Expletive Pronoun Deletion Elicitation

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Expletive Pronoun Deletion Elicitation

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Abstract

Under the current minimalist program, most spoken English sentences are required to have an overt subject by virtue of the strong EPP feature at T. In informal spoken English however, it is possible to omit an expletive or referential pronoun before the raising verb seems. In sentences with a referential pronoun subject, participants will take notice of referential pronoun constructions and assign stress to the subject pronoun, even if it is absent in what they are reading aloud (Weir, 2019). When listening to degraded audio, interspeaker phonological variation plays a significant role in determining the likelihood of reproducing a sentence with the subject pronoun absent. Previous research on the topic of subject pronoun deletion in spoken English has been approached from both a pragmatic approach (Mack et al. 2012) and a phonological approach. The results of the present study suggest a combination of these two approaches which explains the interspeaker variation in the audio recreation data of the present study. This paper also argues that the phonetic patterns that appeared in Weir (2019) are the result of participants adjusting based on the syntactic differences in sentences based on the referentiality of the pronoun subject.

Key words: Pronoun deletion, Phonology, Syntax
1 Introduction

Sentences containing a raising verb like *seems* can either employ an expletive pronoun such as *it* or *there* in English, or raise the embedded clause subject to a higher position in order to satisfy the EPP feature present on the tense head associated with *seems*. Examples of these sentences can be seen in (1).

1) a. (It) seems he likes baking
   b. (There) seems to be smoke coming off the engine
   c. (It) seems to be broken

The pronouns in (1a) and (1b) are examples of expletive pronouns which, under current minimalist theories, are brought into the derivation to satisfy the strong EPP feature, and do not receive a theta role in the process. The pronoun in (1c) is a referential pronoun, which was present in the derivation before *seems* merged in, and received a theta role from its initial position in the embedded clause. All three of these types of pronouns can be deleted in informal spoken English, although, context is required to set up a sentence like (1c). Deletions like those in (1) seem to be acceptable to the majority of native English speakers in a spoken context, but this acceptability decreases when they are presented in writing.

The results of previous studies have indicated that participants will make phonetic adjustments to their speech to account for the referentiality of a subject pronoun, but this study finds that it is unlikely that this may be a unique result of the cross-modal delivery of previous research. This paper argues that the phonetic variation in Weir (2019) is influenced by syntax due to the method of delivery of the stimuli, while the results of this study and Mack et al. (2012) are likely influenced by phonology and pragmatics.

Section 2 of this paper will consist of a review of several works concerning both the deletion of words in spoken English, and the use of speech rate modulations to change what participants perceive. Section 3 will outline the present study methodology and results. Section 4 will discuss the results in detail while providing possible explanations and implications for them. Section 5 will provide future directions to both improve the methodology of the present study and conclude the paper.

2 Background Literature

The literature discussed in this section concerns experimental views on the deletion of left edge material, specifically subject pronouns, in spoken and written English (Mack et al, 2012; Weir, 2019).

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1 When corresponding with my supervisor about this topic over email, the Grammarly™ extension found sentences with the expletive subject pronoun deleted to be incorrect and recommended I change it before sending my email.
2.1 Mack et al. (2012)

The research conducted by Mack et al. (2012) uses a novel variant of the speech restoration method to test participants’ usage preferences in sentences with expletive it as the subject. “Speech restoration occurs when listeners hear, or think they hear, segments of speech that are either absent or highly degraded in the acoustic input.” (Mack et al., 2012, p. 3) By using the speech restoration method, and presenting listeners with degraded and ambiguous audio, Mack et al. (2012) aimed to examine listeners’ usage preferences based on what they think they may have heard. When looking at expletive subjects in English, three observations are noted. First, initial deletion can apply to many different linguistic elements which suggests a prosodic phenomenon as opposed to a syntactic one. This is due to the fact that a syntactic explanation may require the creation of many ad hoc rules to explain all of the potential deletions, while a prosodic explanation would be much simpler. Second, only sentence initial subjects can be deleted in English (shown in (2)). Finally, unstressed constituents cannot be left behind and become the start of the sentence after subject deletion (shown in (3)), which suggests a phonological constraint that prevents English sentences from beginning with weak prosodic material.

