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Agreement interference effects of number in coreference processing in Brazilian Portuguese

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Abstract. Our aim is to investigate how agreement cues and Principle B influence coreference processing in Brazilian Portuguese. According to Badecker & Straub (2002), all focused entities that feature-match the pronouns are initially considered as possible antecedents; and that the structural constraints would quickly select the adequate antecedent among those options. Taken this into account, our hypothesis was that the agreement cues are crucial for coreference processing in a language with rich morphology such as Brazilian Portuguese. Thus we expected to find a strong influence of number cues, even those displayed in attractors, which are candidates that feature-match the pronouns, but cannot be considered structurally acceptable antecedents due to Principle B structural constraints.

An eye-tracking experiment and an off-line grammaticality judgment experiment were conducted with native speakers of Brazilian Portuguese. It seems that our on-line results support Badecker and Straub (2002) and that our initial hypothesis was proved true; however only at early and after processing stages. We also provided a comparison between singular and plural agreement features showing that memory retrieval is more sensitive to marked types of agreement cues like plural. In addition, it should be mentioned that it was observed intrusion effects caused by the presence of plural attractors in both ungrammatical and grammatical sentences, which might be evidence in favor of the existence of content-based memory retrieval. Moreover, the results of the answers to the comprehension questions in the eye-tracking experiment as well as the off-line grammaticality judgment indicate that the presence of plural attractors create illusions of grammaticality and ungrammaticality, while long distance between the structurally acceptable antecedent and the pronoun can cause semantic illusions as well.

Keywords. coreference processing; number features; Brazilian Portuguese

1. Introduction. According to Lewis, Vasishth & van Dyke (2006), in order to process language in real time, previous interpreted information must be kept at least momentarily in our memory so that integration with novel upcoming material can take place rapidly. Taking this consideration, one important question in the literature is how prior linguistic material can be retrieved from memory and which factors can influence or interfere in this process. Since memory retrieval needs to be incredibly fast and efficient, it is hard to believe that our memory works in a serial search. Studies on lexical retrieval have shown that our memory activates linguistic items in parallel through association; therefore, all candidates that are associated with the target are kept activated in memory until one of the items is retrieved (cf. Marslen-Wilson, 1987).

Syntactic dependencies can be comprehended and processed thanks to our memory, which works in a content-addressable fashion (McElree, 2000; McElree et al, 2003; van Dyke and McElree, 2006). In other words, it is a subset of grammatical cues generated by the target that activates in parallel the stored items in memory that match the content of these cues. However, memory can be constrained by similarity-based interference and decay factors (Lewis & Vasishth, 2005; Lewis, Vasishth & van Dyke, 2006). The former occurs when the similarity between the items and the retrieval cues increase, reducing the strength of association between the cue and the target as a greater number of items will be associated. Consequently, failure rates increase, and distractors, that is, candidates that partial-match the cues, can sometimes be retrieved. On the other hand, decay occurs, for example, when the linear distance between the dependent items is increased and the distant item gets decayed over time, which makes its retrieval more difficult to be happening.

The retrieval cues can be composed by, among others, structural, morphological, semantic, and contextual information. The present paper will be focused on discussing only two of them: the structural and morphological. One of the linguistic dependencies that enable us to examine the roles of the structural and the morphological cues in memory retrieval is binding. From the point of view of structural cues, conforming to Principle A (Chomsky, 1981), reflexives and their antecedents must be bound within the same domain, that is, in the same small clause; on the contrary, Principle B (Chomsky, 1981) posits that pronouns and their antecedents must not be bound in the same local domain. However, from the perspective of the morphological cues, pronouns and reflexives must simply agree with their antecedents in gender, number, and person.

Several studies proposed to discuss the relationship between the structural constraints and the agreement cues in memory retrieval. In the following section, some of these studies that focused on reflexive and pronominal binding will be briefly addressed.

2. Structural constraints *versus* agreement cues in binding. The relationship between the structural constraints and the agreement cues in the time-course of binding processing is very controversial in the literature. Considering the studies on reflexive binding, on one hand, Nicol & Swinney (1989), Sturt (2003), Xiang et al (2009); Phillips et al (2011); Dillon et al (2013) pointed out that memory cannot be initially influenced by distractors, that is, candidates that feature-match the anaphors but cannot be retrieved as antecedents according to Principle A. In other words, it seems that the structural constraints of Principle A are quite solid and invulnerable to failure. On the other hand, Badecker & Straub (2002) and Patil et al (2016) argue that the agreement features play a very important role at early processing measures, so that structurally unacceptable candidates can be considered as potential antecedents.

The studies on pronominal binding are also contradictory; on one hand, Nicol and Swinney (1989) and Clifton et al (1997) claim that the initial candidate set is only composed by the candidates that respect Principle B structural constraints; and on the other hand, Badecker & Straub (2002) and Kennison (2003) argue that both structurally acceptable and unacceptable candidates that feature-match the pronouns are initially considered as antecedents since the agreement features rather than the structural constraints are the decisive factor at early processing phases. Finally, Chow et al (2014) defend that both the structural constraints and the agreement features are equally important since the beginning of pronominal resolution. However, they could not find robust interference effects of structurally unacceptable candidates in coreference processing.

Among all the studies mentioned above, one of the most influential ones is Badecker and Straub (2002). After analyzing the results of a series of self-paced reading experiments,

Badecker & Straub (2002)'s finding is that binding structural constraints do not function as initial filters in processing since the initial candidate set can include structurally unacceptable antecedents. Besides the shorter reading times caused by structurally unacceptable antecedents in ungrammatical sentences (facilitatory interference), which the authors called the *no-antecedent* effect, they also found longer reading times when a structurally unacceptable antecedent agreed in gender with both the pronoun and the structurally acceptable antecedent (inhibitory interference), which they called the *multiple-match* effect. The authors support the *interactive-parallel-constraint* model, defending the idea that initially the antecedent candidates are the ones that coincide with the salient discourse entities that match the pronouns in number and gender, and that only at a later processing phase, the structural constraints would operate quickly and effectively in selecting from among the options available.

In a nutshell, the majority of the studies in the literature claim that reflexives are insensitive to structurally unacceptable antecedent candidates and that antecedent retrieval is only influenced by structural constraints, although Badecker & Straub (2002), Parker (2014) and Patil et al (2016) showed clear results that contradict this view. On the other hand, the influence of agreement features in pronominal binding still needs more investigation since there is not so much research on it as on reflexives. Phillips, Wagers & Lau (2011) explain that the apparent online fallibility of Principle B, as Badecker & Straub (2002) and Kennison (2003) showed, might be a consequence of Principle B looseness, since it only posits that the pronoun antecedent must not be local, which is not as restrictive as Principle A. Thus the agreement features may be useful in pronominal antecedent retrieval.

> The recognition of a pronoun must initiate a retrospective search for an antecedent. Since the structural relation between a pronoun and its antecedent is almost free, it is natural do assume that a pronoun initiates a cue-based search for an antecedent that shares its person, number, and gender features, and hence it wouldn't be surprising for this search to detect nouns that match those cues, even when they violate Principle B (PHILLIPS, WAGERS & LAU, p. 171, 2011)

The use of morphological cues in memory retrieval may vary not only depending on the syntactic dependency, but also across different languages. Lago (2015) highlighted the fact that agreement morphology is functionally more important in Spanish than, for example, in English. Because the word order in Spanish is sort of free, the morphological cues are more reliable than the positional information in this language. The author found out that, compared to English, Spanish comprehenders displayed a larger slowdown when there was an agreement violation between subjects and verbs, which might indicate that Spanish speakers rely more on morphological cues as they may struggle more to process a sentence with agreement problems.

Taken the fact that the use of agreement cues may be more fruitful in pronominal binding and in languages with rich morphology like Spanish, the present work aims to investigate how pronouns retrieve antecedents in Brazilian Portuguese, which is also a language with rich morphology. Therefore, we will not only fill a gap in the literature providing one more piece of evidence to the puzzle involving the use of agreement features is pronominal binding, which lacks more investigation, but we will also check whether languages with rich morphology tend to rely more on agreement features in syntactic dependencies resolution.

3. Experiments. It is relevant to mention that the two experiments that will be presented in this paper are similar to the ones in Alves (2016), which investigated the use of gender cues in pronominal antecedent retrieval in Brazilian Portuguese. Taken together, Alves (2016) and the present research are part of bigger project that aims to investigate the influence of agreement features in coreference processing in Brazilian Portuguese. This way, one can find some points in common between both papers.

The first experiment that will be reported here is an eye-tracking study, and its main purpose is to investigate how and when the structural constraints of Principle B and the number agreement cues influence the way nominal antecedents are retrieved from memory. Unlike the first experiment, which focused on the on-line processing, the second experiment is an off-line grammaticality judgment, and its purpose is to check whether the structural constraints of Principle B and the agreement cues influence the grammaticality judgment of the sentences on the same way it may influence the on-line processing.

We assume that since overt and redundant agreement marks are often available in languages with rich morphology, speakers will tend to strongly rely on them in order to resolve a variety of linguistic dependencies such as coreference. This way, our general hypothesis is that the agreement cues rather than the structural constraints of Principle B would play a major role in memory retrieval in a language with morphology richness such as Brazilian Portuguese. Taken this into consideration, we expect to find a robust influence of agreement cues throughout coreference processing in Brazilian Portuguese. For this reason, we expect to find a strong similarity-based interference effects caused by structurally unacceptable antecedent candidates that would function like distractors in our memory. In this paper, this kind of candidates will also be called *attractors* due to its local relation and feature-similarity with the pronouns.

The influence of attractors is also sensitive to the kind of feature, which is known as the *mismatch asymmetry*. It seems that structurally unacceptable candidates with marked features are more influential than structurally unacceptable candidates with unmarked features; and, since plural is morphologically marked in English, distractors with this kind of feature influence processing more than distractors in the singular (cf. among others Bock and Miller, 1991 and Wagers et al, 2009 for subject-verb agreement; Dillon, 2013 for reflexives). Based on this, we also expect to find more influence in coreference processing of attractors in the plural than in the singular. We hypothesize that memory is not that abstract as it may be sensitive to different types of agreement cues. Consequently, we expect that salient and marked cues such as plural would be retrieved from memory more easily than singular. Staub (2009) claims that plural nouns are effective attractors not because of its morphology (morpheme –s) or notional plurarity, but because of its grammatical number. Plural is marked in opposition to singular, which is the *default*, unmarked, automatic and dominant gender.

Finally as memory can be affected by decay, we are also interested in examining the effects of linear distance in coreference processing. Previous studies found that long linear distance can bring costs to binding processing (cf. among others, Schweppe, 2013; Chow et al, 2014). Thus our last hypothesis is that attractors would have stronger interference in coreference when the structurally acceptable candidate is linearly far from the pronouns.

3.1 Eye-tracking experiment.

3.1.1 PARTICIPANTS. Twenty-nine native speakers of Brazilian Portuguese with normal or corrected-to-normal vision participated as volunteers in the experiment. They were undergraduate students of the Federal University of Rio de Janeiro (UFRJ) and were randomly invited to participate in the study, and, as compensation for their work, they receiving three hours of *Cultural-Scientific Activities* (*Atividades-Científico-Culturais Discentes*, AACC), which is mandatory for their graduation. All participants were naive in relation to the object of study of the experiment and signed a consent form which stated that the task they would perform would not bring any risks to their health and that the results would be eventually published. It should be noted that of the twenty-nine participants, five

were excluded from our analysis as they had less than 80% of their eyes movements recorded. Therefore, the experiment was analyzed using data from twenty-four participants, more specifically sixteen female and eight male with a mean age of 22.6 years.

3.1.2 DESIGN AND MATERIALS. The independent variables of the experiment were: *grammaticality of the sentence*, which is directly related to Principle B structural constraints, (grammatical or ungrammatical), the *presence of attractor* (presence or absence), the *linear distance* between the structurally antecedent and the pronoun (short or long) and the *attractor number* (singular or plural). Therefore, our experimental design was 2 x 2 x 2 x 2 with sixteen conditions.

Each of the four lists, which were elaborated using a Latin Square, was pseudo-randomized and composed by sixteen experimental sentences and thirty-two fillers. Of the sixteen experimental sentences, half was short and half long. Of the eight short sentences, four had attractors in the singular and four had attractors in the plural. The same division was made for the eight long sentences. The filler questions were balanced between yes and no answers.

The experiment was composed by two on-line and one off-line dependent variables. The on-line dependent variables were the First and Total Fixation Durations at the pronoun areas. The First Fixation Duration measures how long it takes to read the pronouns when they are first encountered, whereas the Total Fixation Duration corresponds to the sum of all the eye fixations at the pronoun areas. Finally, the off-line dependent variable corresponds to the answers to the comprehension questions, which purpose was to check whether the readers were semantically retrieving the structurally acceptable antecedent candidate or not.

One can find a sample of the materials used in the experiment below[2]:

(1)

  a. *Long ungrammatical sentence with plural attractor*
    O geógrafo trouxe muitos mapas e as rotas marítimas para ensinar os marinheiros que seguem **eles** nas expedições.
    "The$_{[sg]}$ geographer$_{[sg]}$ brought$_{[sg]}$ a lot of maps and the sea-routes to teach the$_{[pl]}$ sailors$_{[pl]}$ who follow$_{[pl]}$ **them$_{[pl]}$** in the expeditions."

  b. *Long ungrammatical sentence without plural attractor*
    Os geógrafos trouxeram muitos mapas e as rotas marítimas para ensinar os marinheiros que seguem **ele** nas expedições.
    "The$_{[pl]}$ geographers$_{[pl]}$ brought$_{[pl]}$ a lot of maps and the sea-routes to teach the$_{[pl]}$ sailors$_{[pl]}$ who follow$_{[pl]}$ **him$_{[sg]}$** in the expeditions."

  c. *Long grammatical sentence with plural attractor*
    Os geógrafos trouxeram muitos mapas e as rotas marítimas para ensinar os marinheiros que seguem **eles** nas expedições.
    "The$_{[pl]}$ geographers$_{[pl]}$ brought$_{[pl]}$ a lot of maps and the sea-routes to teach the$_{[pl]}$ sailors$_{[pl]}$ who follow$_{[pl]}$ **them$_{[pl]}$** in the expeditions."

  d. *Long grammatical sentence without plural attractor*
    O geógrafo trouxe muitos mapas e as rotas marítimas para ensinar os marinheiros que seguem **ele** nas expedições.
    "The$_{[sg]}$ geographer$_{[sg]}$ brought$_{[sg]}$ a lot of maps and the sea-routes to teach the$_{[pl]}$ sailors$_{[pl]}$ who follow$_{[pl]}$ **him$_{[sg]}$** in the expeditions."

  e. *Comprehension question*
    O geógrafo é acompanhado nas expedições?

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[2] It is relevant to mention that the conditions called *without attractor* are those in which the noun that occupies the attractor position does not gender-match the pronoun.

"Is the geographer followed in the expeditions?"

3.1.3 PROCEDURE. The experiment was conducted at the laboratory of experimental research (LAPEX) at the Federal University of Rio de Janeiro (UFRJ) in Rio de Janeiro, Brazil. The eye-tracker used in this experiment was *Tobii Studio^{TM} TX 300*, which requires an initial individual calibration in the beginning of the procedure for the eye-tracker to be able to monitor the participant's pupils during the reading task. The participants were instructed to seat comfortable and were given written and oral task instructions. After that, calibration process would start followed by a short practice with filler sentences so that the experimenter would check whether the participants understood the task and were performing it at a natural speed. Ultimately, the experimenter would leave the participants alone in a quiet room without any distractions. Each sentence of the experiment would appear at once on the computer screen, and after reading them, the participants would press the space bar to answer a comprehension question about the sentence that was just read by fixating their eyes in one of the options - "Yes" or "No". Each participant performed randomly one of the four lists of the experiment. The duration of the experiment was of twenty minutes approximately.

3.1.4 RESULTS. Data was extracted using *Tobii Fixation Filter*, which is the default fixation algorithm in *Tobii Studio^{TM} 2.X version 2.2*. It should be noted that our data did not have any outliers trimming or transformation and was analyzed at R[3] statistics software, using *plotrix*[4], *lmer Test*[5], and *gplots2*[6] packages.

Means as well as standard errors of First Fixation Duration at the pronoun area were reported for each condition in Table 1:

	Short sentences with attractors in the singular	Short sentences with attractors in the plural	Long sentences with attractors in the singular	Long sentences with attractors in the plural
Ungrammatical sentence with attractor	283 (27)	306 (33)	331 (29)	263 (17)
Ungrammatical sentence without attractor	258 (30)	317 (35)	309 (26)	352 (43)
Grammatical sentence with attractor	278 (24)	268 (10)	307 (43)	261 (10)
Grammatical sentence without attractor	260 (16)	297 (21)	286 (28)	303 (22)

Table 1: First Fixation Duration means and standard errors in milliseconds for each experimental condition

[3] R Core Team (2016). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria (https://www.r-project.org/)

[4] Lemon, J. (2006) Plotrix: a package in the red light district of R. R-News, 6(4): 8-12.

[5] Alexandra Kuznetsova, Per Bruun Brockhoff and Rune Haubo Bojesen Christensen (2015). lmerTest: Tests in Linear Mixed Effects Models. R package version 2.0-29 (https://CRAN.R-project.org/package=lmerTest)

[6] Gregory R. Warnes, Ben Bolker, Lodewijk Bonebakker, Robert Gentleman, Wolfgang Huber Andy Liaw, Thomas Lumley, Martin Maechler, Arni Magnusson, Steffen Moeller, Marc Schwartz and Bill Venables (2015). gplots: Various R Programming Tools for Plotting Data. R package version 2.16.0. (https://CRAN.R-project.org/package=gplots)

A linear mixed-effect model was created with the help of *lmerTest* package. Its fixed effects were: *grammaticality of the sentence*, *presence of attractor*, and *type of attractor*, while its random effects were: *participants* and *items*. And by using the *anova* function, we found a significant effect of the interaction between *presence of attractor* and *attractor number* in our First Fixation Duration model: $F(1,0.014)=4.61$, $p=0.037$.

To figure out which pair of conditions were significantly different, bar plots with 95% confidence intervals were created with the help of *gplots* package. Figure 1, 2, and 3 illustrate how attractors in the singular and in the plural affected the First Fixation Duration at the pronoun area in ungrammatical and grammatical sentences.

First fixation duration in long ungrammatical sentences

Figure 1. Barplot with 95% confidence intervals showing First Fixation Duration at the pronoun area in ungrammatical sentences with attractors in the singular and in the plural

First fixation duration in long ungrammatical sentences

Figure 2. Barplot with 95% confidence intervals showing First Fixation Duration at the pronoun area in ungrammatical sentences with and without attractors in the plural

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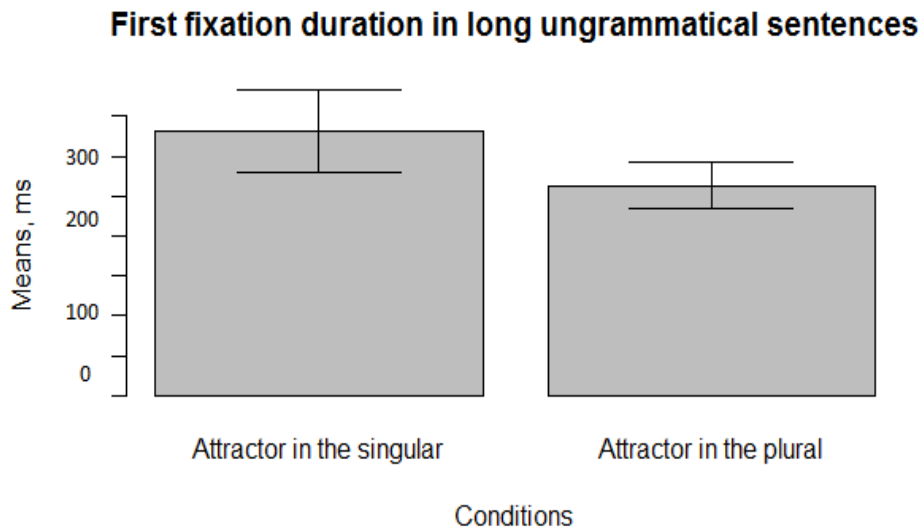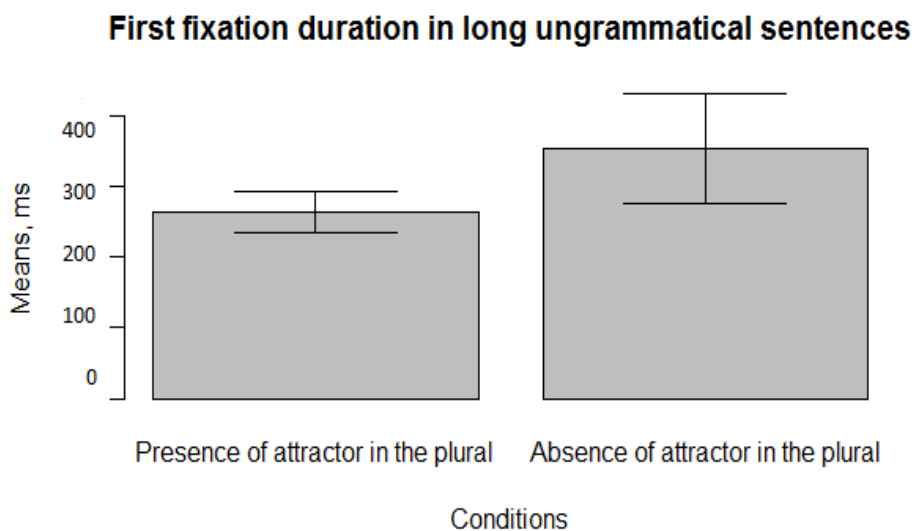
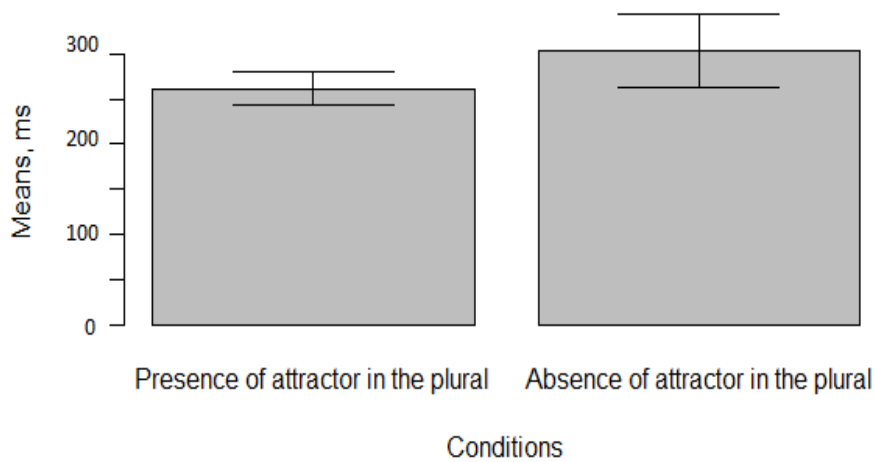## First fixation duration in long grammatical sentences

Figure 3. Barplot with 95% confidence intervals showing First Fixation Duration at the pronoun area in grammatical sentences with attractors in the singular and in the plural

Table 2 contains means along with standard errors of Total Fixation Duration at the pronoun area for each condition:

	Short sentences with attractors in the singular	Short sentences with attractors in the plural	Long sentences with attractors in the singular	Long sentences with attractors in the plural
Ungrammatical sentence with attractor	449 (48)	507 (60)	599 (77)	493 (44)
Ungrammatical sentence without attractor	439 (53)	451 (60)	670 (21)	667 (123)
Grammatical sentence with attractor	450 (41)	376 (37)	439 (81)	367 (27)
Grammatical sentence without attractor	506 (70)	465 (62)	473 (53)	472 (59)

Table 2: Total Fixation Duration means and standard errors in milliseconds for each experimental condition

A linear mixed-effect model was also created with the help of *lmerTest* package. Its fixed and random effects were the same of the First Fixation Duration model. And by using the *anova* function, we only found a slight trend towards significance for *grammaticality of the sentence* in our Total Fixation Duration model: $F(1,0.125) = 2.8$, $p=0.10$. However, when we performed the repeated ANOVA test considering the participants as error, we found a statistically significant main effect of *grammaticality of the sentence*: $F(1,23) = 3.97$, $p=0.047$. We think that there must be some unknown factor in our items that negatively affected our linear mixed-effect model for the Total Fixation Duration.

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To figure out which pair of conditions were significantly different, bar plots with 95% confidence intervals were created with the help of *gplotS* package. Figures 4 and 5 show how attractors in the plural affect the Total Fixation Duration at the pronoun area.

