A.

(8)

- a. NO BREAK: *Jimmy met the brother of the engineer who has a smart dog.*
- b. BREAK AFTER NP1: *Jimmy met the brother // of the engineer who has a smart dog.*
- c. BREAK AFTER NP2: *Jimmy met the brother of the engineer // who has a smart dog.*

Though the sentences were naturally produced, the breaks in condition (8b) and (8c) above were manipulated in Praat (Boersma & Weenink, 2023) to have the same approximate length of 300ms in all sentences. Regarding intonational contours, items in the NO BREAK condition were produced with falling intonation overall, as is typical of declarative sentences in English. In items with a break, there was pitch reset right after the break, consistent with previous studies (Goad et al., 2021).

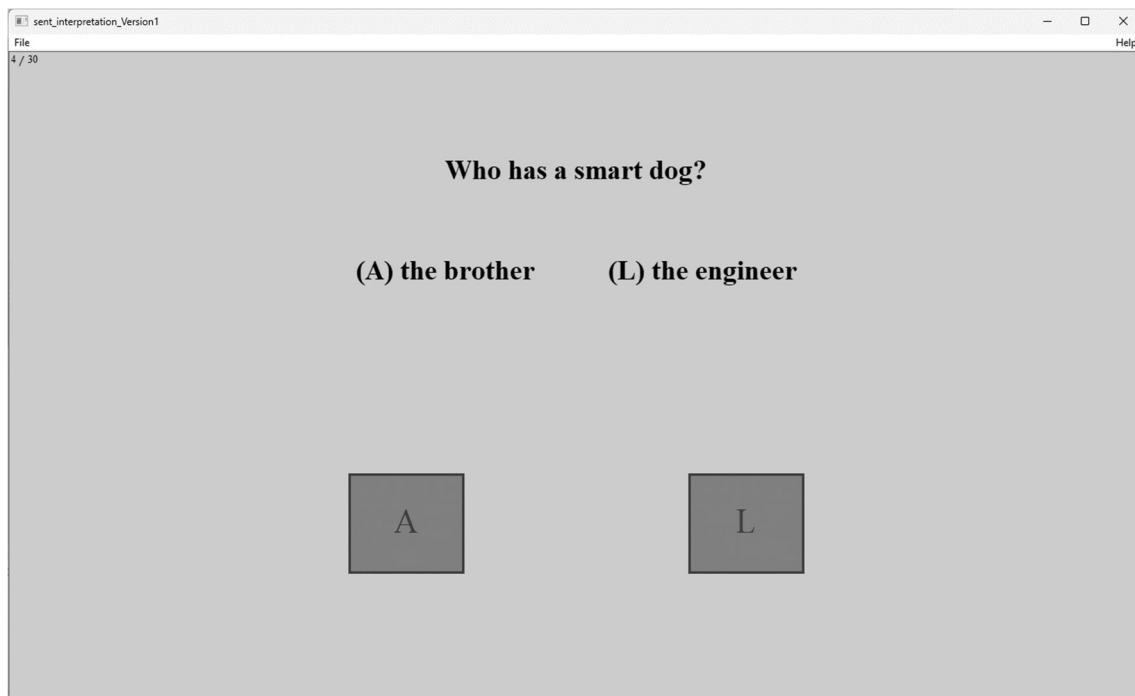
Each recording of a given target sentence was assigned to a different version of the sentence interpretation task. That is, there were three versions of the task, each of which containing only one of the three possible recordings for each target sentence. The reason for this was to avoid having participants listen to the same sentence with different break placements. The test items (fillers and target sentences) were pseudorandomized.

### *3. Procedure*

Participants were first asked to fill out a questionnaire about their language background. The questions included the cities they lived in, their parent(s)'s native language, and other languages they spoke.



Then participants moved on to the sentence interpretation task. The task was designed and run on Praat. Each pseudorandomized test item was played once after a beep sound and followed by a question with two answer options. The test items were presented auditorily only while the screen was blank. The question along with the answer options then appeared on the computer screen, as shown in Figure 1.