2) a. (It) seems like Tom is happier than usual today.
b. *Today (it) seems like Tom is happier than usual.
   (From Mack et al., 2012: 4)

3) a. (It’s) pretty nice out today.
b. *(It) is pretty nice out today.

While these examples do suggest a phonological analysis is sufficient to explain subject deletion in English, Mack et al. (2012) point out that there are pragmatic constraints and differences in sentences with deleted subjects. The deletion of a subject makes the sentence more ‘subjective’ than sentences with an overt subject (Mack et al., 2012). This difference is most obviously seen when comparing a first-person experiencer and a third-person experiencer as seen in (4).

4) a. It looks to me/Sam like things are going pretty well.
b. *(It) looks to me/?Sam like things are going pretty well.
   (From Mack et al., 2012: 5)

The questionable acceptability of a deleted subject when using a third person experiencer suggests that sentences with deleted subjects like (4b) express some sort of immediate judgement information, that only clearly allows the deletion of the subject pronoun when dealing with a first-person experiencer. The idea of immediate judgement in this case refers to a judgement formed by the speaker just before the sentence was uttered (Mack et al., 2012). With a third person experiencer, it is no longer an idea realized by the speaker and cannot be classified as an immediate judgement. Attempting to delete the third person subject pronoun makes the sentence ungrammatical. By expanding this immediacy to both personal and temporal immediacy, Mack et al. (2012) predict that participants will be more
likely to produce sentences with deleted subjects that have some sort of immediacy, in the sense that they have recently formed their own judgements on them.

The study conducted by Mack et al. (2012) had participants come into the lab and listen to short pre-recorded conversations consisting of three sentences. The final sentence of each conversation was a sentence that would permit the deletion of an expletive subject. An example of one of the conversations used can be seen in (5).

5) A: Joe and I are studying like crazy for the German exam.
   B: Oh yeah?
   A: It seems/seemed to me/him like there are thousands of words to learn.
   (Mack et al., 2012)

The conversations that were created controlled for both temporal immediacy by alternating between seems and seemed, as well as personal immediacy by alternating between a first-person and third-person experiencer. The 24 stimuli conversations also covered the three main verbs that were examined in a corpus search they had conducted (seem, look, and sound) (Mack et al., 2012). The audio of the conversations was presented to participants with the subject position distorted by a white noise filter to make it ambiguous whether the subject was present or absent (Mack et al., 2012). No manipulation was done to the audio to change the rate of speech or pitch. Participants were asked to listen carefully to the audio and, when prompted, repeat the last sentence that they heard out loud before then being asked to manually type the first five or six words of that same sentence (Mack et al., 2012). A strong emphasis was placed on ensuring that participants repeated exactly what they heard, regardless of ungrammaticality or any other perceived ‘mistakes’ (some of which intentionally occurred in the filler items) (Mack et al., 2012).

An analysis of the spoken data found that participants would produce an expletive subject 68.3% of the time, with participants being more likely to produce the subject pronoun in both past tense situations, and situations where the experiencer was third-person (Mack et al., 2012). The results of this support their findings from a previous corpus analysis and provide further evidence that both temporal immediacy and personal immediacy have a pragmatic effect on the likelihood of an expletive subject pronoun being deleted. When comparing the spoken results to the written results that participants provided, Mack et al. (2012) found that participants were more likely to produce the expletive subject pronoun in writing compared to their spoken responses. This difference is likely “due to effects of register or prescriptive norms” (Mack et al, 2012, p. 11).