As one can see in Figure 4 and 5, reading times at the pronoun area in grammatical sentences are faster than in ungrammatical sentences in spite of the presence of plural attractors (T-tests, p=0.036 and p=0.010 respectively).
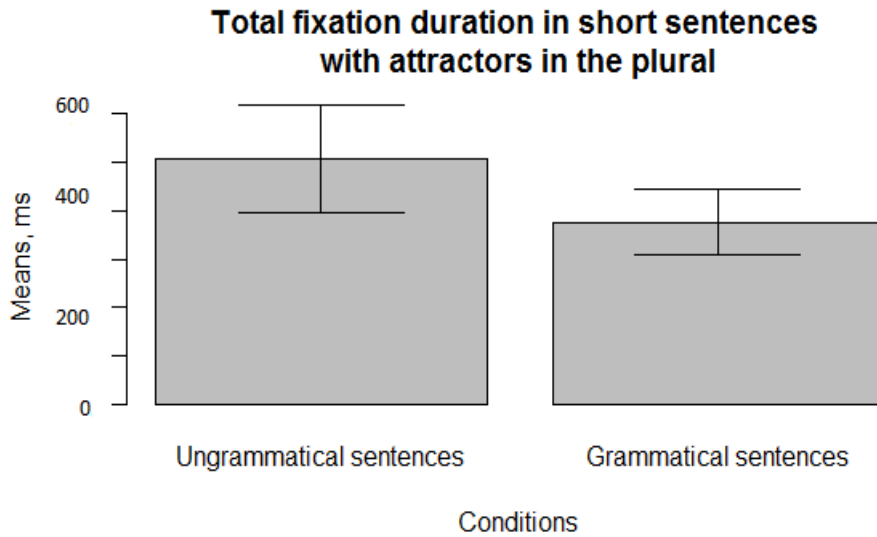
Figure 4. Barplot with 95% confidence intervals showing Total Fixation Duration at the pronoun area in short ungrammatical and grammatical sentences with attractors in the plural
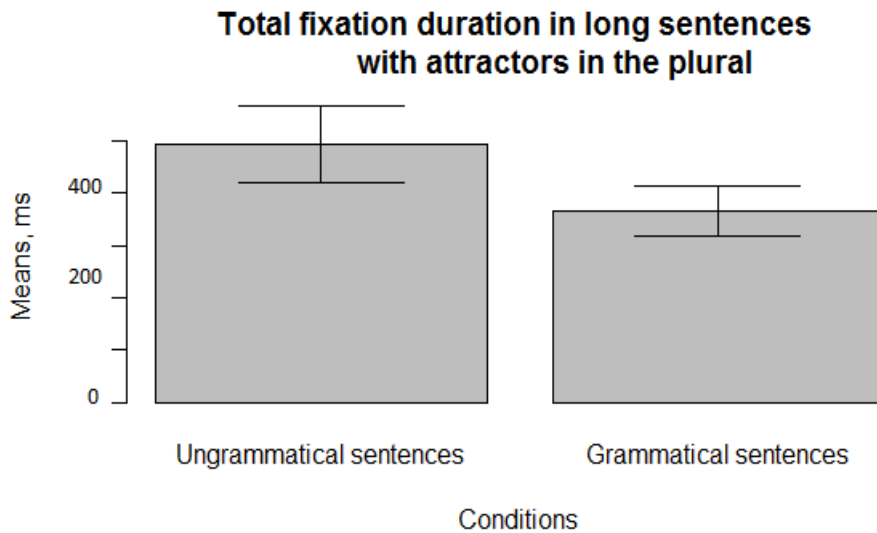
Figure 4. Barplot with 95% confidence intervals showing Total Fixation Duration at the pronoun area in long ungrammatical and grammatical sentences with attractors in the plural

Finally, the comprehension questions in the end of each experimental sentence were used to check whether the readers were semantically retrieving the structurally acceptable antecedent candidate. Consequently, if this is the case, their answer to the questions as in (1e) would be

"yes". The off-line results of the comprehension questions (two sided Fisher Test with simulated p-value based on 2e+05 replicates, p<0.0014) can be seen in Table 3:

The answers to the comprehension questions show that the presence of attractors can interfere in the comprehension of coreference. By looking at the first two rows of Table 3, one can note that the participants tried hard to retrieve the structurally acceptable antecedent in ungrammatical sentences, therefore, they seem to ignore the fact that the structurally acceptable antecedents were not agreeing in number with the pronouns.

	Short sentences with attractors in the singular	Short sentences with attractors in the plural	Long sentences with attractors in the singular	Long sentences with attractors in the plural
Ungrammatical sentence with attractor	96%	74%	80%	77%
Ungrammatical sentence without attractor	83%	88%	75%	92%
Grammatical sentence with attractor	83%	88%	63%	80%
Grammatical sentence without attractor	96%	96%	91%	96%

Table 3: Yes-Anwers to the comprehension questions in percentage

3.1.5 DISCUSSION. As mentioned before, there was a statistically significant effect in the eye-tracking experiment for the interaction between the factors *presence of attractor* and *attractor number* in First Fixation Duration, and a main effect for *grammaticalitly* in Total Fixation Duration. In other words, our results indicate that initially gender agreement features play a very important role in how pronouns retrieve their antecedents from memory and that the structural constraints of Principle B seem to only affect this process at later processing phases. Therefore the present research found evidence in favor of the *interactive-parallel-constraint* (Badecker & Straub, 2002), which states that the initial antecedent candidate set is composed by the focused entities that feature-match the pronoun, and that only later, the binding structural constraints would help the parser choosing the antecedent from among those options. Because the structural constraints are only taken into account at late processing, structurally unacceptable candidates (attractors) can be initially considered as potential antecedents.

It is relevant to say that unlike Badecker & Straub (2002), our research provided evidence that memory retrieval is also sensitive to different types of number agreement features. The pairwise comparison tests between the conditions in First Fixation Duration showed that plural attractors are responsible for greater influence in memory retrieval than attractors in the singular. More specifically, in ungrammatical sentences, that is, when there was a feature-mismatch between the structurally acceptable antecedent and the pronoun, coreference processing was faster in the presence of plural attractors than in the presence of singular attractors. One reason for that may lie on the fact that plural number is salient and marked. It seems that memory can be so strongly influenced by plural, that attractors carrying this type

of number may be retrieved by memory as antecedents in spite of the fact they violate Principle B structural constraints.

In addition, the facilitatory effect in First Fixation Duration was observed when both ungrammatical and grammatical sentences with plural attractors were compared to the same sentences without attractors. In ungrammatical sentences, the same facilitatory effect was also found by Badecker & Straub (2002), and was called the *no-antecedent effect*. As there is not a feature-match between the structurally acceptable candidates and the pronouns in ungrammatical sentences, attractors turn out to be retrieved as antecedents as an attempt of the parser to rescue the sentences. Interestingly, not all attractors can be retrieved by memory equally, as plural attractors may be considered better "rescuers" than singular attractors. In grammatical sentences, on the other hand, in Badecker & Straub (2002)'s work, instead of facilitatory, the presence of attractors was responsible for inhibitory effects, that is, the presence of attractors caused slower coreference presence. The *multiple-match effect*, as the authors called, was considered to be a competition between two antecedents. In this case, the parser would have problems to choose the correct antecedent. However, our results were opposite to the *multiple-match effect* found by Badecker & Straub (2002), that is, rather than slower, the presence of plural attractors was responsible for faster coreference processing. Dillon et al (2013) highlighted that inhibitory effects are not necessarily evidence of the similarity-based interference effects in memory.

> However, the inhibitory interference effects of this sort are not necessarily due to retrieval interference. For example, a feature-overwriting process that degrades the memory chunks when their representations overlap in feature content would predict similar patterns of difficulty, without requiring the use of non-structural cues to retrieval. Thus the strongest evidence that comprehenders use non-structural cues to retrieval, and thereby genuinely retrieve illicit antecedents during online comprehension is the presence of a facilitatory intrusion effect (DILLON, p.101, 2013)

Based on that, the intrusion effects (facilitatory effects) found in our eye-tracking experiment in both ungrammatical and grammatical sentences can be clearly considered evidence that antecedents are retrieved through a content-based memory. In other words, illicit antecedents (attractors) can cause interference effects in memory due to the fact that they partial match the content cues of the pronouns, leading memory to retrieve them as the antecedents.

On the other hand, the results of Total Fixation Duration only showed effects of grammaticality. For obvious reasons, coreference processing in grammatical sentences was processed faster than in ungrammatical sentences despite the presence of attractors. It seems that the structural cues of Principle B is the most important factor in memory retrieval at late processing stages.

Finally, it is relevant to say that *linear distance* effects showed significant effects in neither the First nor the Total Fixation Duration. Thus it seems that the decay effects of the structurally acceptable candidates in long linear sentences did not affect on-line coreference processing. The answers to the comprehension questions, which aimed to check whether the comprehenders were semantically retrieving the structurally acceptable candidate, were probably influenced by linear distance though. In sentences with singular attractors, the structurally acceptable antecedents tended to be semantically retrieved more often in sentences with short linear distance. On the other hand, the attractors rather than the structurally acceptable antecedents tended to be semantically retrieved in sentences with short linear distance. This way, it seems that decay effects resulted from long linear distance made the semantic retrieval of the structurally acceptable antecedent more difficult, which consequently increased the chances of the attractors being retrieved instead.

Curiously, in sentences with plural attractors, the linear distance did not seem to affect semantic retrieval that much. Maybe because the plural features displayed in the attractors bring already strong attraction effects regardless of the linear distance between the structurally acceptable antecedent and the pronoun. Moreover, it seems that in ungrammatical sentences, the context that facilitates the semantic retrieval of the structurally acceptable antecedent the most is the one with short sentences and singular attractors due to the lack of decay effects and salience of the attractor. In grammatical sentences, the context that brings more trouble for memory to retrieve the structurally acceptable antecedent is the one with long sentences and singular attractor. Thus although singular attractors are not too much influential in coreference processings, they can cause serious semantic problems when present in long sentences. One possible reason to justify that is that the singular number is the *default* number, that is, it is the number of most part of the nouns. The force of the plural attractors seems to be only stronger during processing, but it seems that they are not semantically retrieved as antecedent after processing.

It is worthy noting that the structurally acceptable antecedent tends to be retrieved as the semantically antecedent even with a feature-mismatch with the pronoun, which might mean that these ungrammatical sentences are actually not ungrammatical for the comprehenders. Therefore, one could wonder whether the comprehenders did not notice that feature-mismatch, or noticed it and ignored it, considering the sentence grammatical, which is usually called illusion of grammaticality. Finally, it seems that it was difficult for the participants to semantically retrieve the structurally acceptable antecedents in grammatical sentences, which may be evidence that both the structurally acceptable antecedents and the attractors were competing with each other to be semantically retrieved. In these cases, the attractors seems to be retrieved as antecedents, creating semantic illusions.

In order to check whether the presence of attractors caused were illusions of grammaticality and ungrammaticality we decided to conduct an off-line acceptability judgment experiment, which will be discussed in the following session.

3.2 The off-line acceptability judgment experiment

3.2.1 PARTICIPANTS. Forty native speakers of Brazilian Portuguese, undergraduate students of the Federal University of Rio de Janeiro (UFRJ) participated in the experiment. They were all volunteers and received one hour of *Cultural-Scientific Activities* (*Atividades-Científico-Culturais Discentes*, AACC) as compensation for their work. It is relevant to say none of these participants were the same of the eye-tracking experiment and that they were all naive in relation to our object of the study.

3.2.2 DESIGN AND MATERIALS. We conducted a Likert Scale task with the same sentences that were used in the eye-tracking experiment, thus the independent variables and the design were also the same. The dependent variable in this experiment is the rate that the participants gave to each sentence, which varied from one to five, *1* for very unnatural, *2* for natural, *3* for OK, *4* for natural and *5* for very natural.

3.2.3 PROCEDURE. The experiment was conducted in quiet classrooms at the Letters Faculty in the Federal University of Rio de Janeiro (UFRJ). The experimenter gave the participants oral instructions before handing them the handouts, which contained the materials with written instructions and proper spaces above each sentence for the participants to mark their answers.

3.2.4 RESULTS. Z-scores were calculated for each piece of data in order to minimize the subject variability in relation to the scale. The means of the Z-scores as well as their standard errors were reported in Table 4:

	Short sentences with attractors in the singular	Short sentences with attractors in the plural	Long sentences with attractors in the singular	Long sentences with attractors in the plural
Ungrammatical sentence with attractor	-0.37 (0.18)	0.28 (0.23)	0.30(0.18)	1.0 (0.24)
Ungrammatical sentence without attractor	-0.12 (0.14)	-0.23 (0.18)	0.62 (0.18)	0.61 (0.22)
Grammatical sentence with attractor	0.95 (0.20)	0.23 (0.21)	0.21 (0.19)	0.88 (0.25)
Grammatical sentence without attractor	0.65 (0.19)	0.88 (0.25)	0.75 (0.19)	0.80 (0.20)

Table 4: Z-scores means and standard error of the acceptability judgment experiment

A linear mixed-effect model was created with the same fixed and random effects of the eye-tracking experiment. And by using the *anova* function, we found a significant main effect of *grammaticality of the sentence* in our model: $F(1,1.49)=17.9$, $p<0.0001$; a main effect of *linear distance*: $F(1,1.49)=7.0$ $p=0.021$; a significant interaction between the factors *grammaticality of the sentence and linear distance:* $F(1,1.49)=15.2$, $p=0.0001$, and a quite strong trend for the interaction between the *grammaticality of the sentence,* the *attractor number* and the *linear distance*: $F(1,1.49)=3.66$, $p<0.056$.

The *grammaticality* factor was relevant, for example, when comparing the rates in ungrammatical and in grammatical short sentences with attractors in the singular. The grammatical sentences were rated more positively than the ungrammatical sentences with attractors (T-test, $p<0.0001$) or without attractors (T-test, $p=0.001$).

The *linear distance* influence was very robust in all comparisons. Ungrammatical sentences in general and grammatical sentences with plural attractors were rated more positively in long than in short sentences whereas the opposite happened for grammatical sentences with singular attractors (T-test, $p<0.01$). On the other hand, grammatical sentences without attractors do not seem to be influenced by distance factors.

The *attractor number* was decisive when comparing short sentences with singular and plural attractors. Ungrammatical sentences were rated more positively in sentences with plural attractors while grammatical sentences were rated more positively in sentences with singular attractors.

Although the factor *presence of attractor* was not significant in our model, the individual comparisons among the conditions showed that ungrammatical short sentences with plural attractors were rated more positively than sentences without attractors (T-test, $p=0.041$) and that short grammatical sentences with plural attractors and long grammatical sentence with singular attractors were rated more negatively in the presence of attractors (T-test, $p=0.02$).

3.2.5 DISCUSSION. It was observed that the off-line grammaticality judgment experiment presented a main effect of *grammaticality* and *linear distance* besides of the effect of the interaction between these two factors. As one can notice, the results of the off-line grammaticality judgment experiment are congruent with the results found in the eye-tracking experiment for Total Fixation Duration and for the answers to comprehension questions. In the case of the Total Fixation Duration, which measures late processing effects, we also found a main effect of *grammaticality*; and in the case of the answers to the comprehension questions, which occurred at a post-processing phase in our experiment, the *linear distan*ce was also considered a decisive factor. This way, it seems that the *grammaticality* and *linear distance* effects are proper of later processing stages.

Additionally, it seems that our suspicions regarding the fact the sentences with a feature-mismatch between the structurally acceptable antecedents and the pronouns were not considered to be ungrammatical by the comprehenders were correct. The results of the off-line grammaticality judgment experiment indicate that supposed ungrammatical sentences were treated as grammatical in sentences with long linear distance and with plural attractors. The former effect is a consequence of the decay caused by the long distance, that is, the feature-mismatch between the structurally acceptable antecedent and the pronoun tends to be taken for granted or ignored when there is a long distance between the structurally acceptable antecedent and the pronoun. The latter effect is a consequence of the similarity-based interference effects of attractors that display very salient features such as plural.

When it comes to grammatical sentences, it seems that it is the presence of plural attractors rather than the linear distance that is not responsible for leading the comprehenders to treat these sentences as ungrammatical, which would be considered an illusion of ungrammaticality. It is relevant to say that illusions of ungrammaticality are quite rare in the literature. Wagers et al (2009) argue in favor of the grammatical asymmetry as illusions of grammaticality, but not of ungrammaticality can occur in processing. According to the authors, the similarity-based interference effects only occur in ungrammatical sentences, generating illusions of grammaticality. On the other hand, since there is a perfect feature-match between the structurally acceptable antecedent and the pronoun, there is no intrusion of distractors, and no illusion of ungrammaticality. One explanation of this difference between our research and Wagers et al (2009) may be related to the fact that the differently from subject-verb agreement, in pronominal coreference, there is no expectation, no predictions, made by the comprehenders regarding the agreement features displayed in the pronoun. Probably, in the subject-verb relation, once the NPs (noun phrases) are encountered, predictions are automatically made, which may diminish the interference from distractors, especially in grammatical sentences.

4. General Discussion

This research aimed to understand how pronouns retrieve their nominal antecedents in memory in Brazilian Portuguese. Our hypothesis was that because Brazilian Portuguese is a language with rich morphology, the agreement cues would play a more important role than structural constraints in coreference processing. However, our results indicate that the agreement cues only play a role in early processing stages, while the structural constraints cues are delayed until late processing stages, which is congruent with Badecker & Straub (2002) and the *interactive-constructive hypothesis*.

Thus it seems that initially memory activates in parallel all antecedent candidates that feature-match the content cues of the pronouns (*Content Addressable Memory*, CAM), and that Principle B cues seem to filter these candidates until one of them is retrieved. Because the structural constraints are not taken into account at early processing stages, attractors, that is,

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antecedent candidates that are structurally unacceptable according to Principle B, but that feature-matches the pronoun can be initially retrieved as the correct antecedents. Our results showed that the memory in more influenced by attractors in the plural than by attractors in the singular. Therefore, as we hypothesize, memory is not that abstract as one may think as different types of agreement cues may have different levels of activation in memory. Plural attractors rather than singular attractors were responsible for intrusion effects, that is, they facilitated coreference processing in both ungrammatical and grammatical sentences. One possible reason for that lies in the fact that plural is a marked number in English, which makes it more salient in memory than singular.

It should be noted that besides the similarity-based interference effects caused by attractors, coreference can also be influenced by decay effects in memory when, for example, there is a long linear distance between the structurally acceptable antecedent and the pronoun. Therefore, we also hypothesized that in these cases the interference effects of attractors would be stronger since the structurally acceptable antecedent would be more difficult to retrieve. Our hypothesis was partly proven true as our on-line results did not show any sensitiveness to linear distance factors; however, our off-line results indicate that long linear distance between the structural acceptable antecedent and the pronoun can result in difficulties not only to semantically retrieve the structural acceptable antecedents, but also to detect a feature-mismatch on them.

It is important to mention that our research found grammatical illusions during or after coreference processing. The on-line illusion of grammaticality was detected when supposed ungrammatical sentences were processed as grammatical in the presence of plural attractors. On the other hand, the off-line illusion of grammaticality was found not only when structurally acceptable antecedents were semantically retrieved despite the fact that they feature-mismatched the pronoun, but also when supposed ungrammatical sentences were rated as if there were grammatical in long distance sentences. Moreover, it was observed that ungrammatical sentences were rated as grammatical in the presence of plural attractors or in long linear distance sentences, which can be considered an illusion of ungrammaticality. Finally, in grammatical sentences, we also found semantic illusions when singular attractors were semantically retrieved instead of the structurally acceptable antecedent. Thus the illusions are created by memory retrieval problems, which appears to be caused not only by similarity-based interference effects due to the presence of plural attractors, but also by decay effects due to the long linear distance between structurally acceptable candidates and pronouns.

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THE RELEVANCE OF THE U-SHAPED LEARNING MODEL TO THE ACQUISITION OF

THE DIFFERENCE BETWEEN *C'EST AND IL EST* IN THE ENGLISH LEARNERS OF

FRENCH CONTEXT

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Abstract

A U-shaped learning curve entails a three-step process: a good performance followed by a bad performance followed by a good performance again. U-shaped curves have been observed not only in language acquisition, but also in various fields such as temperature, face recognition, object permanence to name a few. Building on the curve, Child Language Acquisition and Second Language Acquisition, this empirical study seeks to investigate the relevance of the U-shaped learning model to the acquisition of the difference between *c'est* and *il est* in the English Learners of French (ELF) context. Rote-learned terms such as *c'est* are acquired before subject clitics such as *il est* in Child Language Acquisition. The present study was developed to assess whether older learners of French in the ELF context follow the same acquisition pattern. The empirical study was conducted on 15 English learners of French, which lasted six weeks. Simple sentences, written compositions and a questionnaire were collected from each subject at three time intervals (after one week, after three weeks, after six weeks), after which, students' work were graded as being either correct or incorrect. The data indicates that there is evidence of a U-shaped learning curve in the acquisition of *c'est* and *il est* and students did follow the same acquisition pattern as children in regards to rote-learned terms and subject clitics. This paper also discusses the need to introduce modules on U-shaped learning curve in teaching curriculum, as many teachers are unaware of the trajectory learners undertake while acquiring core components in grammar. In addition, this study also addresses the need to conduct more research on the acquisition of rote-learned terms and subject clitics in SLA, a topic that has been assessed only in Child Language Acquisition.

Key words: *U-shaped learning model, subject clitics, rote-learning, Child Language Acquisition*

One of the challenges English learners of French (ELFs) face is the acquisition of the difference between *c'est* 'that's' and *il est* 'he is' employed in descriptions. The use of these terms in English does not translate fully into French; hence direct translation from the native language does not infer correct usage in the target one. A number of studies have sought to explain the process of acquisition of French grammatical structures, but there is a lack of data pertaining to this core distinction in an additional language. The present study is a first approach to employ the U-shaped learning model to shed light on the acquisition process of the distinction between *c'est* and *il eat* in learners of French as an additional language.

This paper is divided into six main sections: section one is the introduction of the empirical study, the literature review addressing the U-shaped model and the distinction topic presented in section two, section three describes the methods employed, section four reveals the results obtained in light of the study conducted, the discussion and analysis of data retrieved are presented in section five, and finally, the conclusion and the limitations are discussed in section six.

2. Literature Review

This section will demonstrate the importance of grammar in the context of Second Language Teaching, followed by the relevance of Child Language Acquisition in understanding the distinction between *c'est* and *il est* and lastly, a clear presentation and evaluation of the U-shaped learning model will be presented in relation to the study.

2.1 The importance of grammar in Second Language Teaching

Grammar is a useful tool in the comprehension and creation of oral and written discourses in a language used as change in means rather than as an end in itself. Through the use of grammar, the learner is *sequentially* exposed to a plethora of rules and developmental phases s/he undertakes in order to attain proficiency. Some languages such as pidgin languages are assumed to have no grammatical

backbone due to their grammarless-like stance with the use of oral discourses only. However, although pidgin languages are thought to be grammarless in structure, all languages have grammatical rules despite the lack of rigid written rules, due to the fact that they serve a function, which is to communicate through meaning and context (Navarro, 2015).

Teaching grammar in second language courses is as impactful as acquiring grammar for a first language. Celce-Murcia (1991) demonstrates, "in spite of the intuitive appeal and the anecdotal evidence supporting proposals for exclusively communicative language teaching, there is equally appealing and convincing anecdotal evidence that a grammarless approach can lead to a development of a broken, ungrammatical form of the target language beyond which students rarely progress" (p. 462). Communicating in a language is as important as employing a grammar-like approach which enable learners to achieve high levels of proficiency and accuracy. Gao (2001) uses the term "catalyst" to describe grammar as a medium to attain fluency and accuracy in second languages (p. 326).

For English learners of French, having a grammatical guidance as a consistent portion of the curriculum will greatly aid in acquiring core parts of the language rather than mere fossilization, in which case the learners acquire lessons prematurely. In addition to rules, Dickens & Woods argue that grammar needs to be taught to convey and interpret meanings (p. 630). In ELFs context, it is very tempting to teach by heavily relying on the textbook and translating from English, which can be perceived as meaningless and similar to a pattern drill to the learner.

As Navarro (2015) conveys, using a meaning-based approach to explain basic connotations such as the addition of the derivational suffix –*ed* to a verb in terms of having a beginning and an ending instead of using the traditional approach where learners are asked to merely add the suffix, leads to more retention and future successful application. Hence, it is imperial to teach second languages as an attempt to convey meaning, regardless of the nature of the lesson, whether it is as basic as preposition use or as advanced as the use of literary devices.

2.2 The relevance of Child Language Acquisition to understanding the distinction between c'est and il est

The distinction between c'est and il est. As briefly discussed in the introduction, the translation of *c'est and il est* to *that's and he is* is not interchangeable. While for some constructions, it is permissible to rely on translation, for most it will be fully uncommunicative if the learner employs the same criteria as in English.

Starting from the basics, where translation can be employed, *c'est* is used with adjectives for non-specific referents or for more general observations (see example 1a). *Il est* is used with adjectives *alone* to describe the masculine gender (see example 1b).