*Figure 1: Sample answer screen*

For the target items, the first option was always the first NP in the sentence (i.e., HA), and the second one the second NP (i.e., LA). The structure of the questions was the same for both target sentences and fillers, starting with "Who...". Participants were instructed to use the mouse to select an answer. Once they clicked to choose an answer, the next sentence played

automatically. There was a pause screen after the first 15 test items inviting participants to take a break, to help reduce working memory load. Response time (RT) was also measured.

Finally, participants were asked to complete the cloze test. This test contained a reading passage with 30 blanks inside. To fill in each blank, participants had to pick a word from a list of four answer options. Proficiency levels were determined according to participants' score out of 30: any participant who scored less than or equal to 22 was placed into the intermediate level, while those scoring more than 22 were considered advanced. It took participants approximately 30 minutes to complete the experiment. Participants were compensated for their time.

#### *4. Hypotheses and predictions*

Based on the potential role of prosodic profile in sentence interpretation and the observations about default attachment preferences for English and Vietnamese, these are the hypotheses of this study:

(9)

Hypothesis (i): Sentences with ambiguous RCs exhibiting different prosodic profiles yield different interpretations in both native speakers and L2 learners.

Hypothesis (ii): Vietnamese learners of English are sensitive to the use of prosody for disambiguation to some extent, depending on their proficiency levels.

Following from this, four predictions can be made based on the break conditions and the participant groups included in the study. Note that the predictions for the NS group are in the same direction as those for the L2 group, although the predictions for the L2 group are modulated by proficiency level.

(10)

Prediction (a): The NS group have a slight LA preference in the NO BREAK condition.

Prediction (b): The NS group are able to interpret the difference between the two break conditions (BREAK AFTER NP2 yields higher proportions of HA responses).

Prediction (c): The L2 group have an overall preference for LA.

Prediction (d): The advanced L2 group are sensitive to the difference between the two break conditions (BREAK AFTER NP2 yields higher proportions of HA responses).

### 5. *Statistical analysis*

Based on the hypotheses and predictions, the data were analyzed using two separate mixed-effects logistic regressions, one per group. In the model with NS data, *break* (BREAK AFTER NP1, BREAK AFTER NP2, and NO BREAK) was included as the fixed effect. In the model with L2 data, there was an interaction between *break* and *proficiency* (INTERMEDIATE and ADVANCED). Both models included a by-participant random intercept, to account for the (potential) variability in participants' responses, and they both had BREAK AFTER NP1 as the reference level for *break*. I also ran the L2 model twice, each time with a different reference level for *proficiency*, to investigate any potential effects of proficiency in the learners' responses.

All data analysis was done in R (R Core Team, 2022).

## IV. Results

Overall, most participants got equal to or more than 90% for the accuracy of the fillers in the sentence interpretation task, which suggests they all paid attention to the task. There was one intermediate L2 participant who got a score of 75% on the fillers, but this relatively low accuracy

rate could be attributed to intermediate proficiency level, and for this reason they were not removed from the analysis. Participants' accuracy with the fillers is shown in Table 3.

Proficiency	Accuracy
Intermediate L2ers (n = 8)	92.5 %
Advanced L2ers (n = 7)	98.57 %
Native speakers (n = 16)	98.44 %

Table 3: Mean accuracy rate in filler responses by proficiency group

Below, I discuss the results of the sentence interpretation task by first examining participants' RC attachment preferences and then briefly discussing participants' RTs.