By showing the effects of temporal and personal immediacy on the rate of pronoun deletion, the data in this study suggest that a purely phonological approach to deleted subjects is not sufficient. Mack et al. (2012) conclude their article by stating that usage preferences potentially alter the grammatical structure that participants assign to ambiguous input they are hearing. The present research aims to look beyond these usage preferences, and instead consider the effect that the phonetic qualities of the input might have in the rate of deletion of the subject pronoun.
2.2 Weir (2019)

Research conducted at the University of Calgary investigated the phonetic changes that participants made when asked to read aloud sentences that contain a subject pronoun, versus sentences that had the subject pronoun omitted. The purpose of the research was to look at the adjustments that occurred on the immediately adjacent raising verb *seems*, by having participants read sentences like (6) presented on a computer monitor.

6) The toaster did not pop on schedule.
   (It) seems to be broken.
   I guess it's time for a new one.

The key sentence was always the second sentence, ensuring that participants had sufficient context for all items. Each set of sentences like (6) would have two versions, one that contained the subject pronoun in the second sentence, and one where the subject pronoun was absent. Each participant would only see one version of each sentence, and would see an equal amount of each type of sentence. The stimulus lists were counterbalanced to control for any possible effects of item ordering. The research explored sentences that used expletive *it*, expletive *there* and referential *it* as subject pronouns, and only looked at the present tense verb *seems* (Weir, 2019). Participants were presented with a blank screen, and upon advancing in the experiment, would be presented with a set of sentences like (6) and immediately begin reading. Unlike Mack et al. (2012), the study by Weir (2019) avoided the potential confound of recovering a non-expletive pronoun by not using a copy-raising construction with any experiential verbs.

Initial measurements taken concerned the length of the raising verb *seems* (measured in milliseconds) in isolation, as well as the fundamental frequency (F0) at the onset of the vowel in *seems* in an attempt to observe any significant changes in between the two conditions. The research found that there was no significant difference in either length or frequency between conditions where the subject pronoun was present, versus conditions where it was absent. Instead, the research found that participants would make distinction of both length and F0 of the raising verb based on the type of pronoun that belonged in the subject position (Weir, 2019). Further to this point, Participants would say *seems* differently after an expletive *it* pronoun, compared to any other type of pronoun. This pattern occurred independently of pronoun presence in what participants were asked to read aloud (Weir, 2019). This suggests that participants were processing the type of pronoun that belonged in the subject position, and adjusting the way that they were saying the word *seems* to conform to this underlying pattern, even when the pronoun was absent in what they were reading (Weir, 2019). It was also found that, on average, participants would speak the raising verb 0.140 ms faster if the subject pronoun was an expletive *there* compared to both expletive and referential *it*. Further to this, participants would speak the word *seems* 0.220 ms faster when the pronoun was referential *it* compared to expletive *it*. Both of these rate phenomena occurred independently of pronoun presence (Weir, 2019). When looking at the F0 values of *seems* after the referential *it* pronoun, Weir (2019) found that participants would significantly lower their F0 value 6.75 Hz on average when the pronoun in the subject position was a referential *it* (Weir, 2019). This occurred regardless of the pronoun presence,
suggesting that even when the pronoun was omitted from the sentence that participants were reading, they would still have a lower F0 value on the raising verb *seems* on average (Weir, 2019). The explanation offered by Weir (2019) is that the referential *it*, due to its semantic content and theta role, will receive some amount of lexical stress which results in a decreased F0 on the word that immediately follows it. The fact that this occurs independently of the pronoun presence might indicate that participants are processing the sentence as though the pronoun were present in the subject position, which would align with a PF deletion hypothesis.