      (1a) *C'est* chouette, Maria! *C'est* cool!
             'That's neat, Maria! That's cool!'

      (1b) *Il est* beau et gentil.
             'He is handsome and nice.'

However, it is not synonymous in construction with the description of nouns. Both *c'est* and *il est* cannot be used interchangeably to describe a noun (see example 2). Here, both *c'est* and *il est* are describing *homme* (man), which is a noun. In French, for the sentence to be grammatically correct, description of nouns should be reserved to *c'est*, while use of adjectives *only* should be reserved to *il est* (refer to example 1b). It is important to note that the latter can be used in English to say *he is a young man*, but completely erroneous in French, a distinction that creates confusion in an ELF context.

      (2)   *C'est* un jeune *homme* (correct)
            '*Il est un jeune homme (incorrect)'

Teaching French as a second language for older learners in classrooms can seem mechanical due to its rule-driven nature. The curriculum presents the use of *c'est* first, and then distinguishes its use from *il est*. The use of *c'est* is not presented in a written discourse; it is rather used orally from the beginning of classes (*C'est clair? Is it clear? C'est compris? Understood?*). The learners *acquire* this construction, instead of *learning* it through the use of textbook or more controlled-like instruction, which is saved for the distinction instead. In this context, patterns of French language usage take on a major role. Learners process *C'est* constructions from the French language samples they hear from teacher talk or other sources of aural language.

2.3 The acquisition of the difference between c'est and il est in Child Language Acquisition.

Research has yet to explain the acquisition process that older learners in EFL context undertake to correctly situate *c'est* and *il est*. It is hoped that through this study, it will be a stepping-stone for more empirical research to be conducted for such developmental explanation.

      While researchers have not yet provided explanation for this specific component in French, numerous studies have demonstrated how children under the age of five acquire subject clitics and rote-learned words. Subject clitics are subject pronouns, which "need a verbal host to attach to" (Gotowski, 2015, p.7). An example would be *il est beau*, where *il*, the subject clitic, is attached to *est*, the verbal host. This explanation is misleading partly because *c'est* is also attached to a verb, but it is not a subject clitic.

      Myles et al. (1998) defines rote-learned terms as "imitated chunks of unanalyzed language, available for learner use without being derived from generative rules" (p.324). *C'est* is a rote-learned term because it is an unanalysed form, whereby the learner simply acquires the use of it through imitation and repetition during an actual communicative situation. Like explained earlier, one does not follow a rule-based approach for this lesson; it is acquired without the

controlled nature of explicit instruction with which most basic French lessons are presented.

Following the same process as the ELF's context, *c'est* is one of the earliest utterances found in children's speech as early as the age of two, while those of subject clitics do not occur until the age of three (Meisel, 1994). Meisel demonstrates that the acquisition of rote-learned terms occur earlier due to their imitated and non-formulaic nature (p.137). Equally important it is to consider the effect of frequency of this construction in actual usage. Children likely hear adults around them uttering thousands of examples of C'est as a multiple-purpose collocation. Subject clitics, by contrast, tend to be more productive and require more analysis on the part of the learner to be employed correctly.

The same acquisition pattern among older learners of French is yet to be studied. The current study seeks to answer the same question: Do older learners of French in ELF contexts acquire rote-learned terms earlier than subject clitics?

2.4 Evaluation of the U-shaped learning model in relation to the acquisition of *c'est* and *il est*

The U-shaped learning model. U-shaped learning occurs when a component that was once correctly used by the learner at a given point, becomes destabilized and is used erroneously but is later used correctly again (Navarro, 2015). Carlucci and Case (2013) explain that the U-shaped learning model has been observed not only in the classroom, but also in "a variety of child development phenomena: understanding of temperature, understanding of weight conservation, object permanence, and face recognition" (p.1).

Teachers may perceive this sudden and unexpected drop in performance as discouraging. However, as Navarro clearly advocates, "after more use and exposure, the learner may figure out the correct form/function relationship, yielding a *restructuring* of the learner language" (2015). Hence, teachers should expect students to experience a U-shaped-like figure in learning since this entails that the learners are becoming more proficient due to the plethora of syntactic patterns made available to them.

Numerous studies have sought to explain the acquisition of structures in language acquisition. However, as Mourssi (2013) advocates, most of the studies conducted are devoted to first language acquisition and that there is still a lack of investigation of the existence of the U-shaped learning model in SLA (p. 110). It is deemed beneficial to rely on Child Language Acquisition to understand developmental phases, which may or may not be transferrable to older learners' acquisition.

A classic study, which supports the U-shaped learning model, is the acquisition of past tense in English. Early in language acquisition, Lorenzo (2013) claims that children "learn correct syntactic forms (call/called, go/went), then undergo a period of ostensible over-regularization in which they attach regular verbs (break/breaked, speak/speaked), and eventually reach a final phase in which they correctly handle both the rule-governed regular past-tense formation and the finitely many exceptions represented by the irregular verbs" (p. 57). This evidence has been supported across many studies (e.g., Hakuta study on a Japanese child learning English; Gass & Selinker, 2008).

The studies conducted appear to speak more to controlled aspects of learning in reference to the U-shaped learning model (e.g., past tense). Lightbrown (2000) sheds light on rote-learned terms (implicit learning based on repetition) in that they can also be perceived as difficult to learners even though they have frequently been exposed to those chunks (p. 444). She cites Harley's (1993) study to demonstrate the difficulty faced by French immersion students in understanding the difference between *je* (the first person singular pronoun) and *j'ai* (have). The rote-learned term *j'ai* and the subject clitic *je* are used interchangeably, which renders more confusion on the part of the learner. Lightbrown explains that Harley's participants are not moving toward successful acquisition of this difference, because "they will have to unlearn, or at least reanalyze, these sentences" (p. 444). After this "reanalysis", the students then will be apt to correctly use *je* and *j'ai* based on the array of syntactic resources available.

It is hypothesized that learners in the ELFs context, like the immersion students in Harvey's study, will utilize the same U-shaped learning model to fully

master the distinction between *c'est* and *il est*. Hence, the current study seeks to answer the following research questions: (1) How relevant is the U-shaped learning model in the acquisition of the difference between *c'est* and *il est*? (2) Is the *C'est* rote-learned construction acquired before the subject clitic *Il est*?

Evaluation of the U-shaped learning model. O'Reily and Hoeffner (2003) assert that for at least a number of children, a U-shaped curve does exist (as cited in Mourssi, 2013). However, Hoeffner (1997) argues that not all learners demonstrate a U-shaped developmental curve. Even though the U-shaped curve is necessary for full learning power, Carlucci et al (2006), argue that for some aspects of language learning, there was "no return to previously abandoned wrong hypotheses [and] no return to overgeneralizing hypotheses" (as cited in Carlucci and Case, 2013). This is due to the fact that learners who employ non-U-shaped developmental pathways impose *decisiveness*, where they refuse to return to any previously abandoned hypotheses implicitly, in part because the learner continues to output correct hypotheses since the beginning.

Carlucci and Case also advocate that the necessity of U-shaped learning vanishes when learning is confined to infinite languages only (in the context of *Memoryless* Feedback Learning). Overall, it can be inferred that humans exhibit U-shaped developmental phase in order to acquire core parts of the language due to the *cognitive* stance required on the learner's part.

3. Method

This section discusses the subjects of the study, followed by an explanation of the procedure and instrument used.

3.1 Participants

The participants were students from a French beginner course taught at a major institution of tertiary education in Canada. A total of fifteen students participated (age range 18-24). From these, 53.33% (N=8) spoke English as their first language

and the remainder learned English at the age of five to seven, which falls in the critical period of language learning. Moreover, 40% (N=6) of the participants were bilingual speakers of English and Mandarin/Farsi/Cantonese/ Spanish as first language. As to gender, 87% (N=13) were females and 13% (N=2) were males.

It is important to mention that three of the participants had more exposure to the French language than the rest of the group. These students traveled to France. However, they were still considered beginner learners due to low scores in the placement tests written prior to taking the course.

3.2 Instrument

Pen and paper were used for the simple sentences written compositions in Week 1 and 3. In Week 1, students were asked to write simple sentences to describe the university campus. In Week 3, a composition of around 100 words was assigned in class and students were asked to describe the campus and student community. This was a relevant topic considering the rich ethnocultural composition of the community that studies at this university. The participants were not allowed any dictionary or additional resources during the time they wrote the compositions.

In Week 6, participants were given a questionnaire with one closed question in French, which was completed in class. The questionnaire was prepared by the teacher and it tested for whether students understood when to use *c'est* and *il est* - general description or describing a male gender (see figure 3 for question).

3.3 Procedure

Participants' understanding of the distinction between *c'est* and *il est* was tested thrice using the pre-test, immediate post-test and delayed post-test method. At the beginning of the semester (week 1), students were asked to write simple sentences by using the *c'est* construction only after constant repetition of the term from the teacher. Only written sentences were collected (no oral data). Following the course

curriculum, *C'est* was introduced first (i.e., without *il est*). The latter construction was only presented in Week (3).

During the third week, immediately after being taught the difference between *c'est* and *il est*, students produced compositions with both *c'est* and *il est* occurrences. Finally, in week six, a questionnaire was given to them where one question was asked to test for acquisition of these two core terms in French grammar (see 3 for sample question). They were informed that the question was not for marks and that it was merely a comprehension exercise. This disclaimer was intentional so as to maintain anxiety levels under control during the task.

(3)   *Le café à UCB est très cher! ____ (C'est/Il est) incroyable!*
       'Coffee at UBC is very expensive! ___ (That's/He is) unbelievable!'

3.1 Marking procedure

In Week 1, simple sentences comprised of the *c'est* construction were marked as either right or wrong. For instance, if students used "*est beau*" instead of "*c'est beau*" to describe the campus, the sentence would be changed to the correct form with an explanation of why *c'est* is needed.

In Week 3, a composition was assigned as an in-class assignment to describe not only the campus but also the students on it. If the student used "*c'est un homme*" instead of "il est un homme" to describe a male figure, the sentence will be changed and a explanation such as "Use il est to describe a male figure" would be added to the composition.

Lastly, for the question on the questionnaire administered in Week 6, if students used "*Il est incroyable*" instead of "*C'est incroyable*", an explanation such as "If you are describing the coffee at UBC, use *c'est*. *Il est* is only used for male gender descriptions).

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4. Results

This section will present the findings of the tasks administered at the three different time intervals mentioned in the following order: the introduction of the rote-learned term, *c'est*; instruction of the difference between *c'est* and *il est*; final acquisition test on the distinct application of *c'est* and *il est*.

4.1 The introduction of the rote-learned term, c'est?

In Week 1, after repetition and in-class activities of the construction, *c'est*, students were asked to produce sentences by employing the learned term. Out of 15 randomly selected students, 87% (N=13) delivered correct sentences (see Figure 1). The teacher constantly used the term in most of her sentences at the very beginning of the course (i.e., positive evidence). In turn, students were able to use *c'est* correctly while conversing with their peers and the teacher during in-class activities (i.e., input flooding). They were also able to correctly employ the term in short sentences given to test for their acquisition in class. As mentioned, only the short sentences were used as data for the study.

4.2 The instruction of the difference between c'est and il est

In Week 3, students were introduced to the use of the subject clitic, *il est*. As mentioned above, the challenging aspect for French language learners is that they can perceive the clitic pronoun as being similar to the *c'est* construction. Immediately after an in-class lesson with explicit instruction on the core differences between both target constructions (*c'est* and *il est*), students were asked to write a short composition employing both terms. Out of the same 15 students who participated in the first task (producing sentences with *c'est*), only 40% (N=6) used both correctly (see Figure 1). In other words, less that fifty per cent of the students were able to associate adjectives with c'est and nouns with il est.

The remainder of the students (N=9) used both terms interchangeably, where *il est* was used for general observation and *c'est* was used for describing a

male figure. Overall, students' performance dropped significantly compared to Week 1.
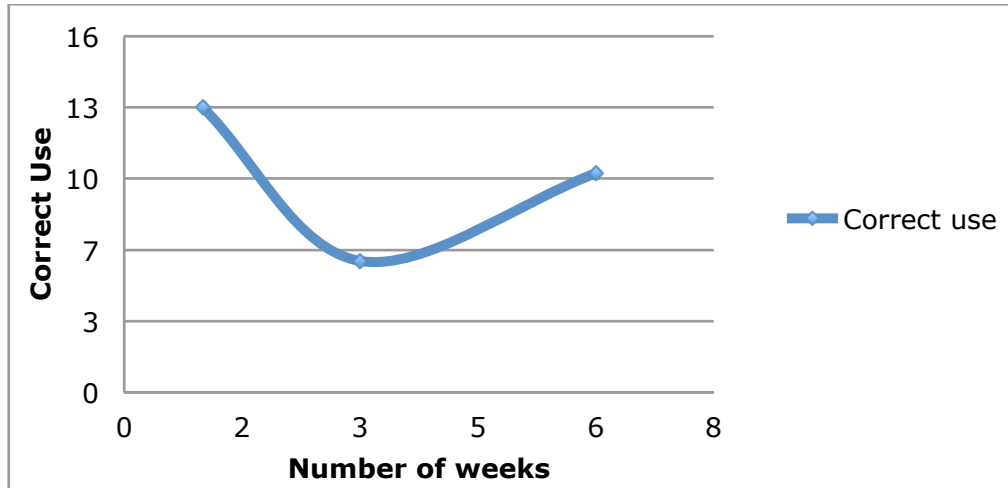
Figure 1. Learners' written use of *C'est* and *Il est* during Week 1, Week 3, Week 6.

See Figure 2 below as an example of inaccurate uses of the target constructions. One student used the word *c'il*, a neologism of c'est and il est and a non-existent construction in French, indicating confusion on the part of that learner.
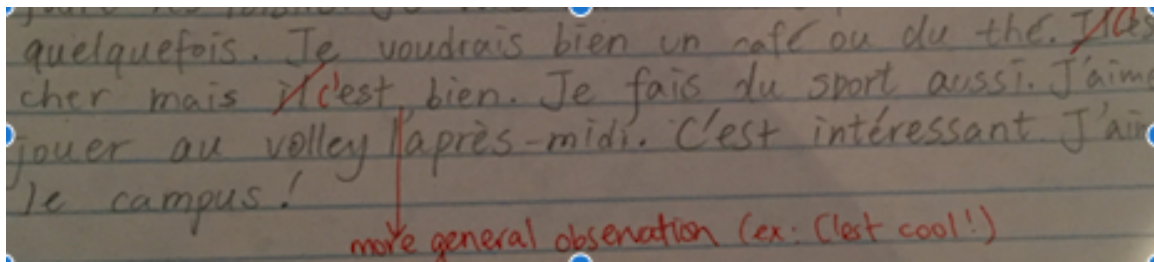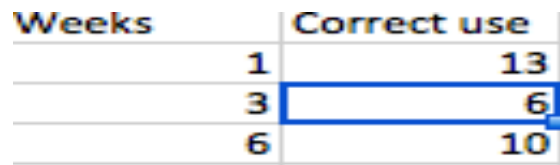

Figure 2. A sample of a student's composition written in Week 3. The student used *il est* instead of *c'est*.

4.3 Final acquisition test on the distinct application of c'est and il est.

In Week 6, during the first day of class, students were told to respond to one question (*Le café à UCB est très cher! ___ (C'est/Il est) incroyable*). Out of 15 students, 67% (N=10) did not use the two constructions interchangeably. Instead, they apply both constructions correctly. These results suggested that students could identify the difference between *c'est* and *il est* at least for replying to an oral instruction. This was further validated by their correct response on the written questionnaire.

The analysis of a comparison at all intervals of the *same* 15 students' work was conducted to ensure consistency and validity of the results. Students' written sentences in Week 1 and compositions in Week 3 were compared, where there was clear evidence of a drop in performance on the use of *C'est*. In Week 6, the written questionnaire demonstrated a rise in performance in the acquisition of both terms, whereby students correctly used *c'est* for describing the coffee at UBC. All data were collected in a grade book, created in *Microsoft Excel.* Figure 3 below shows a sample of the spread sheet containing the number of students' correct responses across the three weeks of data collection. Notice the sudden drop in performance in Week 3.

Weeks	Correct use
1	13
3	6
6	10

Figure 3. Data comparing the correct usage of terms in Week 1, Week 3, and Week 6.

5. Discussion

This section discusses this study's findings in the following order: The relevance of the U-shaped model in the acquisition of the difference between *c'est* and *il est* and the acquisition of rote-learned terms before subject clitics among older learners of French in the ELF context.

5.1 The relevance of the U-shaped model in the acquisition of the difference between c'est and il est.

As Figure 1 shows, the data on how many correct written productions of the target constructions were made at three different time intervals by students. The shape of the line joining the three intervals shows in fact a U-shaped curve. Drawing on the definition by Carlucci and Case (2013), the participants retained 87% of *c'est* correctly in order to produce written statements; failed to correctly distinguish between *il est* and *c'est* after a lesson on that topic (40% correct); to show signs of mastering the difference of both constructions in the third time interval (67% correct).

Figure 2 shows the usage of *il est* instead of *c'est* to connote a general observation. After the introduction of *il est* in Week 3, the student appeared to have discarded the lesson from the first week and employed a subject clitic instead. In other words, the student failed to account for the first grammatical rule acquired regarding the use of *c'est* for general declarations. Of course, this was not a rule that received explicit instruction as we mentioned earlier. Students were expected to learn it implicitly from input. Encouraging though it was to realize that this same student answered the question correctly in Week 6!

As teachers, it is very typical to be disheartened by students' sudden drop in performance. This drop can be erroneously allocated to failure of the teacher as a professional or to the learners as not being able to perform in the target language as expected. However, as my results suggested, learners eventually return to the previously abandoned correct conjecture. Performance in Week 3 was perhaps necessary in order for learners to restructure their in-depth knowledge of the rules (i.e., *intake*) that define the usage of *c'est* and *il est*. This restructuring will eventually aid in acquiring a certain level of expertise (Baylor, 2001).

Bowerman (1982, p. 84) presents a learning strategic-based explanation on the results obtained in this study. She argues that U-shaped learning curves "occur in situations where there is a general rule that applies to most cases, but in which there are also a limited number of irregular instances that violate the rule". In Week 1, the material of the rote-learned term was presented as a "general rule" without

"exceptions", which may explain as to why 87% of the students grasped the lesson successfully. However, in Week 3, the introduction of *il est* was perhaps perceived by students as an *exception* to the rule. That is, one uses *il est* instead of *c'est* to describe adjectives only. As seen earlier, students need to be wary of whether adjectives are being employed or observations are being described.

Bowerman (1982) concludes by advocating that the solution to grasping the general rule with its exceptions is to adhere closely to the rule and to memorize the exceptions (p.86). After a three week period of exposure to the regularities and exceptions in the form of homework exercises and frequent oral discourses reinforced by the teacher, students eventually acquired the difference between *c'est* and *il est* (in Week 6).

Mourssi (2013) argues, "It cannot be claimed that the U-shaped learning model is relevant to Second Language Acquisition" (p.116). He conducted a study to test the relevance of the U-shaped learning model to the acquisition of the simple past tense in the Arab learners of English context. He asserts that while a U-shaped curve can be seen in child language and first language acquisition, it cannot be extended to second language classrooms. In his study, although the majority of students showed substantial knowledge of the simple past tense forms "left, went, came, gave, took" at the first stage, there was little evidence of the U-shaped learning model on the beginning, middle and end phases of this investigation. He explains that the invalidation of the U-shaped curve can be explained due to a rather short experimental procedure (four months) on a difficult topic, which cannot be categorized as comprehensive by learners (p.114).

Mourssi's argument could explain the reason as to why five out of 15 students in the current study failed to respond correctly to the last question in Week 6. However, five as a number is negligible to extend such a powerful statement to the whole study. Other factors such as motivation and the controlled environment might also be considered as explanations.

The results by Mourssi's were displayed as three writings completed by the participants. However, it was unclear whether the U-shaped model was disproved in the first, middle or final stage. Having some clarity on that aspect would have been

more enlightening as to why the U-shaped learning model was irrelevant to the acquisition of the simple past in the Arab learners of English. Such clarification would have aided to shed light on the limitations of the study, where decisiveness or time could have been confounding variables.

The present study contains French beginner students who have not been entirely exposed to the French language – some who claimed that they have been were tested at the beginning of the course. The placement tests reported a poor score, which indicate that they were not proficient in the language. Hence all learners were at the same proficiency level prior to starting the course. Moreover, this study demonstrates clearly when participants experienced confusion – when another term, *il est*, which can be perceived as 'similar' to *c'est*, was introduced in the syllabus.

5.2 The acquisition of rote-learned terms before subject clitics among older learners of French in the ELF context.

As expounded by previous research, children under the age of five, acquire rote-learned terms before subject clitics due to the repetition and less productive nature of the former (Meisel, 1994). The field of language acquisition suffered from a lack of studies on the same aspect with respect to older learners. The current study provided suggestive evidence that adult ELF students learned a rote-learned term first. Despite preliminary, findings from the present study suggested that the fifteen students could use the *c'est* construction before mastering the core difference between *c'est* and *il est*.

Through the short composition in the second phase of the study (Week 3), it can be inferred that *c'est* was used more than *il est* (even though it was a wrong usage), denoting that participants conformed more to the general rule than the exception. At that time, *il est* was still fairly new to their grammatical repertoire, hence they were more prone to confounding with *c'est*. This finding explains the reason why French language curriculum presents the syllabus in such a fashion: *c'est* followed by *il est* followed by the distinction between both. Drawing on child

language acquisition, it recognizes that learners will in fact fare better if the material is taught in that manner, even if they are confronted with a U-shaped learning curve, which as argued in this paper, is necessary.

6. Conclusion

This study has explained the importance of the curve to understanding the plethora of conjectures undertaken by English learners of French to acquire the difference between *c'est* and *il est*. Moreover, it has also yielded suggestive evidence with respect to the acquisition of rote-learned terms before subject clitics among older learners, a validation that was once posited in child language acquisition only. The evidence however should not be generalized to all rote-learned and subject clitics of the French language. More realistically, these findings should be taken as a stepping-stone to provide a stronger empirical backbone to the French language curriculum. And further investigation is indeed in order.

As discussed, language teachers often feel discouraged when they suddenly see that students appear to regress in performance. It may be beneficial to inform teachers that after the addition of a grammatical concept, learners may experience confusion. Hence, teachers will be prepared to understand that this cognitive-developmental trajectory is expected for acquisition. Whether students will follow a similar sequence for all new constructions they learn is a topic we would like to further investigate (cf. Mourssi, 2013).

6.1 Limitations

This study bears some limitations in regard to the length of time and the number of questions asked in the questionnaire administered in Week 6. Having a longer period of data collection (e.g., Week 1, Week 6, Week 12) would have yielded a more consistent and valid result. The students would be expected to have had more time to work on the retention and acquisition between the difference of *c'est* and *il est*. In addition, participants should be asked more questions to better test for that

acquisition – merely asking one question in a questionnaire does not necessarily imply that learners have acquired a distinct lesson. Further research should address these limitations.

In sum, the present study shed light on the developmental order that older learners undertake to acquire rote-learned terms and subject clitics. This is a topic that demands more rigorous empirical scrutiny. Whatever the future approach, the field of SLA should consider enlightening second language teachers on how influential the U-shaped model is to human learning through brief reminders of its impact during training. Reminder of this developmental process should also be included in instructional materials.

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Variable Realization of Interdental Fricatives in Nigerian English

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Introduction

While some forms of variability exist in the pronunciation of the interdental fricatives /θ/ and /ð/ in Nigerian English [NE] (Udofot 2004, Awonusi 2004, Akande 2006, Akande and Akinwande 2006), this study examines the question of what linguistic and social constraints may influence this variation in NE. Previous studies such as Akande (2006)'s study focused mainly on university graduates covering a smaller range of other constraints on the interdental fricatives variation; Akande and Akinwande (2006) examined Yoruba English bilingual graduates. This study however investigates this variability in Nigerian English speakers' speech from different backgrounds and coded for a wider range of variables, with the aim of identifying the variants of the interdental fricatives and the conditioning linguistic and social constraints. It is observed that these variables may be influenced by social factors such as setting, sex, ethnicity, educational background, style; and linguistic factors.

Spoken Nigerian English

Studies on Nigerian English reveals that the variety is distinct from other varieties especially at the level of pronunciation (Jowitt 2000; Udofot 2002, 2004; Akande 2006). Some factors have also been identified to affect NE speech. Jibril (1982) identifies the factor of ethnicity. He observes that spoken Nigerian English is a reflection of the speech differences of the diverse ethnic groups in the country. Banjo (1996)'s study underscores other factors that may influence spoken Nigerian English. He suggests that aside quality of education, home background may affect the way Nigerians use English (Banjo 1996:78). Home background deals with the different environments in which children are raised. Children raised in more educated environment by more educated parents or outside the country in native speakers environment may speak more target-like than others who don't have such background. Also, with English becoming more prestigious in the country and people looking down on the indigenous languages, some parents speak English to

their children right from when they were very young. Those children may grow up to speak English more fluently than those who do not have this kind of background. However, it should be noted that the quality of education or English proficiency of the parents will have to be considered also, in terms of the form the children will grow up speaking.