### 1. Attachment preferences

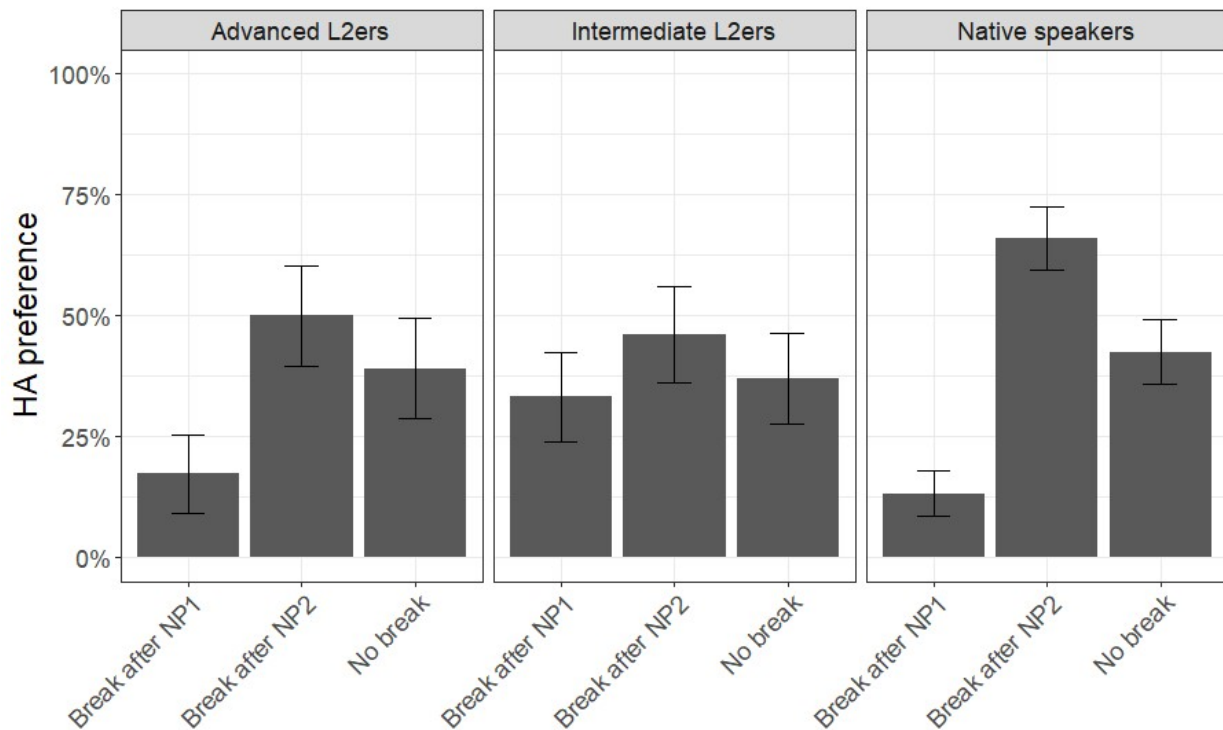


Figure 2: HA responses by condition and proficiency

As can be seen in Figure 2, in the NS group there is a slight preference for LA responses (57.4%) in the NO BREAK condition, which is in line with previous observations (e.g., Cuetos and Mitchell, 1988) and also confirms Prediction (a). For the other two conditions, breaks were also interpreted as expected: BREAK AFTER NP1 yielded substantially more LA responses (86.8%), whereas BREAK AFTER NP2 yielded more HA responses (66%), which confirms Prediction (b). According to the statistical model for the NS group, English native speakers have significantly more HA responses in the BREAK AFTER NP2 condition ( $\hat{\beta}=2.74$ ,  $p<0.0001$ ) and in the NO BREAK condition ( $\hat{\beta}=1.66$ ,  $p=0.001$ ) relative to the BREAK AFTER NP1 condition. The complete statistical results are presented in Appendix C.