When first designing the study that was conducted in 2019, there was an underlying hypothesis that speed of delivery of the sentence was affected in these sentences somehow. Whether it was a result of sentences having a slower rate of speech due to the pronoun being absent and more emphasis being placed on the sentence to denote that, or if it would result in sentences without the subject pronoun being spoken faster due to being associated with quick speech, there was no definitive evidence either way. The goal of the study in this paper was to ultimately try and determine whether such associations could be drawn between speech rate and deletion of subject pronouns. The hypothesis behind this study is that if there is a meaningful distinction between sentences that contain the subject pronoun versus those that do not, we might be able to use artificially altered audio to try and recover those judgements from participants when they are asked to recreate them. The previous research on this topic did not produce any significant patterns to suggest this, but it may have been affected by the cross-modal delivery of written stimulus and audio responses. The present study uses a unimodal delivery and response system which eliminates a potentially confounding variable. Previous research has looked into the idea of participants either adding in or deleting words that they feel they may have heard and this will be covered in the next section.

3 **Current Study**

The study conducted at the University of Calgary is based on a modified version of Mack et al. (2012). Using their method of speech restoration combined with the claim that deletion of subject pronouns may affect speech rate, this study aimed to measure participants ability to recognize speech rate changes and produce sentences with either overt or deleted subject pronouns. This study avoids the use of cross-modal response methods that were observed in all previous research on this topic. Participants heard only audio with no visual prompts, and were asked to reply with only spoken responses.

3.1 Method

3.1.1 Participants

33 undergraduate students from the University of Calgary participated in the experiment in exchange for course credit\(^2\). All participants were native English speakers with normal

\(^2\) The original design of the experiment called for 40 participants, but the data collection was abruptly halted by the COVID-19 pandemic which ceased in person interactions at the University of Calgary.
hearing. The study was approved by the Research Ethics Board at the University of Calgary. Demographic information such as age, gender, and languages spoken was also collected. Participant ages ranged from 18 to 32 with a median range of 19. The majority of participants were from Alberta with a total of 28 participants listing their hometown as an Alberta city or town. The number of languages spoken is summarized in Table 1, sorted by gender identity reported.

Table 1: Participant language demographics

<table>
<thead>
<tr>
<th>Gender Identity</th>
<th>One Language Spoken</th>
<th>Two Languages Spoken</th>
<th>Three Languages Spoken</th>
<th>Total Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>12</td>
<td>14</td>
<td>3</td>
<td>29</td>
</tr>
<tr>
<td>Male</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

3.1.2 Stimuli

The experimental stimuli were created in three groups similar to Weir (2019): expletive it, expletive there, and referential it. The conversations were designed similar to the style of Mack et al. (2012), consisting a short dialogue between two speakers of different genders. Each stimulus group consisted of 10 short conversations for a total of 30 unique stimulus conversations. The rate of speech of the recorded target sentences was calculated, and the averages of the speech rates is presented in Table 2.

Table 2: Average speech rate (syllables per second) per condition

<table>
<thead>
<tr>
<th>Pronoun Type</th>
<th>Male Speaker</th>
<th>Female Speaker</th>
<th>Combined Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expletive it</td>
<td>5.13</td>
<td>4.99</td>
<td>5.06</td>
</tr>
<tr>
<td>Expletive there</td>
<td>4.58</td>
<td>4.87</td>
<td>4.73</td>
</tr>
<tr>
<td>Referential it</td>
<td>4.95</td>
<td>5.01</td>
<td>4.98</td>
</tr>
<tr>
<td>Total Average</td>
<td>4.89</td>
<td>4.95</td>
<td>4.92</td>
</tr>
</tbody>
</table>

Each sound file had the final sentence speech rate artificially increased and decreased to create five total variants of each file. The five conditions were as follows:

- Speech rate decreased by 20%
- Speech rate decreased by 10%
- Unaltered speech rate
- Speech rate increased by 10%
- Speech rate increased by 20%

After the rate of speech modifications, a white noise filter with a duration of 1.60 ms and an amplitude of 0.2 was generated in Audacity version 2.1.3. This filter was applied at the onset of the final sentence to make the presence of the pronoun ambiguous in all conditions, and at a second location near the main verb of the sentence. The same process for applying the white noise filters was applied to the filler items, with random starting locations for the filter.
A total of 10 lists were created, each consisting of 30 experimental trials and 60 filler items. The stimuli conversations created consisted of short, three-line dialogues similar to Mack et al. (2012), without the use of evidential markers such as like or as. The complete list of stimuli conversations used in this study is provided in the Appendix of this paper. The filler items consisted of three sentence conversations like the stimuli sentences, but there was no raising verbs or expletive pronouns of any kind included.