More specifically on the pronunciation of interdental fricatives in NE, studies such as Simo Bobda (1995), Udofot (2004), Akande (2005) underscore some variation in their realization though from different perspectives. Simo Bobda (1995: 254) reveals that /θ/ and /ð/ are often realized as [t] and [d] respectively in NE. He points out that there is no distinction in NE between the pronunciations of *tin* and *thin* on the one hand and *dose* and *those* on the other hand. His study only identifies the variants but does not really explore the variables that may influence this phenomenon. Udofot (2004)'s study investigated general features of spoken English in Nigeria and one of her findings is that /θ/ in *think* and *thigh* changes to [t] and /ð/ in *that* changes to [d]. She identifies the level of education as a major factor for classifying spoken NE. In a more recent study, Akande (2005) examined pronunciation problems in the English of fifty Yoruba-speaking undergraduates of Obafemi Awolowo University in Nigeria using a prepared text and a structured questionnaire in addition to asking the informants to narrate any interesting story of their choice. He discovers that out of fifty subjects who participated in the study, only 8 and 6 pronounce /θ/ and /ð/ as /θ/ and /ð/ respectively. In the case of /θ/, 42 subjects pronounced it as [t] while 44 pronounced /ð/ as [d]. He concludes that these fricatives are problematic for Yoruba speakers of English. However, the study is limited to the Yoruba speakers and also to undergraduates.

In a similar study by Akande and Akinwale (2006), based on 200 subjects who are native-Yoruba speakers of English and university graduates, it was found out that, for the pronunciation of interdental fricatives, the level of education is a more crucial social variable than sex. They argue that this is because their subjects who had university education could use (θ) and (ð) variants while those who did not have university education, irrespective of their sex, could not at all. They conclude that "there is no significant sex differences in the speech of our informants with respect to the realizations of the sounds investigated, sex differentiation cannot be considered a prominent social variable in the linguistic behavior" (Akande and Akinwande 2006: 12). While these studies apparently establish that the realization of interdental fricatives is variable in NE, there are some limitations. First, some of these studies including Akande (2005), Akande and Akinwande (2006) cover a smaller range of subjects (undergraduates, graduates and Yoruba speakers). Second, not

many factors are coded for since it is believed that other factors (not only education) may also influence the realization of the interdental fricatives.

Therefore, the current study examines the realization of the interdental fricatives in NE with the aim of identifying the sociolinguistic factors that may determine the variables which is done by broadening the scope of subjects to involve more diverse subjects and coding for more factors – linguistic and social factors.

Methodology

Data were collected from five recent Nigerian English movies to allow a wider coverage of speakers. The participants are 30 speakers including 15 males and 15 females from the movies. These are major characters who spoke more frequently throughout the movies and as a result had more use of the interdental fricatives. They also have different educational and social backgrounds. Specific focus is given to pronunciation of the interdental fricatives by speakers and the linguistic environment(s) and different stylistic contexts both formal and informal are considered. Factors like setting, education, ethnicity, style are examined to determine social constraints. In all, 300 tokens were collected for the voiceless interdental and 359 tokens were collected for the voiced interdental fricative. The data were prepared in Excel and quantitatively analyzed through Goldvarb X.

Coding System

The variables were coded separately because we suspect that they may be influenced by different factors. Thus, it will be necessary to identify the factors that influence each of the variables in the study.

a)   The interdental fricatives   (coding and some examples)

(1)   (θ) variable

F	voiceless interdental fricative	/θ/	"who are you on the phone wi<u>th</u>"
t	voiceless alveolar stop	/t/	"Henen, You <u>thought</u> she was?"

(ð) variable

f	voiced interdental fricative	/ð/	"is that a job?"
d	voiced alveolar stop	/d/	"she will meet me in the village"

(2)   Word class
        l   lexical word   "I made a list of things for the market"
        f   function words   "Don't mess with me!"
        n   numbers   "there are three steps"

(3)   Sentence positions
        i   initial   "with all the money I gave you"
        m   medial   "money to continue with mama's treatment"
        f   final   "see your mouth"

(4)   Ethnicity
        A   Yoruba
        B   Igbo
        C   Calabar

(5)   Preceding phonological environment
        h-high, m-mid, l-low, x - diphthong) Vowels [with, bath, I thought]
        n   nasal   "I am fine thank you"
        L   lateral   "I gave you all things"
        s   stop   "I don't think so"
        f   fricative   "Take the drugs with you"
        0   nothing   "thank you sir"

(6)   Following phonological environment
        h-high, m-mid, l-low, x - diphthong) Vowels [thing, thought, thousand]
        s   stop   "Today is her birthday now"
        f   fricative   "am deeply in love with Chuka"
        g   glide   "am not in this business with you"
        r   through   "we can go through it"
        L   lateral   "with Lagos on my mind"
        n   nasal   "I don't know what's wrong with me"
        0   nothing   "who are you on the phone with"

(7)   Sex
        m   male
        f   female

(8)   Style
        f   formal
        i   informal

(9)   Socioeconomic status
        u   upper working class

m   middle working class
    l   lower working class

(10)   Educational background
       e   educated
       L   less-educated

(11)   Setting
       v   village
       c   city

Findings and Discussion

The tokens for the (θ) and (ð) variable were analyzed Goldvarb X. The results for both variables are presented in the tables in the following sections:

θ Variable realization Results:

Table 1: Factor Groups Affecting the variable realization

Table 1: θ variable realization input: .62 p = .000			
1. Setting	weight	N	%
city	.86	195/253	77%
village	.15	10/125	12%
2. Ethnicity			
Igbo	.57	163/272	63%
Yoruba	.62	132/164	71%
3. Formality			
formal	.97	135/215	62%
informal	.20	70/144	48%
4. Education			
educated	.76	39/163	84%
less educated	.19	166/196	23%
5. Sex			
female	.71	135/215	62%
male	.35	70/144	48%
6. Word type			
numbers	.95	19/23	82%
function	.48	59/94	62%
lexical	.43	127/242	52%
groups not selected: sentence positions, phonological environments, social class			

The results show that the (θ) variable is influenced by both linguistic and social factors. Social factors such as setting, ethnicity, education, sex and style affect the use of the interdental fricative while linguistic factor such as word type influence the variable. City dwellers tend to use the target like form than the village dwellers. The targetlike form is used in more formal contexts than informal. More educated people use the targetlike form more than the less educated ones. In terms of sex, women tend to favor the use of the target like form than men. We also found out that there is a higher tendency of realizing the targetlike form in numbers in NE than in other word types.

Setting which has a significant influence, which could be based on the fact that most speakers of the target like form in Nigerian English (NE) reside in big cities. Hence, living in the city can influence one's use of the variable. In Nigeria, particularly, standard of living and quality of social amenities and education are very high in the cities. The cities are very competitive such that getting good jobs and economic survival are influenced by good English communication skills. Lagos especially where two speakers Chichi and Chimamanda relocated, is one of the most expensive cities in Nigeria. Head offices of financial institutions, leading companies and richest people in the country reside in Lagos. So, most people migrate to Lagos from the villages for survival just like these two speakers who were initially residing in the village. After getting to Lagos, they socialized with friends including those born there and meeting very educated and rich people in Lagos. It was observed that they began to use the target like in the city which they had never used before. Hence, factors like socialization, exposure and survival in the city affects their use of the variable.

Table 2:   Cross Tabulation of Sex and Education

	V	Less Educated	Educated
Women	θ	30 28%	105 97%
		108	110
Men	θ	9 16%	61 69%
		55	89

This reveals that sex and education together play a major role in the variable use of the interdental fricative. Less educated women generally use the target like (interdental fricative) about 28% while

the more educated women use it about 97%. Less educated men, on the other hand, use the target-like variant about 16%, while the more educated men use it about 69%. Thus, there is a significant relationship between education and sex in the realization of the voiceless interdental fricative.

ð Variable realization Results:

Table 3: Factor Groups Affecting the variable realization

Table 3: ð variable realization input: .65 p = .000			
1. Ethnicity	weight	N	%
Igbo	.59	146/211	69%
Yoruba	.56	121/179	62%
2. Sex			
female	.80	166/252	65%
male	.52	107/196	54%
3. Setting			
city	.70	266/373	86%
village	.18	27/175	21%
4. Formality			
formal	.53	258/413	61%
informal	.18	15/30	50%
5. Education			
educated	.68	257/345	74%
less educated	.11	16/103	16%
6. Word type			
lexical	.91	23/26	88%
function	.46	250/422	59%
Factor group not selected: sentence positions, phonological environments, social class			

We find that the (ð) variable is influenced by both social and linguistic factors. The social factors include ethnicity, sex, setting, education and linguistic factor such as word type. For setting, there is a higher tendency for those dwelling in the city to favor the use of the target like variant than those living in the village. This is not unexpected since there is more exposure to target like forms in the city than the village especially in the Nigerian context. For instance, the presence of international companies, high quality of education, influence of foreign media in the city may affect the use of target like forms.

Formality affects the realization of the variable in the sense that it occurs more in formal contexts than informal contexts. More educated people use the targetlike form more than the less educated ones. This confirms the influential role of education in realization of the fricatives that has been identified by previous studies (Akande 2006; Akande and Akinwande 2006; Udofot 2004). In terms of sex, women tend to favor the use of the target like form than men. For word type, it was observed that lexical words favour the targetlike form than in function words in NE.

Table 4:   Cross Tabulation of Sex and Education

	V	Less Educated		Educated	
Women	ð	11	9%	151	87%
		86		169	
Men	ð	3	2%	106	59%
		67		179	

This reveals that sex and education together play a major role in the variable use of the interdental fricative. Less educated women generally use the target like (interdental fricative) about 9% while the more educated women use it about 87%. Less educated men, on the other hand, use the target-like variant about 3% while the more educated men use it about 59%. In sum, educated women generally use the target-like variant than educated men. Thus, both education and sex interact as variables as determinants of the realization in NE.

Conclusion

From our findings, we see observe that the realization of the interdental fricatives is conditioned by both social and linguistic factors though social factors play a more influential role than linguistic factors which has also been noted by previous studies (Awonusi 2004, Banjo 1995). However, this study identifies a number of social factors, aside education which has been largely noted by previous studies. It underscores that setting, ethnicity, sex, and style may be influential in the realization of the interdental fricatives. Setting here demonstrates that locality (sociolinguistic environment) may affect speech production in NE. This also relates to the idea that most Nigerians

are able to identify where a person comes from based on his pronunciation (Bamgbose 1971). Word type is identified as a major linguistic factor and this includes numbers, function and lexical words. It is noticed that the realization of the interdentals vary in these linguistic categories.

Furthermore, this study opines that while level of education is a very significant factor as it has been frequently identified by previous studies (Akande 2006; Akande and Akinwande 2006; Udofot 2004), this study observes that sex may be influential since educated women use the target like more than educated men. Essentially, what this study has done is to widen the scope of previous studies by demonstrating that other factors (social and linguistic) may influence the variable realization of the interdental fricatives in Nigerian English.

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Opaque Interactions in OT-CC: The Case of Sm'algya̱x Interrupted Vowels

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Sm'algya̱x, a Tsimshianic language spoken in northern British Columbia and New Metlakatla, Alaska, evidences a phenomenon termed "vowel interruption" by Dunn (1979). Dunn (1979:11) describes this process as one where the glottalization from a consonant following a long vowel "bleeds" into the preceding segment. Optionally, the consonant that carried the glottalization prior to the vowel interruption is deleted.

Turning to classic Optimality Theory (OT) (Prince & Smolensky, 1993/2002) in an attempt to explain an apparent counterbleeding interaction proves disappointing. As is frequently noted, OT has difficulty explaining processes that result in opaque outputs (McCarthy: 2007). Ranking constraints for the interaction of Sm'algya̱x vowel interruption and consonant deletion results in a ranking paradox; no ordering of constraints can explain both processes.

In the current paper, the data provided in Dunn (1978/1995, 1979:11) are examined. Data from Anderson (2013) are also discussed, providing more recent data than those in Dunn (1978/1995, 1979). An overview of the rule-based explanation is then provided, followed by an OT explanation illustrating the ranking paradox.

Following this, a brief introduction to McCarthy's (2007) framework of Optimality Theory with Candidate Chains (OT-CC) is provided. After exploring the interaction of vowel interruption and consonant deletion from the OT-CC framework, the discussion turns to some preliminary comments about motivations for the process of vowel interruption. The paper ends by proposing suggestions for future research, including further exploration into Sm'algya̱x syllable structure and analysis of additional data.
Keywords: Sm'algya̱x, Coast Tsimshian, opacity, counterbleeding, OT-CC, interrupted vowels

1   Language Background

Sm'algya̱x (var. Coast Tsimshian, Tsimshian, Tsimshianic, Tsimshian Proper, Ts'msyen, Ts'msyen Sm'algya̱x) is spoken in communities along the north coast of British Columbia, Canada, by approximately 180 individuals. It is also spoken in New Metlakatla in southeastern Alaska. The majority of Sm'algya̱x first-language speakers are over the age of 50; a small population of second-language speakers is also present (Lewis,

Simons, & Fennig, 2015). Part of the Tsimshianic language family, which includes Southern Tsimshian, Nisga'a (Nass), and Gitksan, Sm'algyax̱ is an ergative-absolutive language with basic VAO/VS word order and polysynthetic morphology (Mulder & Sellers, 2010).

1.1 Sm'algyax̱ Phonology
1.1.1 Phonemes
According to Mulder (1994: 20), Sm'algyax̱ has thirty-eight consonant phonemes. Her table of the consonant phonemes is presented in Figure 1 below. It is pertinent to note especially that the language has a series of phonemic ejective stops, as well as the voiceless alveolar ejective affricate /ts'/. Also present are a series of palatalized, labialized, and uvular stops.

	bilabial	alveolar	palatalised	velar (plain)	labialised	uvular	pharyngeal	glottal
Stop:								
ejective	p'	t'	kʲ'	k'	kʷ'	q'		ʔ
voiceless	p	t	kʲ	k	kʷ	q		
voiced	b	d	gʲ	g	gʷ	ɢ		
Nasal:								
(plain)	m	n						
implosive	'm	'n						
Fricative:		s				χ	h	
Affricate:								
ejective		ts'						
voiceless		ts						
voiced		ʒ						
Approximate								
(plain)			j		w			
implosive			'j		'w			
unrounded:								
(plain)				ɰ				
implosive				'ɰ				
Lateral:								
(plain)		l						
fricative		ɬ						
implosive		'l						

Figure 1: Sm'algyax̱ consonant phonemes

Sm'algyax̱ has contrastive long and short vowels; these are presented in Table 1. Additionally, glottalized and falling vowels occur, as do diphthongs, according to Dunn (1979). It should be noted that Dunn (1979) does not distinguish between interrupted vowels like those in the present discussion, resulting from metathesis, and what he terms glottalized vowels. It is, however, assumed that what he terms glottalized vowels are simply a series of VʔV.

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Table 1: Sm'algyax vowel phonemes (Adapted from Dunn, 1978/1995 and Sasama 1997[1])

	Front	*Central*	*Back*
High	/i/ /iː/		/ɯ/ /ɯː/ /u/ /uː/
Mid	/e/ /eː/	/ə/	/o/ /oː/ /ɔ/ /ɔː/
Low	/a/ /aː/		

Minimal and near-minimal pairs, shown below in Example (1) illustrate contrastive vowel length. In each example pair, the first word represents the short vowel phoneme while the second provides the long vowel phoneme. Note that here, as seen in the transcribed form in 1(c), and throughout the paper, there is a departure from Dunn's (1979) transcription of glottalized consonants. While Dunn represents these as a series of a glottal stop preceding a consonant, ʔC, the choice is made in this discussion to transcribe these as a consonant with a glottalization feature: Cʔ. This helps to distinguish glottalized consonants from consonant clusters. In the examples in (1), the traditional practice of noting long vowels as Vː is followed.

(1)		*Token*	*Transcription*	*Gloss*
	a.	xsán	xsán	'gamble'
		xsáːn	xsáːn	'mosquito larvae'
	b.	gox	gɔx	'peck'
		gooxs	gɔːxs	'willow tree'
	c.	bip	bipʰ	'uncle-in-law' (address)
		bii'k	biːkʔ	'lie, tell a lie'
	d.	yel	jɛl	'drill'
		yeen	jɛːn	'fog'
	e.	amuks	ʔamúks	'listen, obey'
		amuus	ʔamúːs	'corner of a house' (inside)

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[1] The identification of phonemes in Sm'algyax is far from straightforward. For example, Dunn (1970) presents only three short vowel phonemes: /i/, /e/, and /a/. In Dunn (1979 and 1978/1995), however, six vowels (all except /ə/) are listed, but not identified as phonemes. It seems that only the short vowel versions are represented as phonemes, with long vowels listed as variants. More recently, Stebbins and Hellwig (2010:44) provide a vowel inventory that includes vowels represented by IPA æ, æː and ɨ, ɨː and does not include ɯ, ɯː. The inventory does not clarify if the sounds presented are intended to represent phonemes; however, given that the inventory follows a discussion of the challenges associated with representing the sixty-five Sm'algyax phonemes in writing, it is likely that this is the case.

2 Vowel Interruption
2.1 As Evidenced in Sm'algyax

According to Dunn (1979: 11) long vowels undergo a process whereby they become "interrupted" with a glottal stop; this does not occur with short vowels.[2] These interrupted vowels occur when a long vowel is followed by a glottalized consonant. The glottalization bleeds into the long vowel which precedes the glottalized segment, thereby interrupting the vowel. In addition, after the vowel interruption occurs, the consonant is sometimes deleted. A later discussion by Dunn and Hays (1983: 47) briefly mentions the process, noting that vowels followed by a glottalized segment assimilate a laryngeal constriction and are realized as creaky. These vowels are then rearticulated, reflecting the perception of them as interrupted.

From the information provided by Dunn, this seems to be evidence of a phonological process at work, which suggests that these vowels differ from other glottalized vowels found in the language; these will be discussed further in §2.2.2

Phonetically, the interrupted vowels can be represented as [VʔV]. Phonemically, Sasama (1997: 48) analyzes them as /VːʔC/. The data in Example (2) provide examples of vowel interruption. Note, however, that the choice is made in this discussion to depart from the standard notation of long vowels as Vː. Instead, long vowels are noted as VV, thus, when two identical vowels are next to one another they should be interpreted as a long vowel. This choice is made in order to more clearly show the metathesis. Data points a-c are from Dunn's (1979) discussion of vowel interruption; points d-e are from Dunn's (1978/1995) dictionary. Finally, forms f-g are from Sasama's (1997) discussion of vowel interruption. To focus on the discussion at hand, tokens are provided only in phonetic forms.

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[2] Sasama (1997) proposes that short vowels historically evidenced the interruption process. She notes that positing this helps to explain words such as gwe'a [gʷéːʔa] 'poor', which seems to show vowel interruption without a glottalized consonant following the long vowel.

(2)   *Uninterrupted form*   *Interrupted form*   *Gloss*
   a.   biikˀ   bíˀɪkʰ   'lie, tell a lie'
   b.   nɛɛqˀ   nɛˀɪx   'anal fin, dorsal fin'
   c.   naaqˀ   naˀax   'woman's dress; skirt'
   d.   ˀɔɔtsˀn   ˀɔˀɔtsn   'spirit, nothingness'
   e.   húupˀʰl   húˀupʰl   'dark, evening, nighttime'
   f.   łáatˀ   łáˀat   'ball'
   g.   t'úutsˀk   t'úˀutsk   'black'

For all word pairs both forms are allowable, according to Dunn (1979:11) and Sasama (1997), respectively. Whether or not the interruption occurs is based on the preferred form used within a particular community or on speech quality; Sasama (1997) notes that the interrupted forms are more often observed in careful speech. However, more recent data suggests that this is not currently the case. For example, Anderson (2013) identifies only the members of two uninterrupted/interrupted word pairs as free variants. Likewise, some present-day Sm'algyax speakers seem to find only the interrupted forms acceptable (M. Ignace, personal communication). These issues will be discussed in §5.

The vowel interruption process appears to be one of metathesis; the vowel followed by [ˀ] is reordered so that the glottal stop precedes the vowel. As the vowel in the uninterrupted forms is long, this is somewhat obscured since the metathesis prompts the loss of the [+long] feature on the vowel, and can additionally trigger a shift in place for one of the resultant short vowels. It could also be the case that terming the process metathesis is an oversimplification.

2.1.1 Co-occurring processes
In some cases, lenition of the consonant that previously carried the glottalization occurs following the metathesis process discussed above. This is illustrated by the forms in Example (3).

(3)   *Initial Form*   *Lenited Form*   *Gloss*
   a.   naaqˀ   naˀax   'woman's dress, skirt'
   b.   soʌqˀ   sɔ́ˀax   'robin'
   c.   łɪksɔ́ˀaqʰ   łɪksɔ́ʌx   'door, doorway'

The pattern of consonant lenition seen in Example (3) can also extend further, with some consonants lenited to the point of deletion. This is illustrated in the examples in (4).

5

(4)	*Initial Form*	*Consonant Deletion*	*Gloss*
a.	hanaaqʼ	hanáʔa	'woman'[3]
b.	haaqʼ	haʔa	'goose'
c.	nágʼɑ	náʔɑ	'woman's dress, skirt'

While the process of consonant lenition or deletion is optional, for the present discussion only those forms evidencing both vowel interruption and consonant deletion or lenition will be considered. This draws attention to the need for revisions to classic OT in order to account for opaque interactions.

2.2 Compared to Similar Phenomena in Other Languages

Prior to turning to a phonological explanation of vowel interruption, it is helpful to discuss some similar phenomena in other languages. This both demonstrates the plausibility of the vowel interruption process in Sm'algyax̱ and shows its uniqueness from superficially comparable processes.

2.2.1 Echo vowels

Several languages evidence the presence of echo vowels. These are vowels that are rearticulated, often following a glottal stop, and have a perceptually weaker quality than the initial vowel (Gerfen & Baker, 2005). Such vowels are seen in Nisg̱a'a, a language closely related to Sm'algyax̱. Tarpent (1987: 117) notes that echo vowels occur following the release of /ʔ/ in preresonantal and preconsonantal positions. This is shown in the examples in (5)

(5)	*Underlying form*	*Surface form*	*Token*	*Gloss*
	móʔn	mɔ́ʔᵓn	mo'on	'salt'
	káʔskʷ	gʷáʔᵃskʷ	ga'askw	'to look (around)'

2.2.2 Creaky vowels

Creaky vowels, variably termed laryngealized vowels or glottalized vowels, are attested in a variety of languages. For example, several Otomanguean languages have creaky vowels; these are often contrastive with breathy vowels. In Coatzospan Mixtec, a language spoken in southern Mexico, the production of laryngealized vowels is quite variable.

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[3] Dunn (1979, 11) includes both of these forms. However, in Dunn's (1978/1995) dictionary, he provides the forms [hanáʔa] and [hanáʔnqʰ] (entry 754). In a later entry, 756, he provides the form [hanáʔnqʰ] as the plural of [hanáʔa]

Gerfen and Baker (2005) note that the vowels have been described as "echo vowels" because the vowel appears to be briefly rearticulated; this results in the laryngealization not being present throughout the entire production of the vowel. Jalapa Mazatec, also Otomanguean, has a three-way voicing contrast amongst vowels: modal, breathy, and creaky (Gordon & Ladefoged, 2001). While perceptually the creaky vowels seem similar to those in Sm'algyax, they are clearly phonologically different in that the phonation is contrastive; this does not seem to be the case with the interrupted vowels.

A case more similar to the interrupted vowels in Sm'algyax is demonstrated in the laryngealized vowels of the Mixe-Zoque[4] language Sierra Popoluca. In this language, vowels are laryngealized (i.e. interrupted) when a glottal stop occurs with a long vowel in a syllable coda. As in Sm'algyax, this vowel laryngealization is not a contrastive feature (de Jong Boudreault, 2009: 107). De Jong Boudreault (2009) goes on to note that these vowels are perceived as VʔV, with the first vowel being a full vowel. What she marks with ʔ is a period of creaky voice; the second vowel is perceptually weaker in quality; as in those cases mentioned earlier in this section, she terms this weaker vowel an echo vowel.