Figure 2 also indicates that both L2 groups favoured LA overall as predicted (Prediction (c)). We can notice the same trends in the ADVANCED L2 group as in the NS group, while the intermediate learners do not seem to exhibit major interpretation preference changes across the three conditions. In particular, ADVANCED participants exhibited more variability in preferences between the two break conditions (BREAK AFTER NP1 and BREAK AFTER NP2), compared to INTERMEDIATE ones, confirming Prediction (d). The statistical model having ADVANCED as the reference level for *proficiency* showed that this group also had more HA responses in BREAK AFTER NP2 ( $\hat{\beta}=1.704$ ,  $p=0.02$ ) and in NO BREAK ( $\hat{\beta}=1.19$ ,  $p=0.01$ ) relative to BREAK AFTER NP1. No other significant effects were obtained in this version of the model. No significant effects were obtained in the version of the model that had INTERMEDIATE as the reference level for *proficiency*, which confirms the observation that intermediate learners behave similarly in the three conditions.

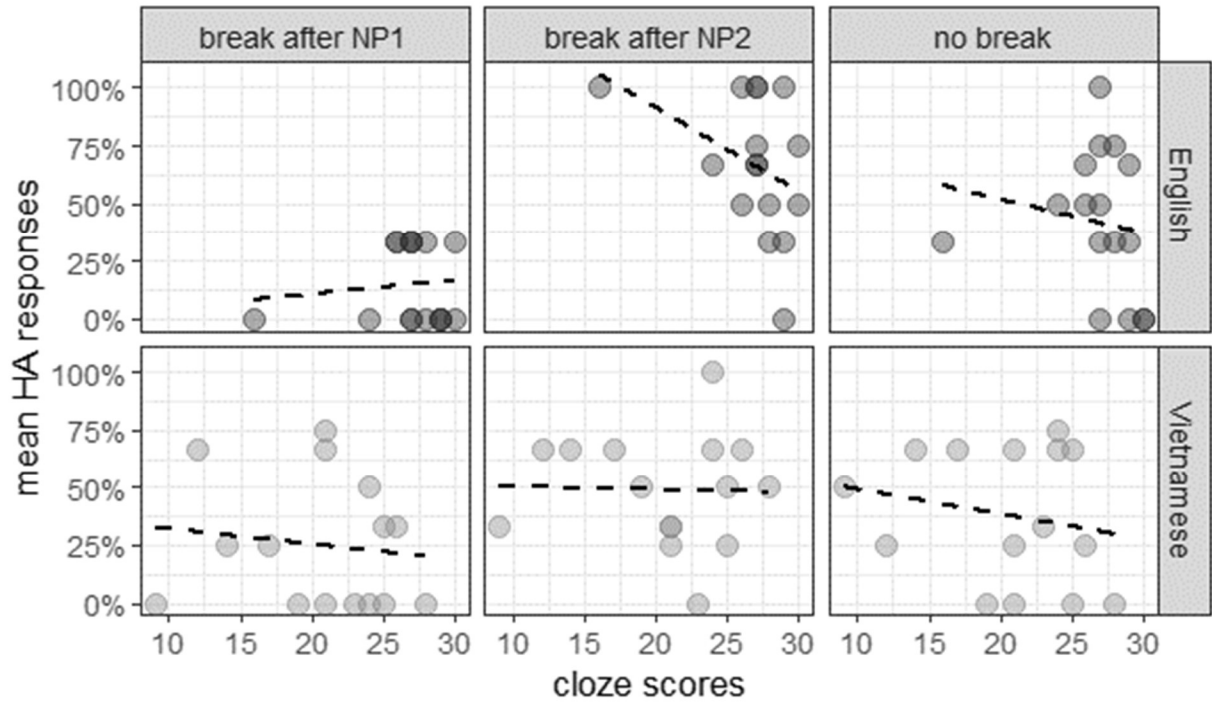


Figure 3: HA responses by condition and cloze test scores

In Figure 3, attachment preferences are presented relative to participants' cloze scores. In the figure, each dot corresponds to a participant mean. The figure suggests no effect on participants' responses if cloze test is treated as a continuous variable. For this reason, and because there is only one NS with a relatively low proficiency score, cloze score was not included in the analysis as a continuous variable. As a result, as mentioned above, English native speakers were assigned to one single group, while learners were divided into two groups.