3.1.3 Experiment Design

Participants were randomly assigned to one of 10 separate lists. The hypothesis put forward is that participants will be able to notice the speech rate changes, and be more likely to recover the subject pronoun in sentences that were sped up. All stimulus sentences were produced with the subject pronoun with no additional intonational cues. The independent variables considered were the gender of the speaker in the key sentence, and the rate of speech of each sentence. The dependent variable considered was the number of tokens each participant produced in which they recovered the subject pronoun. If the speed of the audio that participants hear is a phonological factor that cues the presence or absence of an overt subject, we would expect to see participants producing the subject pronoun significantly more frequently when the audio is sped up, and less frequently when the audio is slowed down. If no significant effect is observed as a function of the speech rate changes, this would suggest that these phonetic adjustments are not meaningful phonological changes that a listener would be able to interpret. The independent variable of speaker gender is being considered to control for the sociolinguistic idea that young female speakers are most often the driving force of linguistic change. This is not a main focus of the study and no significant difference is being anticipated for this, this factor was added for the purposes of balancing the number of items delivered across all lists.

3.1.4 Procedure

The experiment was created in PsychoPy Version 1.8.4 (Pierce et al., 2020). Participants were situated in a sound attenuated booth, with a computer monitor, keyboard, and microphone in front of them. Participants were instructed to listen to each conversation fully, before being prompted to begin recording their response. Participants were in complete control of when the recording began, and were provided with four seconds to record their response. A pure tone would play after each recording time elapsed to let the participants know that they could advance to the next conversation. This was done both to allow the participants to move at their own pace through the experiment, and to ensure that the experiment would not crash due to the memory overload of audio playing and recording occurring simultaneously. Unlike Mack et al. (2012), participants were not asked to provide a second written or typed response to the prompts.

3.2 Results

A total of 990 recordings were assessed and coded based on the presence or absence of a subject pronoun in the initial position. Tokens were coded as “Pronoun Produced” if
participants produced any pronoun before the word *seems*, even if it was not the intended pronoun. These included sentences meant to begin with referential *it* that instead start with a *he* or *she*, or sentences where participants produced an expletive *it* instead of an expletive *there*. Of these 990, five tokens were discarded from the analysis due to inaudible or entirely missing audio. Across all productions, participants produced utterances that contained a subject pronoun 83% of the time (815 total tokens), which is much greater than the results provided by Mack et al. (2012). There appeared to be an underlying trend in the participants that divided them into three broad categories:

- 23 Participants that deleted less than 5 subject tokens
- 7 Participants that deleted between 5 and 25 subject tokens
- 3 Participants that deleted more than 25 subject tokens

The results presented by Mack et al. (2012) do not mention any breakdown by participants so there is no indication that they encountered a similar patterning of results. This does indicate a strong interspeaker variation within this data with the majority of participants being resistant to any subject pronoun deletion. The participants who were inclined to delete any of the subject pronouns would either delete a small number of the possible subject pronouns, or would prefer to delete nearly all of the subject pronouns with few random exceptions. While several participants deleted a total of zero subjects (17 total), no participant in this study deleted all 30 subject pronouns (the maximum was 29 of 30).

All statistical analyses were conducted in R version 3.6.1 (R Core Team, 2019). Considering the initial hypothesis, no significant effect of speech rate was observed. Table 3 presents the data from this initial analysis which shows that increasing or decreasing the speech rate artificially did not affect the rate of subject pronoun deletion in participants ($\chi^2 = 6.8837$, $df = 4$, $p = 0.142$).