Likewise, in another Mixe-Zoque language, Ayutla Mixe, rearticulated vowels interrupted with ʔ surface. Romero-Méndez (2008) comments that the environments in which glottal stop surfaces with vowels vary; glottal stop sometimes occurs with short vowels and in other environments occurs with a rearticulated vowel. He, along with Wichmann (1995: 72) speculates that this variation is due to a previously extant root of the form CV:ʔCC. However, differing from the glottalized vowels in Sm'algyax, those in Ayutla Mixe are identified by Romero-Méndez (2008: 43) as an instantiation of a particular type of vowel nucleus. Additionally, both short and long vowels can carry the feature [+laryngeal]; as was stated previously, in Sm'algyax glottalization on vowels occurs only with

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[4] The Tsimshianic languages have been proposed by some (e.g. Sapir 1921; Hymes, 1964) to be part of the same large family of languages as the Mixe-Zoque languages, as well as languages such as Yokuts, Klamath, Coos, and Sahaptian (Hymes 1964: 218). The existence of this proposed Penutian language family, and especially the membership of the Tsimshianic languages in such a family, has been questioned by many due to weak evidence and large geographical distance separating the languages. More recently, Tarpent (1997) has reconsidered the evidence for Coast Tsimshian's membership in the Penutian family, concluding that there is strong support for the hypothesis. While there are many valid arguments for both Tsimshian's exclusion from and inclusion in the Penutian grouping, this is beyond the scope of the current discussion.

long vowels.[5]

2.2.3 Interrupted vowels in Nisga'a
Returning once again to the related Tsimshianic language, Nisga'a, vowels interrupted with ʔ are also seen. While on the surface these look very much like the Sm'algyax interrupted vowels that are the topic of the present discussion, it is not necessarily the case that they result from glottal metathesis. Nevertheless, it is still prudent to make mention of such forms. It could potentially be the case that these forms are, indeed, evidence of the same process as in Sm'algyax, but show a form that, over time, has lost the glottalized consonant that triggered the process. Examples are provided in (6).

(6)	*Underlying form*	*Surface Form*	*Gloss*
a.	ʔiɫéʔ	ʔɫɫéʔɛ̥	'blood, to bleed'
b.	túwʔ	dúːʔu̥	'over there'
c.	sóʔ	sóʔɔ̥	'(to take) food home from a feast'

Sasama (1997: 55) also draws attention to these similar vowels, providing additional examples from Tarpent (1987). These are provided in Example (7).

(7)	*Underlying form*	*Surface Form*	*Gloss*
a.	ntéːʔ	ndɛ́ːʔɛ̥	'pass the…'
b.	titóʔ	didɔ́ʔɔ̥	'cheeks'
c.	kómʔsimʔ	gɔ́ʔᵊmsimʔ	'go ahead! (pl.)'

Sm'algyax also contains forms with vowels interrupted by a ʔ that do not clearly result from glottal metathesis. For comparison, both with the Nisga'a examples in (6) and (7) and the interrupted vowels resulting from metathesis that are the topic of the present discussion, some examples are provided in (8).

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[5] However, Sasama (1997: 51-52) speculates that Sm'algyax historically distinguished between long and short glottalized vowels. She cites the examples of /kʷéːʔa/ [gʷɛ́ːʔɐ], 'poor' and /ʔáːʔa/ [ʔáːʔɐ], 'yes', saying that, while the vowel occurring after the glottal stop in both cases, [ɐ], is weak, and the vowel resembles an interrupted vowel, the only phonemic representation available is that provided, which has a different vowel phoneme [a] following the glottal stop.

(8)	*Surface form*	*Gloss*
a.	haʔáks	'dipper'
b.	gʲɛ́ʔɛts	'down South'
c.	yáʔanskʰ	'distribution, the act of passing around something'

2.2.4 Metathesis of glottalization

Moving briefly to a more general discussion of metathesis, glottal metathesis is evidenced in several languages. For example, this is seen in two Yuman languages, Kiliwa and the La Huerta dialect of Diegueño (Langdon 1976). In Kiliwa, glottal stops in pre-stressed initial positions metathesize with preceding, non-word initial nasals (Langdon 1976: 874). Glottal stops in La Huerta Diegueño also show metathesis, although the process is quite restricted, occurring only in verb forms where the glottal stop is in initial position and part of a pronominal prefix. In such cases, this initial glottal stop moves rightward to directly precede the verb root (Langdon 1976: 874). This is seen in the forms in Example (9):

(9)	*Language*	*Initial form*	*Glottal metathesis*	*Gloss*
	Kiliwa	pmʔi	pəʔmi	'you said it'
	Diegueño	ʔnʸmkanap	nʸmkaʔnap	'you told me'

The Algonquian language Blackfoot also shows glottal metathesis. Consider the example provided by Peterson (2004) in (10) that evidences glottal metathesis. Relevant segments are underlined. The first line presents the surface form after metathesis has occurred, while the second line shows the addition of the inchoative affix that appears to trigger the metathesis in this case.

> (10) *nitáóʔmaiʔtakiwa*
> nit-áʔ-omaiʔtakiwa
> 1-INCHOAT-believe
> 'now I believe'
> VʔVC ⟶ VVʔC

Peterson (2004: 107) proposes that, in Blackfoot, glottalization is a phonetic feature, rather than a phoneme, calling it the realization of the glottalization on a phonemically long vowel.

3   Previous Explanations

The discussion now returns to the topic of Sm'algyax interrupted vowels, considering explanations for the phenomenon from three theoretical

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frameworks.[6] First, a rule-based account is discussed, followed by a traditional Optimality Theory (OT) account. As expected, OT cannot account for the counterbleeding opacity that results when the processes of vowel interruption and consonant deletion interact. This inability to account for the opaque interaction leads to the examination of the interacting processes from the framework of an extension of OT, namely, Optimality Theory with Candidate Chains (OT-CC).

3.1 Rule-Based Account

Those forms showing vowel interruption can be explained as a process of metathesis. A long vowel is interrupted with a glottal stop when it precedes a glottalized consonant. Thus, a word like húupˀʰl would be realized as húʔupʰl.
This is summarized in the metathesis rule in Figure 2.

$$VVʔC \longrightarrow VʔVC$$

Figure 2: Metathesis rule for vowel interruption

As discussed in §2.1.1, deletion of the formerly glottalized consonant can also occur following vowel interruption. For example, hanaaqˀ would be realized as hanáʔa after both metathesis and glottalized consonant deletion occur. This is illustrated in the rule in Figure 3.

$$[\text{-sonorant}] \longrightarrow \emptyset / \underline{\quad} \#$$

Figure 3: Rule for consonant deletion

3.1.1 Rule order in process interaction

In traditional rule-based theory, the processes of glottal metathesis and consonant deletion interact opaquely in a counterbleeding relationship. The consonant deletion rule obscures the context that triggered metathesis, making it appear that the metathesis rule has over applied. This can be seen by comparing the results of ordering the rule for consonant deletion with that for metathesis, shown in the sample derivations in Figure 4.

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[6] It should also be noted that, in addition to the explanation provided in his 1979 grammar, Dunn has made additional attempts to address the issue of vowel interruption. For example, Dunn and Hays (1983) examine the process using Foley's (1977) phonetic bonding continua, which relies on a combination of the strength of features with the strength of the syllable position. More recently, Dunn (2015) explores a similar idea which he terms "syllable devolution". In this process, certain sounds, including [ʔ], in syllable codas lose features which are transferred to syllable peaks and onsets in a step-by-step process. He uses this gradual feature transference to account for the wealth of variation shown in certain lexical items.

	/haaqˀ/				/naaxˀ/		
Glottal Metathesis	haʔaq	Consonant deletion	haa	Glottal metathesis	naʔax	Consonant deletion	naa
Consonant deletion	haʔa	Glottal metathesis	---	Consonant deletion	naʔa	Glottal metathesis	---
✓	[haʔa]		[haa]	✓	[naʔa]		[naa]

Figure 4: Results of rule ordering

While rule ordering quite easily accounts for the interaction of metathesis and consonant deletion, it has many widely recognized weaknesses. For example, rules are language-specific, rather than universal, although the processes explained by a particular rule occur in multiple languages (e.g. syllable-final obstruent devoicing in German, per Wiese, 1996; as well as in Dutch, per Kager 1999: 14-17). Additionally, the presence of conspiracies, where several rules "conspire" to accomplish the same result, is also cited as a weakness of rule-based phonology (see, e.g. Kisseberth, 1970).

3.2 Optimality Theory Account

3.2.1 Overview of Optimality Theory

The problems previously mentioned, as well as others not treated here, served as a partial impetus to the development of Optimality Theory (OT). Prince and Smolensky, in their seminal work on the theory (1993/2002), note that every language has access to the same constraints; that is, the set of constraints is universal. Language differences, for instance, whether a particular language prefers epenthesis over deletion to eliminate disallowed consonant clusters, result from constraint ranking differences. Two types of constraints are posited: markedness constraints and faithfulness constraints. Faithfulness constraints evaluate potential outputs by comparing them to the initial inputs, while markedness constraints evaluate output forms.[7]

Notably, the universality of the constraint set guards against one of the weaknesses of rule-based theory: the promotion of descriptive completeness (McCarthy 2007). However, as will be shown in the analysis in §3.2.5, OT cannot account for many opaque interactions; counterbleeding interactions prove especially problematic. OT markedness constraints only evaluate outputs, and the opaque forms resulting from counterbleeding interactions are ones where, often, a more marked

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[7] Alderete (2001) also proposes anti-faithfulness constraints. These constraints, as their name suggests, require that a related faithfulness constraint be violated.

structure is preferred as the winning candidate. Since the environment motivating the choice of an opaque, and more marked, output can no longer be seen in the surface structure, OT markedness constraints cannot account for why such a form is preferred over a transparent one (McCarthy 2007: 24-25). In this case, they cannot account for why something like 'haʔa' is preferred over 'haa'.

3.2.2 OT constraints for metathesis

As vowel interruption resulting from metathesis is the primary process considered in this discussion, constraints directly relevant to vowel interruption will be discussed first. Since metathesis is a re-ordering of segments, clearly a faithfulness constraint which assigns violations for such re-orderings in output forms is necessary. Often, the constraint employed is that of LINEARITY, whereby a violation is assigned for each pair of segments in the output whose order is reversed from their ordering in the input. However, here the choice is made to instead use Anttila, Fong, Beňuš, and Nycz' (2008) INTEGRITY-IO (INT-IO) constraint, as the glottalized consonants are best described as a single segment, $C^ʔ$, rather than as a cluster of ʔC. The definition of INTEGRITY-IO is as follows:

> **INTEGRITY-IO (INT-IO):** Assign one violation for any series of segments in the input that is split in the output

In order to eliminate the fully faithful candidate containing the marked sequence $V:C^ʔ$, a markedness constraint addressing this process is required. This is an ad-hoc constraint defined as follows:

> ***V:Cʔ** Assign one violation for each segment consisting of a long vowel followed by a glottalized consonant

While these constraints are those that are most directly related to the process of metathesis, additional constraints are also necessary to ensure that the correct candidate is selected as winner. These are discussed in §3.2.3. Following the introduction of these constraints, tableaux for both metathesis and consonant deletion are presented.

3.2.3 OT constraints for consonant deletion

Since the process is one of deletion, the faithfulness constraint MAX is necessary. The standard definition is used; this is as follows:

> **MAX**: Assign one violation for every segment in the input that is deleted in the output

As described above in §3.2.2, the fully faithful form of V:Cˀ appears to be dispreferred in Sm'algyax. Further, glottalized consonants alone seem to be dispreferred. In addition to the examples in the present discussion, other evidence from the language suggests that this is the case. For example, Dunn (1979: 12) notes that glottalized segments have a tendency to lose their glottalization feature and become voiced. This is seen in the forms in (11).[8]

(11)	*Initial Form*	*Form showing loss of glottalization*	*Gloss*
a.	qˀasqˀáʒn	gɑsgáʒn	'ants'
b.	kʷˀɪlí	gʷɨlí	'three' (of round and abstract objects)
c.	qˀasqʰɔ́s	gɑsgós	'crane, stork'

Thus, this suggests that an additional markedness constraint that addresses glottalized consonants is necessary. This constraint is defined as follows:

*Cˀ Assign one violation for each segment in an output which consists of a glottalized consonant

In addition to the markedness constraint that disprefers glottalized consonants, the constraint NOCODA is also necessary. As it is often a coda consonant that deletes in these forms, this suggests that the language prefers to not have codas, or at least prefers not to have codas consisting of glottalized consonants. The standard definition of NOCODA is used; this is as follows:

NOCODA: Assign one violation for every coda consonant in an output form

With faithfulness and markedness constraints that account for both processes, the discussion now turns to ranking these within classic OT.

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[8] It is prudent to note, however, that while Dunn (1979: 12) provides these forms as pairs in a data list, they are not always listed as variants in Dunn's (1978/1995) dictionary. In other cases, it seems that the difference may be a dialectal one rather than a language-wide process. For example, in the case of the forms in example 11b, what is termed the initial form is labeled as being from the Prince Rupert dialect while the form with the loss of glottalization is provided in a separate entry and identified as being from the Hartley Bay dialect.

3.2.4 Constraint ranking for metathesis

Tableau 1 shows the ranking order for metathesis. The token selected, /biikʔ/, was chosen as, according to the information provided by Dunn (1978/1995), the language does not have a form that also evidences glottalized consonant deletion.

Tableau 1: Constraint ranking for metathesis

/biikʔ/	*V:Cʔ	*Cʔ	MAX	INT-IO	NOCODA
a. biikʔ	*!	*			*
b. bii			*!		
c. bikʔ		*!			*
→ d. biʔik				*	*
e. biʔi			*!	*	
f. bikʔi		*!		*	
g. biiʔ			*!		*

*V:Cʔ, *Cʔ, MAX >> INT-IO >> NOCODA

The high-ranked markedness constraint *V:Cʔ assigns a fatal violation to the fully faithful form and passes the selection to *Cʔ. In this pass, both candidates (c) and (f) are eliminated, as both of these candidates contain a glottalized consonant. This constraint also assigns an additional violation to the fully faithful form, candidate (a). The choice then moves to the relatively high-ranked faithfulness constraint, MAX. In this pass, candidate (b), which deletes the coda, is eliminated. Likewise, candidates (e) and (g) are assigned fatal violations by MAX as they both delete the formerly glottalized consonant. While the three high-ranked constraints do most of the work in eliminating incorrect winners, crucially it is the ranking of INT-IO above NOCODA that ultimately selects the correct winning candidate, (d) over the other candidates.

In cases showing both vowel interruption and consonant deletion, the constraints would be in a different ranking order. Notably, NOCODA >> MAX in order to select the less faithful, yet preferred, candidate showing coda consonant deletion. This then results in an order like *V:Cʔ, *Cʔ, NOCODA >> MAX>> INT-IO. Having a different ranking order than that shown for metathesis is not problematic in this case. As mentioned previously, most of the forms in the language are in variation, according to Dunn (1979). Thus, these different ranking orders simply reflect the variation in the language; that, for example, a form like 'hanaʔaq', 'woman' and one like 'hanaʔa' are both allowed. Further, since there are no forms currently under consideration evidencing just Cʔ deletion without metathesis, providing a tableau attempting to show just this deletion is not informative. Thus, the discussion now turns a tableau illustrating the difficulty in accounting for the process interaction in OT.

3.2.5 Constraint ranking for interaction of processes

As evidenced in the previous discussion, while simply ranking INTEGRITY-IO >> NOCODA selects the correct candidate in the case of metathesis, attempting to account for the interaction of processes in classic OT proves problematic. This is seen in Tableau 2.

Tableau 2: Ranking paradox resulting from interaction of processes

/haaqˀ/	*V:Cˀ	*Cˀ	NOCODA	MAX	INT-IO
a. haaqˀ	*!	*	*		
← b. haa				*	
c. haqˀ		*!	*		
d. haˀaq			*!		*
→ e. haˀa				*	*!
f. haqˀa		*!			*
g. haaˀ			*!	*	
h. haaq			*!		

It is first important to note that, as was previously the case, the ranking order of the three markedness constraints is flexible. The constraints driving the selection of the winning candidate are the two faithfulness constraints, MAX and INTEGRITY-IO. Turning now to the assignment of violations, the fully faithful form, candidate (a), is eliminated by the high-ranked markedness constraint *V:Cˀ. Candidates (c) and (f), which both have glottalized consonants, are then eliminated by the high-ranked ***Cˀ**. The choice of candidates then passes to NOCODA; this assigns fatal violations to candidates (d), (g), and (h). The choice of winner moves then to MAX. As both remaining candidates (b) and (e) violate MAX, it is left to the lowest-ranked constraint, INTEGRITY-IO, to select the winner. However, this results in the incorrect choice of candidate (b) over the expected winner, candidate (e). A close examination of the constraint ranking further shows that there is no ranking order possible that will result in the selection of the correct winner.

How, then, can the interaction of metathesis and Cˀ deletion be accounted for? One option is to look to one of several extensions proposed to classic OT theory; it is to this that the discussion now turns.

4   Overview of OT-CC

While classic OT can elegantly deal with a variety of phonological phenomena, many opaque interactions, as demonstrated in §3.2.5, prove

problematic. Indeed, the inability of OT to account for opacity is one of its major weaknesses (McCarthy 2007). Rather than dispense with an otherwise strong theory, attempts were made to extend OT to better deal with opaque interactions (see, for example, Łubowicz, 2003 for a discussion of local constraint conjunction, Bermúdez-Otero, 1999 for stratal OT, McCarthy, 2003a for comparative markedness, or McCarthy 1999, 2003b for sympathy theory). [9]

A relatively more recent extension is McCarthy's (2007) Optimality Theory with Candidate Chains (OT-CC). This theory, at the most basic level, is a synthesis of the constraint rankings of OT with an expanded form of the derivations of rule-based theory (McCarthy 2007). The next several sections first briefly introduction the main principles of OT-CC and then move to an analysis of Sm'algya̲x interrupted vowels from within this framework.

4.1 Description of the Theory

4.1.1 Candidate Chains
In addition to the constraints familiar from OT, OT-CC also introduces what McCarthy (2007) terms *candidate chains*. These are chains of possible output forms, beginning with the fully faithful candidate and including a variable number of intermediate forms. Forms in a chain must meet the requirements of faithfulness, gradualness, and local optimality in order to be a part of an allowable candidate chain. These requirements, adapted from those in McCarthy (2007: 61-62), are explicated below:

> (i) **Faithful first member:** The first member of the chain is a fully faithful candidate. In other words, it violates no faithfulness constraints
> (ii) **Gradualness:** Faithfulness constraint violation occurs gradually. That is, each candidate in a chain shows an accumulation of the faithfulness violations of previous candidates while adding violation of only one additional faithfulness constraint. McCarthy (2007: 61) terms these gradual violations *localized unfaithful mappings*, or LUMs
> (iii) **Local optimality:** Each successive form in a chain shows harmonic improvement from the previous form. Additionally, the form is more harmonic than all other possible candidates that could result from a violation of the same faithfulness constraint. That is, the candidate evidences the "best" violation.

Due to the requirement of local optimality, OT-CC changes some

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aspects of OT. Notably, consultation between GEN and EVAL is required in order for the grammar to determine which candidate is most harmonically improving and the best faithfulness violation. Additionally, due to the restriction of harmonic improvement, there are a limited number of candidates in the OT-CC set, compared to the infinite number in the OT candidate set (McCarthy 2007: 65).

4.1.2 LUMs and PREC Constraints

In order for the candidate chains to go beyond the derivations garnered from rule-ordering, while, at the same time maintaining consistency with the constraint-ranking architecture of OT, several additional requirements are necessary. First is the idea of LUMs. As mentioned before, this term refers to the *local unfaithful mappings* represented by each form in a candidate chain. The set of LUMs in a given chain is referred to as the LUM Sequence, or LUMSeq. Within a candidate chain, each form represents the addition of one LUM.

Precedence, or PREC, constraints result from the presence of convergent chains. As the name suggests, convergent chains occur when there are two or more chains that have the same output and the same LUMs. The chains differ only in the order of LUMs (McCarthy, 2007: 96). Rather than evaluate the same candidates in two different orders, these are treated as one candidate set. McCarthy's (2007: 98) formalization of PREC constraints specifies the order in which LUMs must be violated. Further, PREC constraints can only apply after all candidate chains, and any possible converging chains, are determined. These constraints can assign violations in two circumstances: If there are two constraints of the order (A, B), one violation can be incurred if a candidate has a structure that violates constraint B before constraint A. Additionally, PREC (A, B) can also assign a violation to a candidate that has a structure that violates constraint B without a preceding violation of constraint A.[10]

4.1.3 Review of key OT-CC definitions

Prior to moving to the proposed analysis of Sm'algyax interrupted vowels from within the OT-CC framework, key terms are presented in list form, and defined following McCarthy (2007) in Figure 5.

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[10] In addition to LUMs and PREC constraints, McCarthy (2007: 95-99) also proposes the ideas of the $\mathcal{L}$-set and rLUMSeq. Due to the scope of the present discussion, these are not discussed; the phenomenon can be explained without these more technical aspects of the theory.

Candidate chain	A series of possible forms, beginning with the fully faithful form; each subsequent form reflects only one additional faithfulness constraint violation while also reflecting the accumulation of the violations of all previous forms
LUM	Acronym for 'local unfaithful mapping'; refers to the gradual faithfulness violations accrued by forms in a candidate chain
LUMSeq	The series of all LUMs violated by the forms in a given candidate chain
Convergent chains	Two or more candidate chains having the same output and same LUMs; differ only in the order of LUMs
PREC Constraints	Precedence constraints; they evaluate the relationship between the LUMs in an rLUMSeq

Figure 5: Definition of key terms in OT-CC

4.2 OT-CC Account of Sm'algya̲x Interrupted Vowels

The discussion now turns to a re-analysis of Sm'algya̲x interrupted vowels and consonant deletion from the framework of OT-CC. The formation of candidate chains will first be examined, followed by a presentation of tableaux.

4.2.1 Formation of candidate chains

To demonstrate how a candidate chain is formed, the paper revisits the example word /haaqˀ/ from §3.2.5. In Figure 6, the candidate chains are shown on the left and the LUMs are on the right. The first form in the chain, shown in (a), is the fully faithful candidate; as such it will be identical to the phonemic representation just presented. As a reminder, the relevant faithfulness constraints are MAX and INTEGRITY-IO (INT-IO), defined in §3.2.3 and 3.2.2, respectively.

a. <haaqˀ>   ø
b. <haaqˀ, haa>   MAX
c. <haaqˀ haʔaq>   INT-IO
d. <haaqˀ,haʔaq, haʔa>   INT-IO, MAX ✓

Figure 6: Formation of candidate chains for /haaqˀ/

Candidate chain (a) consists of only the fully faithful form. Chain (b) begins with the fully faithful form; the next form, haa, incurs one violation of MAX. Likewise, chain (c) begins with the faithful form; the output form haʔaq shows a violation of INT-IO due to the presence of metathesis. Finally, chain (d), which contains the winning output form haʔa, begins with the fully faithful form and then moves to the form haʔaq, which violates INT-IO, and then to the desired output, haʔa, which violates MAX.

Notably, there are far fewer candidates provided in the candidate chains than were considered in the OT account for haaqʔ provided in Tableau 2. This is due to the fact that the main problem that OT-CC is seeking to account for is why the candidate showing metathesis and consonant deletion, haʔa, is selected over haa; the candidate that the OT account incorrectly chooses as winner.

4.2.2 Application of OT-CC to the data
Now that the process of forming candidate chains has been examined, the discussion moves to the ranking of constraints in OT-CC. Note that, like in an OT tableau, candidates are presented along the leftmost column. Also like an OT tableau, constraints are ordered and ranked along the topmost row. However, note that the OT-CC tableau lists the faithfulness constraints that each candidate violates. Also note that an additional constraint has been added, namely a precedence constraint. As a reminder, precedence constraints specify the order in which faithfulness constraints must be violated. The precedence constraint employed here is defined as follows:

> **PREC (INT-IO, MAX)** : Assign one violation mark for any violation of INT-IO that is not preceded by a violation of MAX; additionally, assign one violation mark for any violation of MAX that follows a violation of INT-IO.

Tableau 3 shows the ranking of constraints for the output forms from the candidate chains provided in Figure 6. As was found in the classic OT analysis, the markedness constraint *V:Cʔ eliminates the fully faithful form, candidate (a). This candidate incurs a further violation from the *Cʔ constraint. The final markedness constraint, NOCODA, adds yet another violation to the fully faithful candidate (a), and assigns a fatal violation to candidate (c), which shows only metathesis. The selection of winner then moves to the first faithfulness constraint, MAX. This constraint assigns one violation to each of the remaining candidates: candidate (b) has deleted the final segment, qʔ, as has candidate (d). Thus, with these two forms tied, the choice passes to the precedence constraint. This constraint assigns a fatal violation to candidate (b), haa, resulting in a correct selection of candidate (d), which evidences both metathesis and consonant deletion.

Tableau 3: OT-CC constraint ranking for /haaqˀ/

/haaqˀ/	*V:Cˀ	*Cˀ	NOCODA	MAX	PREC(INT-IO, MAX)	INT-IO
a. haaqˀ Ø	*!	*	*			
b. haa **MAX**				*	*!	
c. haʔaq **INT-IO**			*!			*
d. haʔa **INT-IO, MAX**				*		*

(→ points to row d.)