## 2. Response time

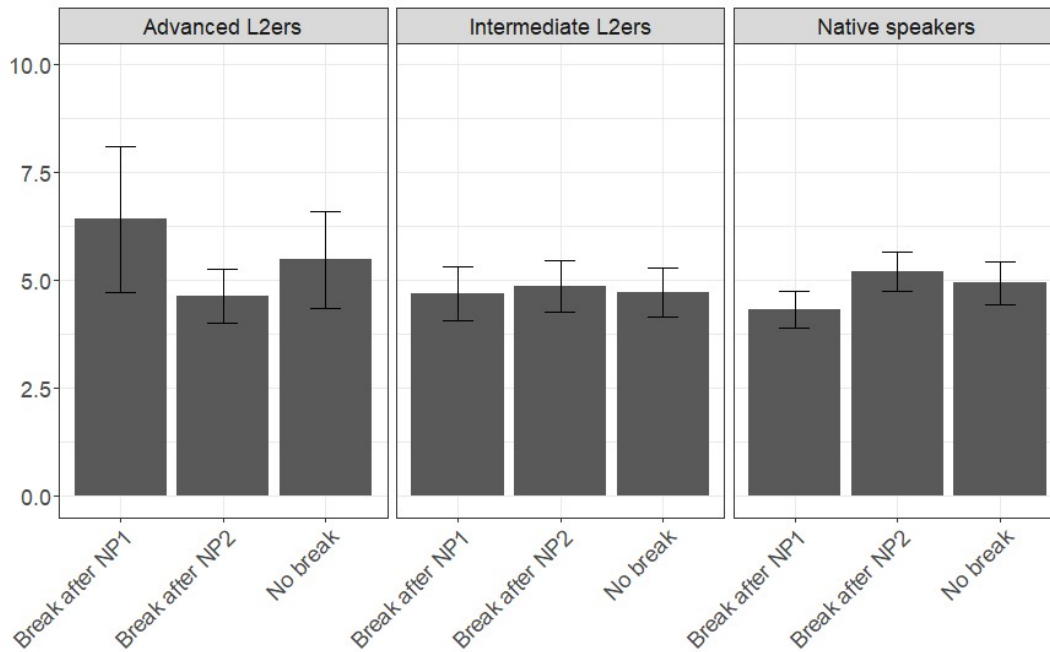


Figure 4: Response times by condition and proficiency

Figure 4 plots participants' response time for the three conditions under analysis. In the figure, the y axis corresponds to participants' response time in seconds. The figure suggests that all the groups behaved similarly with respect to response time, that is, they take averagely the same amount of time for all three break conditions. For this reason, RTs were not modelled statistically in this study.

## V. Discussion & Conclusion

In this study, I examined whether English native speakers and Vietnamese learners of English can interpret an intended RC attachment preference cued by the corresponding prosodic break.

First, we found that English native speakers favour LA when there are no break cues, in line with previous research (Cuetos and Mitchell, 1988). The results of attachment preferences in the NS group also suggest that a break after NP1 can reinforce English native speakers' LA preference, while a break after NP2 can override that default preference. Overall, our findings are consistent with Hypothesis (i), according to which interpretation preferences are affected by the use of prosodic cues.

In addition, I investigated whether L2 proficiency plays a role in the learners' responses. The results in the L2 group confirmed that not all learners interpret prosodic cues the same way. In fact, only advanced learners of English showed clear sensitivity to the different break conditions, whereas intermediate learners appeared to have mixed responses (i.e., they could not recognize the effect of the breaks). These findings are in line with Hypothesis (ii), since learners' preferences are modulated by proficiency.