<table>
<thead>
<tr>
<th>Rate of Speech</th>
<th>Pronoun Produced</th>
<th>Pronoun Deleted</th>
<th>Deletion Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speech rate decreased by 20%</td>
<td>172</td>
<td>26</td>
<td>13.13%</td>
</tr>
<tr>
<td>Speech rate decreased by 10%</td>
<td>166</td>
<td>32</td>
<td>16.16%</td>
</tr>
<tr>
<td>Unaltered speech rate</td>
<td>152</td>
<td>45</td>
<td>22.84%</td>
</tr>
<tr>
<td>Speech rate increased by 10%</td>
<td>164</td>
<td>33</td>
<td>16.75%</td>
</tr>
<tr>
<td>Speech rate increased by 20%</td>
<td>161</td>
<td>35</td>
<td>17.86%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>815</strong></td>
<td><strong>171</strong></td>
<td><strong>17.34%</strong></td>
</tr>
</tbody>
</table>

Ignoring any effects of rate of speech, the three pronoun types were split and a Chi squared analysis was run on the data. The results of this test were not significant, but still worthy of some discussion ($\chi^2 = 5.612$, $df = 2$, $p = 0.060$). The data is presented in Table 4.
Table 4: Pronoun production tokens by pronoun type

<table>
<thead>
<tr>
<th>Pronoun Type</th>
<th>Pronoun Produced</th>
<th>Pronoun Deleted</th>
<th>Deletion Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expletive it</td>
<td>259</td>
<td>70</td>
<td>21.28%</td>
</tr>
<tr>
<td>Expletive there</td>
<td>281</td>
<td>48</td>
<td>14.59%</td>
</tr>
<tr>
<td>Referential it</td>
<td>275</td>
<td>53</td>
<td>16.16%</td>
</tr>
</tbody>
</table>

There appears to be a trend emerging in this data suggesting that participants were more likely to delete an expletive *it* pronoun more than any other pronoun type. Although the statistical analysis was not significant for this data, this is still being mentioned due to the fact that data collection was ended prematurely for this study, so it is possible that if data collection had completed, there may have been a significant result here.

When examining the effect of the number of languages spoken on their deletion rates, a somewhat surprising result was observed. Participants who spoke two languages fluently were significantly more likely to delete subject pronouns of all types ($\chi^2 = 19.75$, df = 2, p < 0.001). These differences can be seen in Figure 1 and Figure 2 below.

Figure 1: Pronoun production by number of languages spoken
Looking specifically at bilingual participants, there was also an effect based on what their second language was. Participants who spoke Mandarin and Cantonese appeared to be more likely to delete subject pronouns in this study ($\chi^2 = 149.59$, df = 5, $p < 0.001$). Table 5 presents a quantitative breakdown of the bilingual participants based on their L2.

Table 5: Bilingual speaker pronoun productions

<table>
<thead>
<tr>
<th>Language</th>
<th>Number of Speakers</th>
<th>Pronoun Produced</th>
<th>Pronoun Deleted</th>
<th>Deletion Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arabic</td>
<td>1</td>
<td>28</td>
<td>2</td>
<td>6.67%</td>
</tr>
<tr>
<td>Cantonese</td>
<td>3</td>
<td>32</td>
<td>58</td>
<td>64.44%</td>
</tr>
<tr>
<td>French</td>
<td>7</td>
<td>195</td>
<td>13</td>
<td>6.25%</td>
</tr>
<tr>
<td>Malayalam</td>
<td>1</td>
<td>27</td>
<td>3</td>
<td>10.00%</td>
</tr>
<tr>
<td>Mandarin</td>
<td>2</td>
<td>33</td>
<td>27</td>
<td>47.37%</td>
</tr>
<tr>
<td>Urdu</td>
<td>1</td>
<td>29</td>
<td>1</td>
<td>3.33%</td>
</tr>
</tbody>
</table>

There were no significant effects in the multilingual speakers, and none of the groups when separated by languages spoken had any significant effects on pronoun type or rate of speech.