4.3 Discussion of Results

The account provided above does seem to provide a fairly satisfying account of the counterbleeding opacity evidenced in the interaction of Sm'algya̲x vowel interruption and consonant deletion. However, many questions still remain; some of these will be addressed here.

First, the careful reader will have noted the omission of the candidate 'biik' in the tableau for metathesis (Tableau 1) and, likewise, the omission of the candidate 'haqa' in the tableau describing the interaction of processes (Tableau 2). Including a featural markedness constraint such as MAX-GLOTTAL eliminates such candidates, allowing for OT to provide an adequate account of the interaction of metathesis and consonant deletion. Likewise, the preference for candidates such as 'hanaʔa' over ones such as 'hanaaq' suggests that a constraint like MAX-GLOTTAL might be viable. However, based on the research conducted for this discussion, it is not clear that such a constraint accurately describes the preferences of Sm'algya̲x as a whole. For example, as described above in §3.2.3, Dunn (1979: 12) notes a tendency for glottalized segments to lose their glottalization feature and become voiced. With the limited examples provided, it is not clear whether this is a common process or not. If it is, then the analysis of the interaction of metathesis and consonant deletion could indeed be worth further consideration.

5   Interrupted Vowels in Modern Sm'algya̲x

As noted earlier, while Dunn (1979) maintains that all three forms, that without an interrupted vowel, that with an interrupted vowel, and that with an interrupted vowel and deleted consonant, are allowable in Sm'algya̲x, more recent data suggests that this is no longer the case. Most notably, the intuition of some present-day speakers is that the non-interrupted forms are not allowable (M. Ignace, personal communication). This is also seen in data from the Sm'algya̲x online talking dictionary (Anderson, 2013).

For example, consider again the token used in Tableau 1 to illustrate the constraint ranking for metathesis. While Dunn (1978/1995) provides both biiʔk and biʔikʰ as valid forms, Anderson (2013) only includes the form biʔikʰ:

(12) *Dunn*   *Anderson (2013)*
      (1978/1995)
      biiʔk   -----
      biʔikʰ   biʔikʰ

In other cases, forms that Dunn (1979) used as support for the phenomenon of consonant deletion following vowel interruption are classified by Anderson (2013) as dialectal variants. For instance, Dunn (1979) provides hanaaqˀ and hanaʔa as forms for 'woman'. However, Anderson (2013) gives hanaʔax as the main entry, classifying hanaʔa as a dialectal variant.

(13) *Dunn*   *Anderson (2013)*
      (1978/1995)
      hanaaqˀ   hanaʔax
      hanaʔa   hanaʔa

6   Further Research

With the questions remaining from the analysis as to whether or not a constraint such as MAX-GLOTTAL can be employed, and the changes evidenced in the data in Anderson (2013), it is clear that much work remains to be done to gain a clearer understanding of Sm'algyax vowel interruption. Completing a field study comparing the acceptability of interrupted and uninterrupted forms of the various data points presented in Dunn (1978/1995, 1979) would be beneficial both in terms of adding to the general body of work on Sm'algyax and also in terms of documenting the process of language change. Some of the difficulties encountered in the OT-CC analysis might be alleviated through this; perhaps the present-day forms would result in a proposal of either new constraints or new constraint rankings.

Additionally, examining the data within other theoretical frameworks might also prove useful in explaining the phenomenon. Perhaps, for example, the vowel interruption is a type of segment shift, analyzed by Gietz, Jurgec, & Percival (2015) with Harmonic Serialism (see McCarthy, 2010 for an overview). They note that such languages as Gitksan show segment shift, and, notably, Ayutla Mixe, mentioned previously in §2.2.2, shows laryngeal segment shift. If it is the case that the Sm'algyax glottal metathesis process is one of segment shift, Harmonic Serialism might be able to successfully account for the phenomenon.

Additionally, doing a thorough comparative analysis among vowels that appear to be interrupted in Sm'algya̱x, Nisg̱a'a and Gitksan would be beneficial. This would not only likely provide insight into the process of vowel interruption, but might also lead to a better understanding of the motivation of vowel interruption.

Finally, and perhaps most importantly, gaining a more thorough understanding of Sm'algya̱x glottal metathesis and consonant deletion requires native speaker intuition. For example, a discussion of why an uninterrupted form like biikʔ is not allowed, and why the interrupted biʔikʰ is, would likely lead to both a better understanding of the phenomenon itself as well as a clearer understanding of the motivation for glottal metathesis and subsequent vowel interruption.

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THE MAJORITY INFLUENCE IN ENGLISH-CHINESE-JAPANESE TRILINGUAL ACQUISITION[*]

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This paper investigates the cross-linguistic influence in early trilingual acquisition involving English, Chinese and Japanese. Especially it focuses on checking the plausibility of the Majority Influence (Cenoz 2003, Clyne 1997), which is caused by a linguistic feature shared by two of the three languages being transferred to the third language in a trilingual constellation. Through the longitudinal utterance data of an English-Chinese-Japanese trilingual child (2;1-2;7), who has a Japanese-speaking father, a Chinese-speaking mother, and goes to a English daycare center (8 hours for 2days/week at the time of the study), it was found that the child produces errors, which are predicted by the Majority Influence. For example, the child produced ungrammatical sentences with head-initial NegP or VP in Japanese which are clearly influenced by the majority linguistic features shared by the two languages, i.e. Chinese and English. On the other hand, we have found no Majority Influence errors regarding wh-movement in English where it is predicted that the child would produce wh-in-situ questions more often in English by the majority linguistic feature in Japanese and Chinese. We discussed that this is due to the potential ambiguity in Japanese input caused by scrambling and ellipsis, which cancels out the majority factor in the constellation.

Keywords: early trilingualism; cross-linguistic influence; majority influence; language dominance; head parameter; wh-movement

1. Introduction

Hoffman (2001) distinguished different types of trilinguals, including children growing up with two languages at home that are different from the language of the wide community and the bilingual children who become trilingual via immigration and third language learner. This paper

focuses on the first type, which can be referred to simultaneous trilinguals. Research on the trilingualism is still in its infancy (Unsworth 2013). The most studies on simultaneous trilinguals involve observational case studies with rather little sentence-internal linguistic data, focused on the question of e.g. early language differentiation (Montanari 2009a, 2009b, 2010, 2011, Quay 2008, 2010) or potential effect of reduced input (Yang and Zhu 2010, Barnes 2006, 2011, Place and Hoff 2011).

   For example, Quay (2008) conducted a case study with a two-year-old girl (-2;4) named XiaoXiao, who has a bilingual father (American English native/ fluent in Japanese), a trilingual mother (Mandarin Chinese native/Japanese fluent/English fluent), and lives in Tokyo, Japan where she attends a daycare (weekdays for 7h/day from 0;5, and 8.5h/day from 1;5). Both parents use one-parent-one-language approach (mother-Chinese, father-English). The findings include that Xiaoxiao prefers to speak English or Japanese to her father, English, Japanese, or Chinese to her trilingual mother, and that Xiaoxiao's preference for Japanese comes out particularly when she addresses both parents together, which shows that it serves as a *lingua franca* in her family. Also, it was mentioned that the child spoke mainly Japanese in the monolingual daycare setting. Based on these findings, Quay concludes that a Chinese-English-Japanese trilingual child at age of two is aware of which languages the father/mother could handle best, and can select languages according to her interlocutor's linguistic knowledge in terms of their native language as well as the language they speak to her.

   On the other hand, there are few qualitative studies, looking at the sentence-internal linguistic data of early trilingual child, more specifically, how the three languages influence each other (i.e. Cross-linguistic Influence; henceforth the CLI) in early trilingual acquisition. Thus, the goal of this paper is to shed light on the CLI pattern of a trilingual child by looking at the longitudinal linguistic data, more specifically, of an English-Chinese-Japanse 2 years old child, who has Japanese-speaking father, Chinese-speaking mother, and lives in the U.S.A.

   The section 2 briefly reviews the cross-linguistic influence in early bilingual acquisition before moving on to the CLI in trilingual acquisition, where we introduce the Majority Influence, which is resulted from a linguistic feature shared by two of the three languages being transferred to the third language. Then, I will make some predictions in English-Chinese-Japanese acquisition based on this Majority Influence hypothesis. Section 3 describes the actual study and shows its result, where it is shown that the child produced ungrammatical sentences with head-initial NegP or VP in Japanese which are influenced by the majority linguistic features shared by the two languages, i.e. Chinese and English. The section 4 discusses the result of the study and the section 5 concludes the paper.

2. Effects of the Mixed Input: Cross-linguistic Influence (CLI)

2.1. The CLI in Early Bilingual Acquisition
Although the CLI in early trilingual acquisition has been paid little attention, the possibility that the two grammars of a bilingual child may interact each other has been investigated vigorously in the past decades. For instance, Grosjean (1982) claims that only the dominant[1] language

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[1] "dominance" is broadly defined as "the condition in which bilingual people have greater grammatical proficiency in, more vocabulary in, or greater fluency in one language or simply use one language (i.e., the dominant language) more often" (Genesee et al., 2004, p. 80)

interferes with the weaker one. This influence underlies the so-called 'dominant language hypothesis' (Petersen 1988). However, this hypothesis dealt only with overt phenomena, such as lexical insertion. The most outstanding hypothesis was proposed by Hulk and Müller (2000) and Müller and Hulk (2001), which claim that children may transfer the use of a grammatical construction from language A to language B if (i) the construction in question is at the interface between two modules of grammar, and (ii) if the two languages overlap at the surface level. Based on this cross-linguistic influence hypothesis, many studies have been conducted and some general pattern of cross-linguistic influence in bilinguals is established as follows (Serratrice 2013).

(a) Higher omission rates than those observed in monolingual acquisition
    e.g. Pervasiveness of null topicalizaed objects in German causes a higher rate of omissions
         in the Italian of a German-Italian bilingual child
(b) Use of a construction in language A that is unattested in contexts in which it is not
    semantically or pragmatically appropriate in language B
    e.g. overt pronominal subjects in the Spanish of an English-Spanish bilingual
(c) Use of a construction in language A that is unattested in monolingual acquisition
    e.g. prenominal relative clauses in the English of a Chinese-English bilingual

However, it is clear that these conditions on cross-linguistic influence are sufficient but not necessary. For instance, not all children exhibit cross-linguistic influence even when the relevant conditions are met (Gathercole, 2007).

2.2. The CLI in Early Trilingual Acquisition

In a trilingual acquisition, imbalanced relationship within trilingual constellation regarding overall typological distance is regarded as an important factor in triggering the CLI (Cenoz, 2003). As Clyne (1997) pointed out, if two languages may share a linguistic feature not found in the third language, it may lead to such a feature being transferred to the third language. Such a constellation is referred to as the *majority factor*, and its effect as *majority influence*. It could also prevent the transfer from a third language to first/second languages. This majority factor/influence is only manifested in the trilingual acquisition and not in bilingual counterpart, which makes it interesting to examine the CLI in early trilingual acquisition in this regard.

  One of the few previous studies in this regard is conducted by Kazzazi (2011), which looked at compound nouns in two Persian-English-German trilingual children. In such a trilingual constellation, two of the three languages (English and German) behave similarly in attribution structures, i.e. German and English are both predominantly pre-modifying whereas Farsi is predominantly post-modifying as shown below.

(1) a. German   *roter Apfel*   *mein Apfel*   *Apfelbaum*
    b. English   *red apple*   *my apple*   *apple-tree*
    c. Farsi   *sib-e qermez*   *sib-e man*   *derakht-e sib*
                 apple-*ezafe* red   apple-*ezafe* my   tree-*ezafe* apple
                 ='red apple'   ='my apple'   ='apple-tree'

Thus the majority influence hypothesis predicts that German and English, being majority, would cause children to make pre-modification errors in Farsi.

  Data from a longitudinal naturalistic case study of the author's two children growing up with three languages (main data from Anusheh 1;0-/ some corpus of written notes from Irman) was investigated for such errors. The mother of the children is a German/English-native, knows Farsi, and speaks mainly in English to the children and German to the father. The father is a Farsi-native, German-fluent, and speaks only Farsi to the children. The children were growing up in Germany since birth and answering each of the parents mainly in German, but occasionally also in English (to mother) or Farsi (to father). Irman started day-care at the age of 3, then with only little knowledge of German, his active language use was English and Farsi. He became fluent in German and Farsi by 11;7. Anusheh spent up to 8 hours, 5 days a week in a day-care, from the age of 13 months, making German her sociopragmatically dominant language, and thus she was an early trilingual. The author notes that their language strength was German > Farsi > English.

  Results show that the pre-modification in German, the dominant language, triggers pre-modification error in Farsi:

  (2) *surati kafšhā*   cf. F. *kafšhā-ye surati*
      'pink shoes'   shoes-*ezafe* pink (Anusheh, 3;9.17)

However, converse instances of Farsi postmodification are observed in German and English, in compounding as shown below.

  (3) *Schuhehaus*   G. *Hausschuhe*   'slippers'   (Anusheh 1;5.1)
  (4) schau mal, [*autopɔtsəlait*]   G. *Polizeiauto*   'Look, police car' (Anusheh, 2;3.12)
  (5) *Keksebutter*   G. *Butterkekse*   'butter biscuit'   (Anusheh 2;4.15)
  (6) *Feuerlager*   G. *Lagerfeuer*   'campfire'   (Anusheh 3;3.14)
  (7) key-car   E. car-key   (Irman 2;7.24)
  (8) bath-swimming   E. swimming-bath   (Anusheh, 3;3.26)
  (9) dog-sheep   E. sheep-dog   (Anusheh, 3;3.27)
  (10) wall-sky   Metaphorical neologism   'ceiling'   (Irman, 3;4.19)

  The author extensively discusses the reason why both the children like post-modification although they hear and use the language presenting this model less than the German and English model taken together and have acquired the pre-modifying structure of German and English. Kazzazi claims that post-modifying compound is more iconic than a pre-modifying one, saying the ordering 'determined → determining element' is cognitively more motivated due to logical iconicity, i.e. first you mention what you want to talk about and then what you want to say about it (i.e. Topic-Comment order). It is claimed that the Farsi morpho-syntactic structure is conceptually closer to such language-external, ontogenetic iconic principles and thus serves as a trigger for overlaying the German and English language-internal morpho-syntactic structures. Thus, Farsi structures, though in the minority, 'win out' over the majority of the Germanic structures, contrary to the prediction by the majority influence.

  Overall, because of the converse errors caused by the iconicity, it is not clear whether the pre-modification errors in Farsi in this study is due to the Majority Influence effect from German and English. Also, the errors can be explained by the dominant language hypothesis (Petersen 1988), by saying that the dominant language, German, influenced the grammar of a weaker language, Farsi. Thus, in order to test the plausibility of the effect, we need to show clearer cases with different kind of constructions in different trilingual constellation without the converse errors

caused by a language-external principles or the possibility of the dominant language influence.

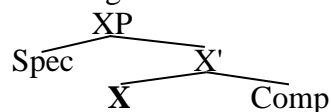## 2.3. Predictions in English-Chinese-Japanese Trilingual Acquisition

Based on the discussion above and the previous research, the research questions in the present research of an English-Chinese-Japanse 2 years old child are the following:

(i) Are there any cross-linguistic influence pattern in Japanese-Chinese-English trilingual child's utterances similar to that of Kazazzi (2011)[2]?
(ii) Is the majority influence (Clyne 1997) observed in his utterances?
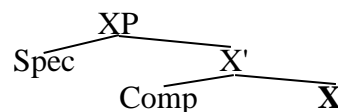
Now, considering the majority factor among Japanese, Chinese and English, there are mainly two linguistic features which are shared by two languages and not found in the third language, which may lead to majority influence, i.e. such features being transferred to the third language.
  The first of such feature is the head parameter setting, where it is head-initial in Chinese and English but head-final in Japanese, based on the X-bar theory (Chomsky 1970):
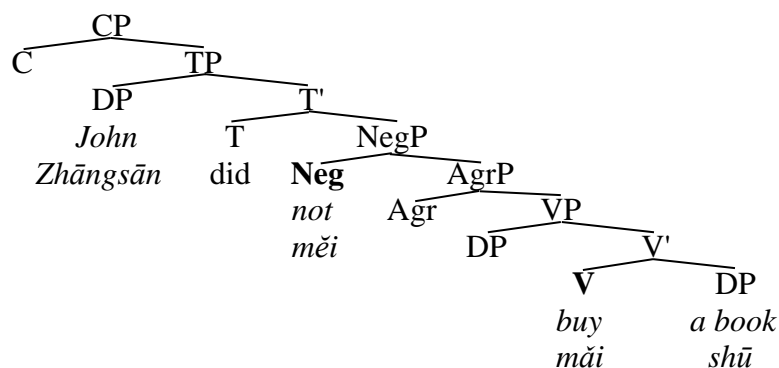
(11) a. Chinese/English   b. Japanese

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           XP                                    XP
        /      \                              /      \
     Spec      X'                          Spec      X'
             /    \                                /    \
            X     Comp                          Comp    X
```

This structural difference among 3 languages (Japanese/Chinese/English) is salient in e.g. the position of internal argument (object) of verbs or negation of a predicate as in (12). The tree structures are shown in (13), based on Chomsky (1995) and Ouhalla (1991).
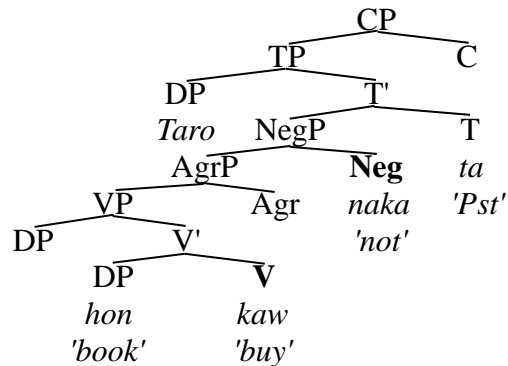
(12) a. John did <u>not</u> [<u>buy</u> a book]   English
     b. Zhāngsān <u>měi</u> [<u>mǎi</u> shū]   Chinese
            not-Pst buy book
     c. Taro-ga   [hon-o   <u>kawa</u>] <u>nakat</u>-ta   Japanese
          -Nom   book-Acc buy -not-Pst

(13) a. English/Chinese

```
              CP
          /        \
        C           TP
              /          \
            DP            T'
          John         /     \
        Zhāngsān    T       NegP
                   did    /       \
                        Neg       AgrP
                        not    /        \
                        měi   Agr       VP
                                    /        \
                                  DP          V'
                                            /    \
                                          V       DP
                                        buy     a book
                                        mǎi       shū
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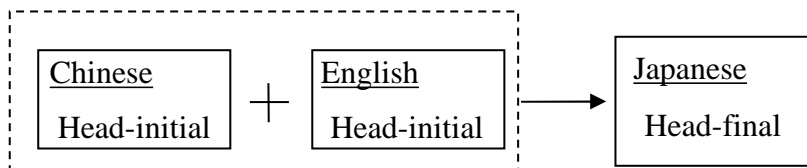[2] Here I cannot look at the compounding since Japanese, Chinese and English share pre-modifying property.

b. Japanese

```
                              CP
                      TP            C
                 DP        T'
                 Taro  NegP      T
                      AgrP    Neg    ta
                 VP        Agr  naka  'Pst'
            DP      V'           'not'
                 DP      V
                 hon    kaw
                 'book'  'buy'
```

Here, since the head is always in the initial position in a phrase in English or Chinese, the verbs in these languages precede their objects while Japanese verb follows its object because it is located in the final position within a phrase. Similarly, the Neg head, which hosts a negative item like *not*, precedes a predicate in English or Chinese but follows it in Japanese due to its different positions (initial/final) in a phrase. Based on this, we can predict that the head-initial property as a shared linguistic feature in English and Chinese would be transferred to Japanese, the third language. Thus, it is expected that an English-Chinese-Japanese early trilingual would produce errors in Japanese, in which a verb precedes a object or negation precedes a predicate. This is summarized below.

(14) <u>Prediction 1</u>: Majority factor from Chinese and English causes the errors in Japanese, e.g.
           (a) a verb precedes its object, (b) negative element precedes a predicate

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  ┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
  │  ┌──────────┐     ┌──────────┐  │        ┌──────────┐
  │  │ Chinese  │     │ English  │  │        │ Japanese │
  │  │          │  +  │          │  │   →    │          │
  │  │Head-initial│   │Head-initial│ │        │Head-final│
  │  └──────────┘     └──────────┘  │        └──────────┘
  └ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```

Another linguistic feature shared by two of the three languages is *wh-in situ*, i.e. a wh phrase stays in the original position in Japanese/Chinese wh-questions, but moves to the beginning of the sentence in English, as shown below.

(15) a. **When**$_i$ did [the visitors arrive t$_i$]?   English
     b. **Who**$_i$ do [the parents think [that the children saw t$_i$]]
(16) a. [kengakusha-wa **itsu** tsuki- mashita-] ka ?   Japanese
              visitor   -Top when arrive Pst   Q
         'When did the visitors arrive?'
     b. [ryoshin-wa [kodomo-tachi-ga **dare-o**   mita   to] omoi- masu-] ka ?
          parents -Top child -Pl -Nom who-Acc see-Pst that   think Pres   Q
          'Who do the parents think that the children saw?'
(17) a. [canguan de   ren **shenme shihou**   dao de ?]   Chinese
             visit Gen people what   time   arrive F
   'When did the visiters arrive?'

  b. [fumuqin renwei [haizimen kandao **shei** le]]?
      parents think   children saw   who Pst
     'Who do the parents think that the children saw?'

It is assumed (Chomsky 1995) that wh-phrase is base-generated in a canonical position and wh-features on a C head require checking (and thus movement) only if it is strong and that the feature is strong in languages like English, but weak in languages like Japanese or Chinese.
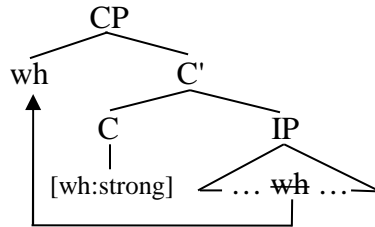
(18) a. English   b. Japanese/Chinese
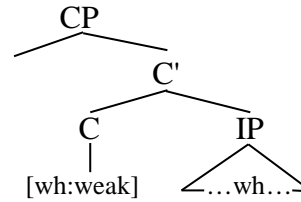
Based on this, the weak wh feature as a shared linguistic feature of Japanese and Chinese is predicted to be transferred to English, by which we expect that an English-Chinese-Japanese trilingual would make *wh-in situ* errors[3] in English, as a majority influence effect (Prediction 2).

(19) <u>Prediction 2</u>: Majority factor from Chinese and Japanese causes an error, i.e. wh-element
                   appears in situ in English
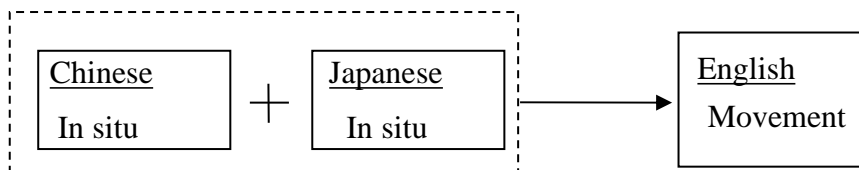
Now we are turning to the present study on an English-Chinese-Japanese trilingual child in the next section to check if these predictions are borne out.

3. The Study

3.1. Method
The study is based on the author's Japanese/(Mandarin) Chinese/English trilingual son, named Xun. His mother is a Chinese (Mandarin) native speaker and his father, a native Japanese speaker. The parents followed the one person-one language principle (Ronjat 1913) from the birth of the child, however since the family moved to the U.S. when he was 0;11, the parents try to speak English to him when it is appropriate (e.g. when reading a picture book in English). The mother was the primary caretaker since only father works outside during the day at the time of study. Conversation between parents were mainly in Japanese. The child regularly spent 2 days (about 8

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[3] Wh-in-situ is possible in English when the set of possible answers is part of the common ground, e.g. echo questions (Pires & Taylor 2007). Thus, such cases are excluded from/not considered to be the errors here.

hours each) at a daycare center where he speaks with monolinguals (in English), from the age of 2 years and 5 months. Language strength (dominance) is calculated based on quantity/quality of cumulative exposure to each language from the birth, using the Utrecht Bilingual Language Exposure Calculator (UBiLEC; Unsworth 2013). His dominant language was Japanese, followed by Chinese and English (Japanese > Chinese > English) at the time of this study. The child mainly speaks Japanese to his father and Chinese to his mother, and sometimes uses/responses in English when he is spoken to in English[4]. His utterances are sometimes mixed with two or more languages[5]. Recordings (n=98, 10min-1hour), in addition to written notes, were made every 2-3 days before, during or after the dinner time at home where both parents are usually present. The present study looks at longitudinal data between the age of 1;0 and 2;7.