The results for the NO BREAK condition were consistent with our assumption that the default preference for RC interpretation in both English and Vietnamese is LA. However, it is puzzling that the Vietnamese-speaking learners have overall a relatively high rate of acceptance of HA in the NO BREAK condition, given that their L1 seems to strongly favour LA with RCs. One possible reason for this is that the learners interpret the relative pronoun *who* as a resumptive pronoun, similarly to what is observed in Vietnamese sentences where a classifier is used resumptively before an RC; see (7). Another possible reason is that learners are aware of the ambiguity in English but do not transfer the strong LA bias from their L1.



The other results suggested that advanced learners and native speakers (but not intermediate learners) are sensitive to breaks indicating HA versus LA in English. These observations with respect to proficiency are compatible with those in previous studies on prosodic cues for disambiguation (Liljestrang-Fultz, 2007; Dekydtspotter et al., 2008; Goad et al., 2021), in that L2 learners with higher proficiency are able to detect prosodic cues in sentences with RC attachment ambiguity.

An issue to consider in the present study, however, is that the cloze test, which is a reading-and-vocabulary-based one, might not be suitable to evaluate participants' proficiency in terms of their listening comprehension abilities. It is also possible that a cloze test involves skills that are not necessarily linguistic, but impact participants' responses nonetheless. This could explain why a native speaker got a relatively low score in their proficiency test, even though their responses in the sentence interpretation task were not unusual. Therefore, for future research, I would suggest using a listening-based or an oral proficiency test in studies involving prosodic cues.

In addition, this study included breaks as the only type of prosodic cues for disambiguation. Future research is needed to determine whether Vietnamese learners of English are sensitive to other cues that may disambiguate RCs, such as constituent size and pitch contour.

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# Appendix A

## Certificate of Research Ethics Clearance



### CERTIFICATE OF RESEARCH ETHICS CLEARANCE

This is to certify that the Research Ethics Board has reviewed the research proposal:

<b>SMU REB Registration Number:</b>	23-033
<b>Title of Research Proposal:</b>	Sentence Interpretation in Vietnamese-English Bilingualism.
<b>Faculty, Department:</b>	Arts, Linguistics
<b>Faculty Supervisor:</b>	Dr. Natalia Guzzo
<b>Student Principal Investigator:</b>	Chau Tran

and concludes that in all respects the proposed project meets appropriate standards of ethical clearance and is in accordance with the Tri-Council Policy Statement: Ethical Conduct of Research Involving Humans (TCPS2) and Saint Mary's University relevant policies.

Clearance Period: January 6, 2023 - January 6, 2024\*

#### CONTINUING RESEARCH ETHICS REVIEW REPORTING REQUIREMENTS

##### **NEW INFORMATION AND UNANTICIPATED ISSUES**

Any new information and unanticipated issue or event that increases the level of risk to participants or has other ethical implications is reported to the REB without delay, (within 1 business day).

##### **REQUESTS FOR CHANGES TO CLEARED RESEARCH**

FORM 2

Research ethics clearance needs to be secured prior to implementing any changes or additions different from the research proposal that received initial research ethics review and clearance throughout the life cycle of the research. This includes proposed changes to the proposal that affect research participants at any state of the process including, but not limited to, the informed consent process (form/script as relevant), changes to the tasks or interventions involved in the research or research materials.

##### **ANNUAL STATUS REPORT\***

FORM 3

Research ethics clearance is issued for **one year** at a time. When research continues beyond the specified time frame, researchers request an extension and receive an updated clearance to accommodate multi-year research projects. The SMU REB requests that researchers please submit requests 30 days prior to the expiry of the clearance.

##### **END OF STUDY REPORT**

FORM 5

Researchers submit a completion of the research request when the research ethics clearance period does not need extension. The SMU REB requests that researchers please submit requests 30 days prior to the expiry of the clearance.

\*Researchers need to be aware that when research clearance expires, no activity on the project is permitted until the research ethics clearance is renewed. Failure to hold a valid SMU REB Certificate of Research Ethics Clearance of Continuation may result in delay, suspension or loss of funding as required by the federal granting Councils.