3.2. Result
3.2.1. Head Parameter Errors
As shown below, there are some ungrammatical instances where a verb precedes its object in his Japanese, as predicted by the majority influence (14: Prediction 1-(a)).

(20) F: Xunxun kore tabe-ru?
　　　　　This eat-Pres
　　'Xunxun, do you want to eat this?'
　　X: chocolate! Xunxun **taberu chokoreeto**!　(2;6.08)　　cf. Xunxun chokoreeto tabe-ru[6]
　　　　　　Eat-Pres chocolate
　　'intended: Xunxun will eat chocolate'

(21) X: Xunxun karee tabe-ta
　　　　　curry eat-Pst
　　'Xunxun ate curry rice'
　　F: tabe-ta　no?
　　　Eat-Pst Q
　　X: xunxun **tabeta karee**　(2;6.08)　　cf. Xunxun karee tabe-ta
　　　　　eat-Pst curry
　　'intended: Xunxun ate curry rice'

His English/Chinese verbs, on the other hand, consistently precede their objects, suggesting no converse errors.

(22) Chinese
　　a. xunxun **xi shoushou** (2;3:23)
　　　　　wash hands
　　'Xunxun washes hands'
　　b. baba **mǎi nori** (2;4,01)
　　　Father buy seaweed(J)

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[4] This conforms to the conclusion reached by Quay (2008, 2011), where it is argued that the Japanese-Chinese-English trilingual child can differentiate her language use (choice) at the early age of 2;0.
[5] The number of mixed utterances has decreased as he grows up, suggesting that it is resulted from vocabulary gap, rather than code-switching (cf. Montanari 2009a, 2009b, 2010, 2011).
[6] The grammatical counterpart of the sentences are shown here in *cf.*

      'Daddy bought seaweed'
    c. **kan   shu** (2;6,10)
      read book
(23) English
    a. **open door** (2;4,01)
    b. **Fixed it!** (2;6,02)
    c. X: stop **stop your hands** (2;6,08)
      M: mama hold your hands. No?

Also, there are some ungrammatical instances where a negative element *-ja nai* 'is not' precedes a predicate in Japanese, as expected by the prediction (14: Prediction 1-(b)).

(24) F: hai, gohan tabe yo
      Ok, food eat Q
      'Ok, let's eat this'
   X: **janai** kore da   (2;4,05)   cf. kore janai
     Is-not this Cop
     'not this one'
(25) F: xunxun samui no?
          cold Q
     'Xunxun, are you cold?'
   X: **Janai** samui (2;6,01)   cf. samu-ku-nai
     Is-not cold   cold-Infl-not
(26) F: Xun-kun okatazuke siyou
      -Hon cleanup   do-let
     'Xun, let's clean up'
   X: no
   F: Thomas katazukete ii?
         clean-up   good
     'Can I clean up the Thomas?'
   X: **janai** katazuke! (2;6,04)   cf. katazuke janai
     is-not clean-up
(27) F: Xun kun, mou   ne-you ka?
      Xun-Hon already sleep-let Q
     'Xun, let's go to bed now'
   X: **Janai** onenne. Yom-ou **book**!   (2;7,8) cf. Onenne janai. Book yomou
     Is-not sleep   read-let
     'intended: I'm not going to bed, let's read books'

Again, there were no converse errors, as no converse orders were observed in negation in Chinese and English. Here are some examples of his utterances.

(28) a. zhei-ge bee, zhei-ge **mei you** bee. (2;03:29)   Chinese
     This-CL   this-CL not have
   b. M: Zhe-ge   re   yixia ba?
       This-CL warm a little Q

'Shall I warm this up a little?'
     X: **Bu yao**   (2;6,07)
        not need
(29) a. F: Have you found one?   English
      X: **Nothing** chocolate   (2;5,16)
  b. F: What's this?
     X: **I don't know**   (2;6,10)

The result is summarized in the table below (one-word utterances are excluded; $p<0.01$ by Fisher Exact Probability Test[7]):

	NegP Target order	NegP nonTarget order	VP Target order	VP nonTarget order
Japanese	3	4	3	4
English	2	0	9	0
Chinese	7	0	7	0

Table 1: Number of Phrases with non-/target Head Parameter Setting

3.2.2. *Wh*-Movement Errors

Regarding the prediction 2 in (19), I could not find any pieces of evidence for the predicted errors, as Xun's English wh-questions never had wh-phrase in situ, as shown below.

(30) a. **Which** one like? (2;5,10)
    b. **Which** one book you like? (2;5,22)
    c. **Which** one papa like? (2;6,19)
    d. (playing with a train set)...stop. Hi this way. **Where** you going? (2;6,19)
    e. **How many** do you see? (2;7,11)

Also, there were no errors in Japanese/Chinese wh-question sentences either, i.e. wh-phrase appears correctly at the in situ positions, as shown below.

(31) a. xunxun -de puppy **doko**? (2;4,1)   Japanese
        -Gen(C)   where
    'Where is my puppy?'
    b. kore   **nanji**   –da (2;4:05)
      this what-time -Cop
      'What time is this?'
(32) Baba, gan **(shen)ma** ne?   (2;5,18)   Chinese
    daddy do   what   Q
    'What is daddy doing?'

---

[7] Combined NegP and VP tables and used 2×3 contingency table (Freeman and Halton 1951)

4. Discussion

The result of the study in the previous section shows that the CLI predicted by the Majority effect hypothesis is observed as expected. Specifically, the head-initial property of the majority languages (English and Chinese) caused the errors in Japanese (head-final language) in which heads appear in the initial position in phrases like NegP or VP, without converse errors in English or Chinese. Therefore, the prediction 1 was borne out. Also, it should be pointed out that the observed errors, e.g. verb-object/negation-predicate word order in Japanese, are not due to the "dominant language hypothesis" (Peterson 1988), by which it is claimed that only the dominant language (i.e. the language with greater proficiency, more vocabulary or greater fluency) interferes with the weaker one (Grosjean 1982), since Xun's dominant language was Japanese at the time of the study (language strength: Japanese > Chinese > English) while it does not interfered with the weaker ones, i.e. Chinese or English. It was actually the other way around, i.e. the weaker languages Chinese/English interferes with the dominant language.

  Now, regarding the wh-movement typology, we could not find the errors in English expected by the prediction 2, by which wh-in-situ property of the majority languages (Japanese and Chinese) should appear in the child's English wh-questions. I claim that this has been caused by the ambiguity in Japanese input regarding the position of *wh*, which is due to its atypical syntactic operations. For example, Japanese has scrambling operation (Ross 1967=1986), which derives non-canonical word order where constituents can occur in a variety of orders without changing the meaning of the sentence. For instance in the following sentence, the object can be scrambled to the front of the sentence over the subject without meaning changes.

(33) a.   S   O   V
       Mary-ga   sono hon-o   yonda (koto)
       Mary-NOM that book-ACC read (fact)
       'Mary read that book'
    b.   O   S   V
       sono hon-o   Mary-ga   yonda (koto)
       that book-ACC Mary-NOM read (fact)
       'Mary read that book'

Crucially, this same scrambling of object can apply to the wh-phrases, as shown below. Here, although there is no wh-movement as found in English, wh-phrase moves to the same surface position in Japanese.

(34) a.   S   O   V
       Mary-ga   nani-o   yonda no
       Mary-NOM   what-ACC read   Q
       'What did Mary read?'

    b.   O   S   V
       nani-o   Mary-ga yonda no
       what-ACC Mary-NOM read Q
       'What did Mary read'

Another problematic example comes from ellipsis in Japanese, where any pronouns can be

dropped, as shown in (35B) below.

(35) A: kono keeki -wa oishii. Dare -ga   yaita   no?
          this cake -Top tasty who -Nom bake-Pst Q?
          "This cake is tasty. Who baked **it**?"
     B: shiranai. ki ni itta?
        know-Neg. like-Pst?
        "**I** don't know. Did **you** like **it**?"

Because of this rather atypical ellipsis property in Japanese, wh-phrase can appear at the beginning of the sentence, for example in cases like the following, where pronominal subject is elided and as a result object wh-phrase appears in the beginning of the sentence.

(36) a. Kare/anata-wa nani-o tabeta no?
          He/you -Top what-Acc eat-Pst Q
     b. **Nani-o**   tabeta no?
        what-Acc eat-Pst Q
        "What di you/he eat?"

My claim is that because the child gets the inputs like these (e.g. (34b) or (36b)), he might have mistakenly thought that the wh-phrases can be both at the sentence initial position and in situ in Japanse. That is, the value of the wh-movement feature is now, [English: movement], [Chinese: in situ] and [Japanese: both]. In fact, as the following table shows, about a half of the Japanese wh-question input (mainly from his father) in the transcript were such ambiguous cases with *wh*-phrases appearing at the sentence-initial positions.

	Unambiguous	Scrambling	Ellipsis	Total
Number	11	4	5	20
Percentile	55	20	25	100

Table 2: Japanese *wh*-question Input

This configuration now cancels out the majority factor, since there is no majority syntactic feature (neither sentence-initial nor wh-in situ). Therefore, we did not encounter the majority errors regarding the wh-movement.

5. Conclusion

This paper discussed the cross-linguistic influence of an English-Chinese-Japanese trilingual child (-2;7), who has a Japanese-speaking father, a Chinese-speaking mother, lives in the U.S.A. and goes to a English daycare center (8 hours for 2days/week). Through the longitudinal utterance data, we found that the English-Chinese-Japanese trilingual child produces errors, which are predicted by the Majority Influence (Cenoz 2003, Clyne 1997), caused by a linguistic feature shared by two of the three languages being transferred to the third language in a trilingual constellation. For example, the child uttered ungrammatical sentences with head-initial NegP or VP in Japanese which are clearly influenced by the majority linguistic features shared by the two

languages, i.e. Chinese and English. On the other hand, we have found no predicted Majority influence errors regarding wh-movement in English, where wh-phrases should appear in situ as in Japanese and Chinese. We discussed that this is due to the ambiguity in the Japanese input (by scrambling and ellipsis), which cancels out the majority factor in the constellation.

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Telecollaboration, to what extent is this a valuable addition to a Spanish Language Program?

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Abstract

This case study was motivated to formally assess the value of the UBC-UNAM telecollaboration for Spanish language practice. Drawing on the notion that in-tandem learning is an effective complement to traditional Spanish language instruction (Navarro, 2013), volunteer students at a university on the West Coast of Canada exchange English for Spanish with Mexican counterparts since 2013.

The observation of a single Anglophone Canadian student over the course of five sixty-minute sessions revealed some systematic patterns of interaction during the online language exchange sessions with Mexican partners. More precisely, we observed whether participants functioned in monolingual mode (Grosjean, 2000); how they negotiated meaning (Gass & Mackey, 2006); and the extent to which a computer-to-computer interface constrained participants' embodiment of the language learning process (Taylor, 2012).

Findings showed that while conversing in English, participants produced 605 interactions from which only 7.44% were cases of language mixing, whereas from a total of 611 interactions in Spanish, 6.71% were switches into English. These findings suggested that overall, participants managed to activate and process both languages successfully, functioning primarily in

monolingual mode during the time allocated for each language. Participants also used few examples of constructions to negotiate meaning suggesting high degrees of comprehensibility in both languages. Equally revealing were the instances in which the Anglophone participant and his conversation partners resorted to nonlinguistic actions (e.g., gesturing, body movement). The latter findings suggested that interlocutors overcame the physical constraints of videoconferencing and perform compensatory strategies to enhance intelligibility.

Keywords: telecollaboration, additional language learning, Spanish, meaning negotiation, embodiment, videoconferencing

On the Canadian West Coast, the teaching and learning of Spanish at the postsecondary level happens primarily in a classroom context. Following the trend in English language instruction, we refer to *Spanish as an additional language* (SAL) in place of the traditional and likely more controversial foreign language label. Students who study Spanish often manifest interest in the Hispanic community, its culture, and people. Others study the language to read the vast literary production of Spain and Latin America. Irrespective of what triggers a decision to study Spanish, students end up learning the language from an instructor and instructional materials graded by program objectives. Same as in instructed learning of English as an additional language (Long, 1983), there is perhaps consensus that the effect of instruction also holds for Spanish. The classroom is a safe context where students gradually develop the linguistic skills to comprehend and produce Spanish especially in the early stages. But beyond the classroom, students have limited opportunities to hear or read Spanish let alone communicate with Hispanophones unless

they do it as part of a community outreach project (Navarro, 2012, 2013, 2015). This means that students have few opportunities to either process or produce authentic Spanish.

The linguistic context of the Spanish classroom is in fact an important aspect to consider. The idea that in Canada and the United States, the student population is primarily Anglophone still remains (Wiley Senior Marketing Manager, personal communication, March 04, 2016). Thus, textbooks and ancillary materials combine the presentation of Spanish language and cultural contents with English translations. What this entails is that students tend to maintain activated both languages and language processing mechanisms, resulting in frequent code switches and borrowings. This language state is what Grosjean (2000) calls the bilingual mode. Psycholinguistically, this situation may become even more complex in the case of a trilingual student who may extend the processing of third-language Spanish from second-language English to first-language Mandarin Chinese.

By constraining the Spanish learning experience to the classroom, students have limited opportunities to engage in spontaneous and unplanned oral discourse. For the most part, task objectives determine beforehand what students are expected to accomplish (e.g., discuss a topic, practice questions and answers, etc.). Students have limited freedom to deviate from those objectives especially if formal assessment is involved. Teachers who organize activities such as communicative crosswords, spot the difference, jigsaw readings, or group story building enrich the level of communication in important ways. Among others, the students exercise strategies (e.g., clarification, comprehension checks, confirmation check, rephrasing) to achieve understanding of what an interlocutor may want to communicate during task completion (i.e.,

meaning negotiation). This is a key communicative function to prepare students to react when facing moments of unintelligibility in conversation (Gass & Mackey, 2006).

One last aspect worth of consideration is that in the language classroom, practice activities unfold with minimum physical displacement. Reading, listening, writing, screening a movie clip, or even speaking in Spanish keep students primarily seated and with little body movement. Likewise, practice activities seldom allow students to have sensory experiences such as hugging someone while speaking congratulatory words, or replacing an oral message for a hand gesture as in the case of the command ¡Ven! 'come here'. Not surprisingly, the classroom expects that students "speak" the words rather than gesticulate them (albeit the latter is an integral component of human communication). Students in the end run the risk of developing an atomistic view of the target language and only minimally embody it within the full range of human communication (Taylor, 2012).

The question is whether the current Spanish instruction context could be enriched. And if so, what could be done? In what follows we introduce a collaborative project through which new opportunities for students learning Spanish and English are available at two geographically distant universities.

The UNC-UNAM telecollaboration: Enriching the learning of an additional language beyond the classroom

This telecollaboration is motivated to enrich exposure to English and Spanish for students interested in learning them as an additional language. Following the principles of in-tandem learning (Telles & Vasallos, 2006; Vasallos & Telles, 2006), students in Canada offer English in exchange of Spanish practice while students in Mexico offer Spanish in exchange of English practice. The exchange sessions happen via videoconferencing in language laboratories at the University of British Columbia in Canada and Universidad Nacional Autónoma de México. Videoconferencing (or computer-to-computer communication) is one of the few effective ways for integrating computers to hold native/nonnative conversations as well as facilitating learner exposure to the target language culture (Chapelle, 2001; Pim, 2013). This extramural program has been in progress since 2013. Evidence from a telecollaboration between a Spanish undergraduate class in Canada and an English undergraduate class in Chile suggested positive effect of using online language exchanges. Learners acknowledged the value of meeting native speakers to practice the language and learn cultural information too (Navarro, 2013).

Participation in the telecollaboration is completely free. Students contact the coordinator of the program to enrol at the beginning of a term. Afterward, electronic communication maintains coordination namely to secure equal number of participants in each weekly session. Participants also receive a guide that provides simple tips and suggestions for an effective participation (e.g., be tortious and respectful at all times, offer suggestions for improvement, say please and thank you, etc.). In what follows we list a number of features that characterize this program.

1. Synchronous language exchanges. Participants in the telecollaboration speak with conversation partners in real time. Thanks to videoconferencing, students can see each other while conversing or completing a task.

2. Flexible structure. Students may begin a session speaking either Spanish or English provided that equal time is allocated for both languages. Supporting materials distributed at the beginning of each session are optional. Students are welcome to discuss the topics of their own interest. There is no formal assessment or direct teacher supervision!

3. Naturalness of the conversations. The flexibility of the program greatly contributes to lower students' anxiety. Students relative to their proficiency levels engage in fluid and spontaneous dialogues that resemble language performance in immersion. This kind of language practice overlaps Higgins (1991, p. 5) idea authentic language practice defined as 'anything not created by a teacher for the purpose of demonstrating language at work'.

4. Target language use. One of the most important "rules" governing the telecollaboration is adherence to the target language. Students have 30 minutes to practice each language and they are expected to respect it. The aim is to deter students from speaking only one language, use a language other than those being exchanged (i.e., English and Spanish), or avoid language mixing (Telles & Vasallos, 2006). By sticking to the target language, the participants manage to perform in monolingual mode i.e., they deactivate (not entirely) the language that is not being practiced (Grosjean, 2000).

5. Autonomy. The language exchange sessions depend primarily on what both participants decide to do (Schwienhorst, 2008). In the absence of direct teacher supervision, students are responsible for choosing which language they want to speak first, complete (or not) the supporting material receive, contribute with conversation topics, provide suggestions for correcting mistakes, and so forth. In the telecollaboration, students become fully autonomous Spanish and English language users to decide on what and how to complete their conversations (Aoki, 1999; Holec, 1987; Little, 1991; Scharle & Szabó, 2000).

6. Reciprocity. In accordance with the in-tandem learning principles, there is no hierarchy in the telecollaboration. Both conversation partners fulfil the roles of language *experts* and *learners* in every session (Navarro, 2013). Canadian students are the experts when English is the language the Mexican learners want to practice. But then, the Mexicans are the experts when Spanish is the language the Canadian learners want to practice. These duality of roles grant the participants an opportunity to help and support each other engaging in moments of collaborative dialogue (Swain, 2013).

Intuitively, these many features present the UBC-UNAM telecollaboration as a valuable addition to the teaching and learning of Spanish. But can we confidently say so? Below we report our first attempt to observe learner performance in this extramural activity.

The study

This case study was motivated to assess the UBC-UNAM telecollaboration for Spanish language practice. Up until now and despite its popularity, there has been no assessment of its value as a learning resource. Namely it was assumed that it would be effective because students practice the target language in addition to regular classes, it happens in the safety and comfort of a university space, and previous research involving Spanish-English language exchanges yielded positive evidence. Bearing these ideas in mind, the study aimed to address the following questions:

(1) To what extent did the Canadian student and his partners conversed in monolingual mode (Grosjean, 2000) during the online exchanges? That is, students respect the time allocated for the practice of each language and they in fact produced discourse in both languages.

(2) How did the Canadian student and his conversation partners negotiate meaning (Gass & Mackey, 2006) during the online exchanges? In other words, when encountering

moments of unintelligibility, the students reacted by attempting to restore

communication.

(3) To what extent did the computer-to-computer conversations limit the Canadian student

and his conversation partners' embodiment of the target language (Taylor, 2012)? In

other words, the participants managed to incorporate nonlinguistic actions while

conversing.

Methodology

Participants

A 23-year old male Canadian Anglophone undergraduate was observed interacting with Mexican

counterparts for a month. At the time of the observations, the student was enrolled in an upper

intermediate Spanish class at The University of British Columbia where the study took place. In

addition to Spanish, he had different levels of mastery of Italian and Croatian. He learned both

Spanish and Italian in an academic environment whereas Croatian was his parents' native

tongue.

There were also three Mexican students at UNAM: an 18-year old female and two 25-year old

male students. One of the male students reported some knowledge of German in addition to

English while the other participants only had English as an additional language. All participants

were attending different study programs at Universidad Nacional de México.

At both institutions, there were female coordinators who provided logistic support. For example, they distributed handouts the researcher prepared for each conversation session, set up the computers and verified that all units had proper access to Internet connection, and timed the beginning and end of the sessions. The Mexican coordinator was the Directed of El *Centro de Enseñanza de Lenguas Extranjeras*. In Canada, the coordinator was a graduate student in Hispanic Studies. All participants in this project were volunteers.

Materials

For the Spanish exchanges, the participants received handouts that contained different topics of a cultural interest. The aim was to facilitate the interaction between both conversation partners and so lower anxiety levels. Students learned that they could complete the handouts collaboratively unless another they decided to speak about something else. It was up to them since no marking was assigned to their participation. The design of the material was colorful, highly interactive and written entirely in Spanish.

Since the telecollaboration sessions happened in language laboratories at both universities, students had at the disposal desktop computers equipped with webcams, microphones, headsets, keyboards, Internet access, and SKYPE connection. Moreover, students had access to their personal mobile phones that they employed for searching information pertaining to the topic they were discussing (e.g., songs or pictures).

Procedure

As mentioned above, the telecollaboration sessions extend for an entire term with a weekly meeting that lasts 60 minutes. Participants in the online exchanges receive instructions on how to work in this program, thus they learn that each session should be equally divided so that both conversation partners can equal practice time.

The Anglophone Canadian student was observed over the course of five exchanges with different Mexican counterparts. All sessions were recorded, transcribed, and coded for the Spanish and English interactions. Worth mentioning is that the first author and the two coordinators scheduled the online sessions early on in the term. Likewise, they remained in contact to monitor the number of participants in attendance, circulated the conversation handouts, and timed the beginning and end of each session.

Coding system

All files containing the conversations in Spanish and English were coded for the following:

1. The total number of turns that occurred in each language. Immediate self-repetitions or unintelligible chunks of dialogue were excluded from the total count.

2. Instances in which the participants deviated from target language use and either code switched or code mixed.

3. Instances in which the participants resolved interruption of the communication flow and produced comprehension checks, confirmation checks, clarification, or conversation help.

4. Instances in which the participants conveyed meaning using a non-linguistic action such as hand gestures, facial gestures, typed words, pointed to the computer screen, etc.

Results

From the five sessions in which the Canadian student was observed, findings reported here correspond to only four of them. A technical failure ruined the recording of the Spanish interactions in the fifth session; thus, this session was excluded from analysis. Findings then come from four files in Spanish and four files in English. First we report results for the language mode in which the Canadian student interacted with his Mexican counterparts. Next, we report results of the proportion of times when the Canadian student and his conversation partners failed to understand each other, hence they needed to negotiate meaning. Finally, we report results of nonlinguistic actions during communication.

From the eight files analyzed, we coded a total of 1,216 interactions that were divided into 605 in English and 611 in Spanish. When analyzing the files to answer the question of whether the Canadian student and his counterparts interacted in monolingual mode or rather they reverted to another language, our results showed the following. Figure 1 shows that when the Canadian student spoke offered his first-language so that the Mexican students practiced English, 92% (N = 560) of the interactions happened in monolingual mode. Participants reverted into Spanish just 7.44% (N = 45) of the time from which 28 (5%) were cases of code mixing and 17 (3%) were examples of code switching.
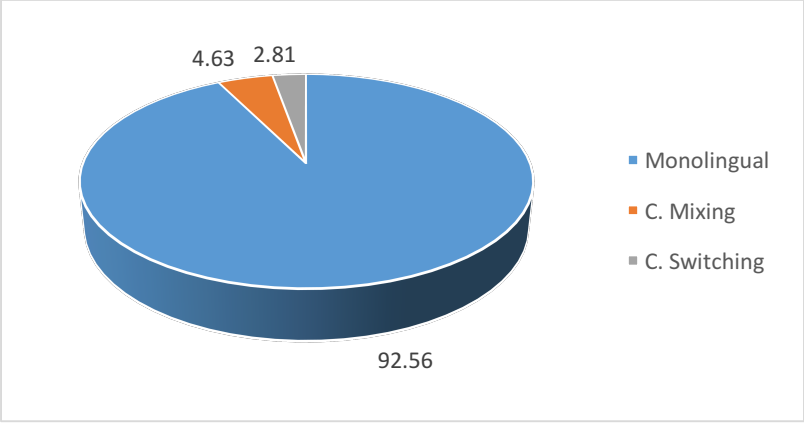
Figure 1. Percentage of interactions in monolingual English and code mixing and switching into Spanish.