On behalf of the Saint Mary's University Research Ethics Board, I wish you success in your research.

  
Dr. James Cameron

Chair, Research Ethics Board

Saint Mary's University

## Appendix B

### List of stimuli

#### *Target items*

1. Jimmy met the brother of the engineer who has a smart dog.
2. Anna yelled at the daughter of the actress who was waiting outside.
3. Adam gave money to the assistant of the dentist who plays golf.
4. Katie is dating the cousin of the doctor who enjoys football.
5. Bob found the uncle of the manager who went on a vacation.
6. Henry had dinner with the sister of the lawyer who has a red car.
7. Kim argued with the son of the journalist who speaks five languages.
8. George recognized the secretary of the director who was divorced.
9. Nora picked up the mother of the architect who likes banana bread.
10. Rachel was worried about the aunt of the child who has blue eyes.

#### *Fillers*

1. The journalist reported that the senator arrived early on Saturday morning.
2. The detective discovered that the suspect disappeared on Friday.
3. The woman went to the church looking for the priest.
4. The painter told the model not to move but she couldn't help scratching her arms.
5. The doctor said that the actress is out of danger.
6. The nurse gave the young patient a toy.
7. The psychologist said encouraging words to the teenager.
8. The boss realized that the carpenter missed work today.
9. The swimmer went to the snack bar and saw the lifeguard.
10. The salesman looked at the customer with ripped jeans.
11. The informant testified against the policeman.
12. The girl loved the man with the good sense of humor.
13. The firefighter entered the burning house and rescued the toddler.
14. The landlord sent the letter to the tenant.
15. The client complained that the accountant cheated last year.
16. The editor announced that the poet won an award this morning.
17. The artist invited the critic to the gallery opening.
18. The bakery chef was angry at the customer.
19. The hotel owner found out that the visitor had left.
20. The teacher wrote an email to the principal.

## Appendix C

### Statistical models

#### *Native speaker model*

Reference level: <i>break</i> = BREAK AFTER NP1				
	Estimate	Std. error	z value	p value
Intercept	-2.01	0.46	-4.40	<0.0001
<i>break</i> (BREAK AFTER NP2)	2.74	0.54	5.09	<0.0001
<i>break</i> (NO BREAK)	1.66	0.51	3.26	0.001

#### *Learner models*

Reference levels: <i>break</i> = BREAK AFTER NP1; <i>proficiency</i> = ADVANCED				
	Estimate	Std. error	z value	p value
Intercept	-1.68	0.61	-2.74	0.006
<i>break</i> (BREAK AFTER NP2)	1.70	0.72	2.36	0.018
<i>break</i> (NO BREAK)	1.19	0.72	1.65	0.01
<i>proficiency</i> (INTERMEDIATE)	0.92	0.76	1.21	0.23
<i>break</i> (BREAK AFTER NP2): <i>proficiency</i> (INTERMEDIATE)	-1.08	0.92	-1.18	0.24
<i>break</i> (NO BREAK): <i>proficiency</i> (INTERMEDIATE)	-0.98	0.93	-1.05	0.29

Reference levels: <i>break</i> = BREAK AFTER NP1; <i>proficiency</i> = INTERMEDIATE				
	Estimate	Std. error	z value	p value
Intercept	-0.76	0.46	-1.65	0.10
<i>break</i> (BREAK AFTER NP2)	0.62	0.59	1.06	0.29
<i>break</i> (NO BREAK)	0.21	0.59	0.36	0.72
<i>proficiency</i> (ADVANCED)	-0.92	0.76	-1.21	0.23
<i>break</i> (BREAK AFTER NP2): <i>proficiency</i> (ADVANCED)	1.08	0.92	1.18	0.24
<i>break</i> (NO BREAK): <i>proficiency</i> (ADVANCED)	0.98	0.93	1.05	0.29