As to the interactions in Spanish, Figure 2 shows that when the Mexican students spoken their first language so that the Canadian student practiced Spanish, 93% (N = 570) of the interactions were produced in monolingual mode. Results also showed that 6.71% (N = 41) were cases of English-language use. The latter were subdivided into 30 cases of code mixing (4.91%) and 11 examples of code switching (1.80%) respectively.
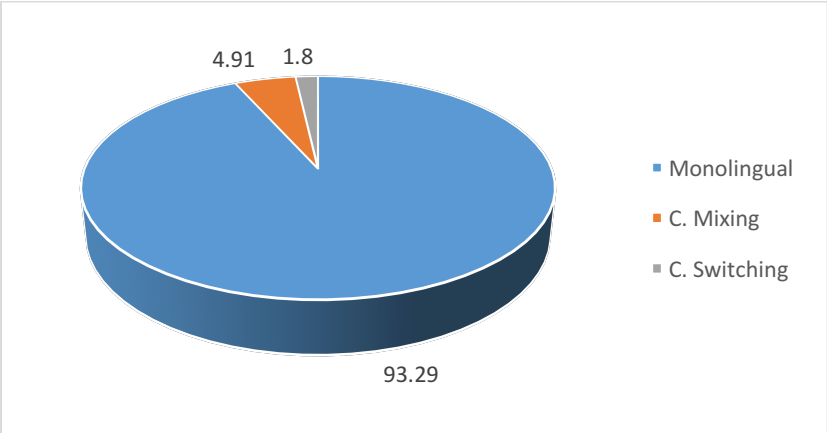

Figure 2. Percentage of interactions in monolingual Spanish and code mixing and switching into English.

Our next set of results show how the Canadian student and his conversation partners negotiated meaning. That is, the strategies the participants implemented when the flow of communication was either completely or partly interrupted. Figure 3 shows that from the total of 605 interventions across the four files in English, the participants needed to negotiate meaning 7.27% (N = 44). This means that they could successfully understand each other 92.73% of the time. Our analysis of the instances when the participants negotiated meaning revealed that 31.82% (N = 14) corresponded to confirmation checks, 29.55% (N = 13) clarification requests, 22.73% (N = 10), and 15.91% (N = 7) examples of conversation help.
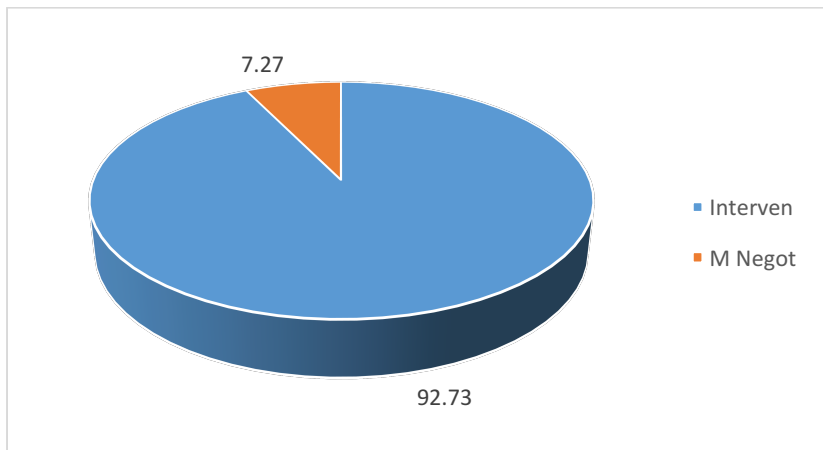

Figure 3. Proportion of times when the Canadian participant and his conversation partners negotiated meaning to restore comprehension in English.

Figure 4 below shows that from a total of 611 interventions across the four files in Spanish, the Canadian student and his Mexican counterparts needed to negotiate meaning 9% (N=55) of the time. This means that the participants successfully understood each other 91% (N = 556). Our evidence also revealed that the participants mostly produced clarification requests (34.69% N =

17) followed by comprehension checks (32.65% N = 16), and confirmation checks (30.61% N= 15).

9.00

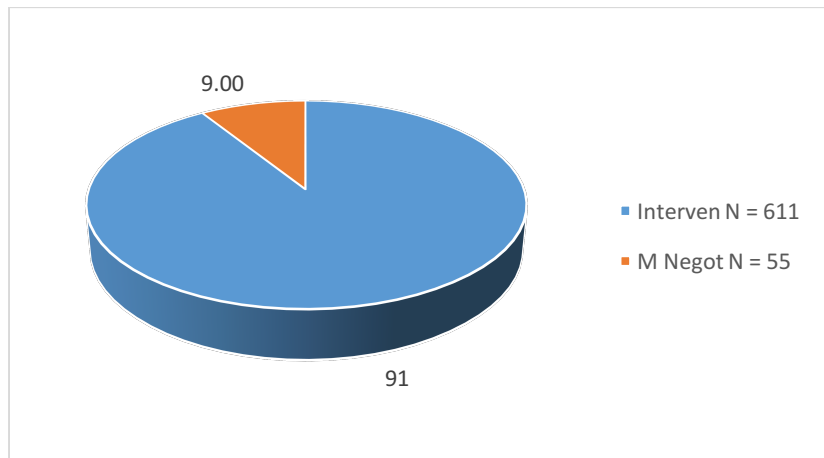■ Interven N = 611
■ M Negot N = 55

91

Figure 4. Proportion of times when the Canadian participant and his conversation partners negotiated meaning to restore comprehension in Spanish.

Our third and last set of results shows the proportion of nonlinguistic actions that the participants performed at the time of the conversations. We explored this evidence to determine the extent to which the participants defied the rigid constraint of the computer-to-computer setting and embodied the language more fully. From the total of interventions in English, 0.33% (N = 2) were nonlinguistic actions. For example, the Canadian student typed a word to help his Mexican counterpart to make sense of what he was saying.

From a total of 611 interventions in Spanish, 3.93% (N = 24) were nonlinguistic actions. For instance, a Mexican student moved his upper torso, arms and hands to demonstrate to his Canadian counterpart how Mexicans danced a traditional corrido. The students were engaged talking about their favorite music and past time activities.

Discussion

This case study assessed the pedagogical value of the UBC-UNAM telecollaboration for the practice of English and Spanish. From the three aspects analyzed, our evidence suggests positive gains. Across the 1,216 interactions analyzed, the Canadian student and his conversation partners largely communicated in the language assigned for each turn. That is, when the Canadian student offered his first-language, the Mexican students used this opportunity to practice English. Conversely, when the Mexican students offered Spanish, the Canadian student did not waste the opportunity to practice the language of his interest.

The low frequency of code mixing and code switching in the data appeared as isolated instances of vocabulary gap. This is important because it suggests that—whenever it was needed—the participants reverted and remained conversing in the nonnative language. Recall that 30 minutes was the time allocated for practicing each language; this was longer than what students often practice in class. We can infer that the telecollaboration likely "pushed" students to produce output (Swain, 1985, 1993, 2005) in a language they were still in the process of learning and minimally deviating from it. This evidence should not be considered trivial. By contrast and despite non-direct teacher supervision, the students respected the times allocated for practicing English and Spanish and performed primarily in monolingual mode (Grosjean, 2000). Worth mentioning is the negligible difference of meaning negotiation observed in the English (7.27%) and Spanish (9%) online tandems. This evidence suggests that at the time of the study, the participants elaborated messages that were largely comprehensible in both languages.

Whether this comprehensibility resulted from the participants' proficiency in the languages they wanted to practice was certainly a possibility. As known, low proficiency learners produce oral discourse containing numerous examples of constructions to clarify, confirm or check comprehension of a message (Gass & Mackey, 2006). The low percentage of those constructions in our data suggested that the Canadian and Mexican learners managed to convey information minimally interrupting the flow of information.

Another possibility is that in the context of computer-to-computer conversations, the participants realized that creativity was needed if meaning was to be conveyed successfully. Namely, they had to go beyond the linguistic code for communicating. Our findings showed that participants managed to introduce for example movement, gestures, and used electronic devices (e.g., mobile phones) at specific moments during a conversation. They resorted to these nonlinguistic actions to enhance the intelligibility of the communication.

Consistent with the collaborative nature of in-tandem learning, participants helped each other explaining, repeating, and even wrote words down. The latter was the case of the Canadian student who helped his Mexican counterpart understand what he meant by grabbing the keyboard and typing a word. In this sense, the students overrode the rigidity of a computer-to-computer setting and incorporated movement, gestures that were not random. Instead they targeted these compensatory strategies to reinforce comprehensibility.

In short, our evidence showed that one-on-one exchanges seem a good fit to connect language learners triggering moments of true immersion. This study supports the UBC-UNAM

telecollaboration as a curriculum innovation for Spanish language programs at the postsecondary level

Conclusion

In today's cyber reality, computers are continuously offering new and more extensive support to language instruction (Chapelle, 2001; Motteram, 2013). Videoconferencing enables teachers in a foreign language environment to bridge geographical gaps and engage students in authentic linguistic and cultural exchanges (Pin, 2013).

The present study provided evidence that supports the pedagogical benefits of the UBC-UNAM telecollaboration. Findings showed that students achieved the goal for which they participated in the program. They practiced the language of their interest and in return helped the conversation partner practice the language they offered. The evidence also showed that the medium allows students to embody the language beyond the linguistic code as they also integrated body movement to aid comprehension. The latter was possible because in this learning context the participants can see each other on the computer screen. Thus, the array of nonlinguistic actions through which humans fully embody a language are compatible with online conversations like the UBC-UNAM telecollaboration.

We acknowledge that our observations came from a single student in interaction with different conversation partners. This design however was triggered by practical considerations. Namely, the UBC-UNAM telecollaboration sessions engage up to ten computer-to-computer interactions

simultaneously. This number makes it challenging to conduct systematic observations of what participants may say or do. By recording and analyzing a single student across different conversations, we managed to have a first approach how the program functions and its potential impact on students' learning. Indeed, corroborating our findings is in order to build more robust evidence of this extramural language program at the post-secondary level.

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Word order as a signal of meaning:
English reflexive pronouns and why we behave ourselves

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Abstract. This paper offers a semantic account of the occurrence of reflexive pronouns in contexts like *she behaved* / *she behaved herself* and *he dressed* / *he dressed himself*. Through an examination of attested data, I will show that the use of pronouns in these contexts leads to inferences of a HIGHER level of control by the subject in the activity named by the verb. This communicative effect can be explained by the meanings signaled by the English System of Degree of Control (Reid 2011), a semantic account of English word order. The Control analysis posits that the position of subjects and objects is a consistent signal of linguistically encoded meanings that are present in every instance of use, and it explains why speakers sometimes choose to use reflexive pronouns in examples like these.

1. Introduction. Linguists have observed that languages sometimes provide different formal structures for what appear to be essentially the same function. This paper seeks to understand the distribution of forms in one such instance by appealing to the notion that language is a symbolic system, consisting of signs with meanings, an idea traced to Saussure and found today among current schools such as cognitive grammar (Langacker 1988), the Columbia School (Diver 1969; Reid 2011; Huffman and Davis 2012), and others (Butler and Gonzálvez-García 2014). In particular, we examine pairs like those in (1), which seem to be referentially equivalent with or without the optional reflexive pronoun:

(1)   a.   She behaved / she behaved herself
           b.   He got sick / he got himself sick
           c.   He dressed / he dressed himself
           d.   He drove / he drove himself

All these verbs can occur intransitively or with a reflexive pronoun, with the same referential interpretation. Out of context, these sentences appear to be interchangeable. Labeling these uses as "optional reflexives" or as "middle voice" explains neither why they occur, nor what are the differences between them. This paper will demonstrate that when reflexive pronouns appear in these contexts, speakers are using the grammatical resources of English word order to guide hearers to their intended interpretations.

The overall communicative import of any utterance is far greater than its truth conditions. And in order to move beyond truth conditions, one has to move beyond isolated sentences, so I set out to collect actual instances of uses, such as (2):

> (2) Sometimes I found myself angry that **the client had gotten himself sick** in the first place, a notion only one step away from the anger I was really feeling – anger at Joe for **getting sick** and for dying and of course for leaving me. (Senak)

This example shows the importance of context in understanding the distribution of forms. In the first instance (*the client had gotten himself sick*) it seems that the writer wants someone to blame, and it appears that the client was responsible for getting sick. Later in the passage though (*anger at Joe for getting sick*), the writer speaks calmly about his partner's death – and here he does not assign blame, and does not present getting sick as something that Joe is personally responsible for. That is, it is only when the reflexive pronoun appears that the writer seems to impute agency in the act of getting sick.

2. English System of Degree of Control. I will propose that the meanings of the English System of Degree of Control (Diver 1984; Reid 1991, 2010; Huffman 1993) account for the presence of reflexive pronouns in these types of examples. This grammatical system has been proposed within the theoretical framework of Columbia School linguistics (Huffman 2001), and it pertains to the ordered positions of words or phrases referring to participants in an event (or in traditional terms, arguments of a verb).

Columbia School, based on the work of William Diver and his students, proposes a radically functionalist approach to linguistic analysis. Language is seen essentially as a device of communication. Meanings are posited not only for lexical items, but also for all grammatical morphology, and for some features of word order as well. That is, when people speak, they choose not only lexical items based on their meanings, but also grammatical categories, such as singular and plural, to help communicate messages.

Columbia School analyses make a distinction between meaning and message: meanings are the semantic values that are linguistically encoded by lexical and grammatical signs, while messages are the interpreted results of communications. Analysts aim to account for the distribution of linguistic forms in terms of the contributions that the forms' meanings make to messages in actual communicative situations. As this framework is not based on truth conditions of sentences, it draws the line between linguistic meaning on the one hand, and pragmatics and what is sometimes called "social meaning" on the other, in a different way than generative and traditional linguistic theories.

The English System of Degree of Control (Control System, for short) refers to the ordered position of words or phrases referring to participants in an event. More specifically, the meanings in the Control system rank entities in terms of the semantic substance Control of the Event (where the event is expressed by the verb). These meanings are borne by signals, which are defined in terms of the position (relative to the verb) of one or more words for entities that

contribute to making the event happen.[1]

In verbs with both a subject and an object, there are two levels of control: HIGHER Control and LOWER Control. In such cases, the entity named before the event (Controller 1, or C1) is hypothesized to be a signal of HIGHER Control in the event, while the entity named after the event (C2) signals a LOWER Degree of Control in that event. This can be seen in the example, *The cat liked the dog*, and outlined in Figure 1:

Figure 1: Control meanings in *the cat liked the dog*

The cat liked the dog
C1   C2
HIGHER   LOWER

Event = *liked*

Clearly, the cat exerts more control over the event of *liking* than does the dog, who presumably is more of a passive recipient of the cat's affection. Hearers must infer plausible roles for the participants in the named events, but in all cases, we find that the entity named before the verb (C1) has a relatively HIGHER degree of Control over the event than does the entity named after the verb (C2).

By hypothesis, Control meanings are signaled each time there is a verb with both a subject and an object. The Controller before the verb always has a HIGHER degree of Control in the event than the Controller after the verb:

(3)   a. An avalanche destroyed the temple
          b. A knife cut the cake
          c. The key opened the door
          d. The shoes dance her out into the street[2]

The examples in (3) show that we cannot predict the roles of subjects (HIGHER Controllers) and objects (LOWER Controllers). In (a), the avalanche was the agent that destroyed the temple. The knife in (b) had an active role – as the instrument – that cut the cake. And in (c), the key acted upon the door. The last example (d) is from a 1948 film based on "The Ballet of the Red Shoes," a fairy tale by Hans Christian Anderson. In this story, a young girl wants to attend a dance in a pair of red shoes. She gets the shoes and all goes well until she becomes tired and wants to go home. But the shoes are not tired and they do not want the night to end; as the movie database IMDb says, "They [the shoes] dance her not only out into the street, but also over mountains and valleys, through fields and forests." Clearly, the shoes have more Control in the dancing than does the girl, who is feet are dancing against her will.

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[1] Defining these signals in terms of position rather than order is an innovation suggested by Joseph Davis (p.c.).
[2] Examples (c) and (d) are from Reid (1991: p. 175).

Unlike thematic roles, Control meanings rest on a crucial distinction noted above between meaning and message. The Control System hypothesis is that the meanings HIGHER Control and LOWER Control are linguistically encoded, and are signaled with every instance of a two-Controller event. By contrast, the roles of Agent, Patient, Instrument, Cause, etc., are not linguistically encoded; they are part of the message that *results* from the interpretations of utterances.

The Control System contributes the same same linguistic meanings each time it occurs. Another important point is that the Control meanings are relational. And because the Control System underdetermines the specific roles each participant will play, speakers can use it in creative ways (e.g., the *Red Shoes* example) - as long as the first participant has a HIGHER Degree of Control in the event than does the second participant.

In a moment we will see another example that illustrates the creative deployment of the meanings of the Control system, which involves the word *bunt*, which can be either transitive or intransitive:

> (4) a. With a runner on third, the batter bunted.
> b. The batter bunted the ball down the first base line.

In the next example, from a play-by-play commentary of a baseball game, a broadcaster is discussing the team manager's decision whether to have a player (Rubén Tejada) bunt or swing. He sees Tejada getting ready to bunt, and announces (5):

> (5) Tejada is up. Is he going to bunt? In a similar situation in the 5^{th} inning, he let him hit. But he's going to bunt him here. (Cohen)

This example demonstrates the speaker's creative deployment of the English System of Degree of Control. There are two participants in this act of bunting, the manager, and the player, Tejada. The manager is signaled as the HIGHER Controller because while Tejada will execute the bunt, it is the manager who has decided, and has directed him to do so.

These examples show the need for an imprecise meaning of Control. In the Columbia School approach, meanings are hypotheses, not observations. That is, the meanings of the Control System (HIGHER Control and LOWER Control) are posited to be the constant semantic contribution of a specific linguistic signal (word order); that is, they are posited to encompass the full range of the distribution of these signals, not their interpretation in a particular example.

3. One argument clauses. By hypothesis, there are no Control meanings signaled when there is no object. When there is just one argument, the subject can have virtually any role with respect to the event, as shown in the following examples from Reid (1991, p. 178):

> (6) a. Sterling Moss drives well
> b. The car drives well
> c. The gasoline drives well
> d. The road drives well

In (7), we see more one-argument examples. With no grammatical mechanism for signaling degree of Control in one-argument examples, we see that the range of control that a subject has in these events ranges quite widely:

(7)   a. The child played.
           b. The choir sang as a lone violin played.
           c. The soup that eats like a meal
           d. The book will publish in Italy by Rizzoli in early October. (Hachette)

4. Explaining *behave*-examples. We return now to the question we asked at the outset: why do reflexive pronouns occur in examples like (1), repeated here in (8):

(8)   a.   She behaved / she behaved herself
           b.   He got sick / he got himself sick
           c.   He dressed / he dressed himself
           d.   He drove / he drove himself

The answer lies in the meanings of the Control System. Without a pronoun, the two meanings of the Control system are not signaled. On the other hand, the presence of the reflexive pronoun invokes the Control System. When two arguments are mentioned (*she behaved **herself***), a HIGHER level of Control is assigned to the first (the subject). The reason then that speakers include reflexive pronouns in these contexts is precisely to make clear that the subject is in control of the event named by the verb.

We can see this communicative strategy at work in the first attested example above (2), repeated here as (9):

(9)   Sometimes I found myself angry that **the client had gotten himself sick** in the first place, a notion only one step away from the anger I was really feeling – anger at Joe for **getting sick** and for dying and of course for leaving me. (Senak)

It is the grammatical mechanisms of the English System of Degree of Control that create the message effects we saw earlier. With the reflexive pronoun, the Control System is invoked so that the writer imputes HIGHER Control to the client. Without the reflexive pronoun, and hence without the meaning HIGHER Control, the utterance would not present getting sick as something Joe had control over.

We turn now to other attested data. The next example is from a book for expectant parents:

(10)   We are brought up to control and manage our bodies' functions, holding back coughs and yawns, fending off sleep in public…. But childbirth cannot be controlled in this sense. Once labor begins, **your baby is going to get himself born** with or without your conscious cooperation. (Leach)

The writer is explicitly trying to express the agency of the baby, and his control over the birth situation. The baby's birth will not be something that just happens; rather, the baby will be the active, controlling participant. It's not that *he will be born, or get born*; rather, *he will get himself born*. The meanings of the English System of Degree of Control (*your baby* is signaled as a HIGHER Controller) contribute to this message.

4.1 *Driving and dressing*. We turn now to examples of *driving* and *dressing*, which also raise the question: what is the reflexive pronoun doing with these verbs, since the sentences have the same referential interpretation with or without them (i.e, *she drove / she drove herself*). Once again, invented examples shed no light on the question. However, the next example, from an article in *The New York Times*, provides context that does help us understand the writer's choice to include the reflexive pronoun. It's about a man who lost the use of his legs when he was just 7 years old, in an accident with a drunk driver. The article describes the monumental battles this man has faced to live independently - to complete high school and college, and even finish law school, all while waging legal battles with New York State for funding along the way:

> (11) At the end of the day, **Mr. McGuire drives himself home** in his specially equipped car, using hand controls instead of foot pedals, to his mother and step-father's ranch house in the Newburgh neighborhood where he grew up. (Glaberson)

The presence of the reflexive pronoun here, invoking the Control meanings, helps express the overall message of Mr. McGuire's own agency, his own role in controlling the driving, as he has controlled his life in general. The writer wants to emphasize the man's own level of control over this activity.

We see a similar reason for a reflexive pronoun in (12), about the NASCAR driver Jeff Gordon:

> (12) Jeff Gordon was always out of the ordinary. As mothers helped their 8- and 9-year-old sons into their uniforms, gloves, and helmets and buckled them into their quarter midget racers, **young Jeff dressed himself**. (Fortune)

Here too, the reflexive pronoun triggers the Control System, whose meaning HIGHER Control underscores the greater control that young Jeff had in the event of dressing. The previous context tells us that most of the children were dressed by their mothers. But not in this case: it is the young Jeff Gordon who had control of this dressing.

4.2 *Inanimates*. In (13) we have a typical example of *behave* without a reflexive pronoun; the subject, an inanimate, (*the fire*) is not seen as having agency in what it does:

> (13) In the months that followed, Scott would collect all the information he could about the fire as **it behaved** in his neighborhood -- and about how his city's firefighters and his neighbors behaved as the flames approached. (Del Vecchio)

Again, if we think about sentences out of context, we would wonder why we might ever see *behaved itself* with an inanimate subject, because we might not expect a speaker to want to attribute HIGHER Control or agency to an inanimate thing.

The next example shows the use of *behave itself* in which the inanimate subject (*it*) refers to a someone's hair. This appeared on Tumblr, in a post in which a teenage girl says "my hair has been really weird and wavy since I washed it yesterday, and I keep brushing it but then it just goes off and does what it wants." She included a photo with the following caption, about her hair:

(14)   Thankfully **it behaved itself** for this picture

This example illustrates the use of the meaning HIGHER Degree of Control ascribed to an inanimate so as to communicate a message that the subject (*it* or *her hair*) has a will of its own.

4.3 *Behave herself* vs. *behave*. The final two examples show the verb *behave* both intransitively and with a reflexive pronoun. These examples appear in plot summaries from the IMDb movie database, and both pertain to films whose heroines' names are Scarlett. The first is about the 1939 movie *Gone With the Wind*, about the willful heroine Scarlett O'Hara:

(15)   Scarlett is a woman who can deal with a nation at war, Atlanta burning, the Union
        Army carrying off everything from her beloved Tara, the carpetbaggers who
        arrive after the war. Scarlett is beautiful. She has vitality. But Ashley, the man she
        has wanted for so long, is going to marry his placid cousin, Melanie. Mammy
        warns **Scarlett to behave herself** at the party at Twelve Oaks (Gone)

Scarlett O'Hara is strong, brave, and intrepid. But when it comes to her behavior in the presence of the man she desires, she is advised to gather all the self-control she can muster: to behave herself. That is, her behavior should be as tightly constrained and controlled as her corsets!

By contrast, the next passage is from the plot summary of a less known movie, *One, Two, Three* (from 1961). The main character's name is also Scarlett:

(16)   **Scarlett**, however, does not **behave** the way a young respectable girl of her age
        should: Instead of sightseeing, she goes out until the early morning and has lots of
        fun. (One)

This Scarlett is not constrained: no one is telling her what to do. She's out partying, relaxed, having fun. There is no need in this example to signal that she is maintaining or should maintain a HIGHER level of Control over her behavior.

5. Conclusion. In this paper, we have proposed an answer to the question we started with: what accounts for the presence of reflexive pronouns in contexts like the following:

(17) a.   She behaved / she behaved herself
      b.   He got sick / he got himself sick
      c.   He dressed / he dressed himself
      d.   He drove / he drove himself

Through an examination of naturally occurring data, we have observed that the presence of the pronouns lead to an interpretation of the subject having a higher degree of control over an event. We have also seen that these communicative effects can be explained as the result of the meanings posited by the English System of Degree of Control (Diver 1984; Reid 1991, 2010). In this view, English word order is seen not as a manifestation of underlying syntactic structure, but rather, as a meaningful signal that is used by speakers to meet their communicative goals.

The Control analysis hypothesizes that word order is a consistent signal of the meanings HIGHER Control and LOWER Control (for, respectively, the noun phrase before and after the verb), and that these linguistically encoded meanings are present in every instance of use.

We have also seen the importance of naturally occurring data to understand the structure of language. And it appears that speakers and writers deploy the resources of their linguistic system for communicative purposes, a finding that is consistent with the theoretical position that grammar is fully meaningful.

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