Finally, participant F0 on the raising verb seems was calculated for all tokens. This was done to observe if the pattern observed in Weir (2019) where the F0 in the referential it sentences was significantly lower would appear in this strictly auditory context. The speakers who were asked to create the stimuli sentences were instructed to deliver them as neutrally as possible, so the pattern did not exist in the audio that participants were hearing. If this pattern emerged in Weir (2019) as a result of participants noticing the syntactic differences in sentences with referential subjects, we would not expect participants to be able to recreate this pattern if they are only hearing the audio files, especially if that audio does not also contain this pattern. The mean F0 values by pronoun type are presented in Table 6.
Table 6: Mean F0 observed at raising verb by pronoun type

<table>
<thead>
<tr>
<th>Pronoun Type</th>
<th>Mean F0 (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expletive *it</td>
<td>251.30 Hz</td>
</tr>
<tr>
<td>Expletive *there</td>
<td>252.32 Hz</td>
</tr>
<tr>
<td>Referential *it</td>
<td>253.09 Hz</td>
</tr>
</tbody>
</table>

A statistical analysis in R version 3.6.1 (Kuznetsova et al., 2017; R Core Team, 2019) using a linear mixed effects model showed no significant effects. There was also no significant interaction between the F0 on the raising verb, and the presence of a subject pronoun in the sentences that participants were producing, or the type of pronoun in the sentence. The initial model of this test is shown in (7)

7) F0 ~ PronounType * PronounProduced + (1|Participant) + (1|ItemID)

When comparing models, it was determined that removing the PronounType effect made for a better and simpler model. This implies that the type of pronoun had no significant effects on the F0 of the raising verb, which contrasts with the results from Weir (2019). The simplest and best model is expressed in (8) and summarized in Table 7.

8) F0 ~ PronounProduced + (1|Participant) + (1|ItemID)

Table 7: Linear mixed effect model analysis of F0 values

| Estimate | Std. Error | DF  | t value | Pr (>|t|) |
|----------|------------|-----|---------|----------|
| (Intercept) | 249.5650   | 8.760 | 34.792  | <2e-16*** |
| PronounProduced: TRUE | 3.467     | 2.126 | 890.872 | 1.63     | 0.103     |

--- Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

The random effects in (8) of participant and item variance yield a significantly better model when compared to models where either of those effects are removed. The reason for these random effects improving the model is likely related to the effects of number of languages spoken, and the variability in some items which allow different combinations of possible subjects to be recovered.

4 Discussion

In terms of the initial hypothesis, there was no significant effect of speed observed, meaning that participants were not influenced by the extralinguistic information that may be conveyed by someone deleting a subject pronoun. There are two possible reasons for why no effect was seen here. The first is that the difference may have been too subtle for participants to pick up on and make adjustments for. Participants were not given specific instructions on what they should be looking for before the experiment began, and were simply told to fill in any missing information they may have heard while being as accurate as possible. No mention was made of the changing speeds before the study began. A second possible reason that they were reluctant to delete subject pronouns is due to the fact that
their personal grammar was influencing what they were saying regardless of what they were hearing. Even though they were hearing audio which may have sounded like there was no subject pronoun, they would still have to make a choice on what they would say when repeating the sentence. Based on their own internal grammar, they may want to produce a sentence with a subject pronoun. This lack of an effect when asking participants to recreate audio like this suggests that subject pronoun deletion in English is most likely a phonological phenomenon. The pragmatic effects noted in Mack et al. (2012) likely still affect this so it is not solely on the phonology to determine what should be deleted, as much as it determines what is able to be deleted.

When splitting the pronoun types, there seems to be a potential for an effect to emerge surrounding expletive *it* being more likely to be deleted, and expletive *there* being less likely to be deleted. We can look at research done by Dilley and Pitt (2010) to examine a potential explanation on why *there* is appearing to behave differently than both expletive and referential *it*. They found that function words were likely to appear or disappear as a function of speed changes when they were able to coarticulate with some surrounding. Example (9) shows how the function word might be able to blend into the previous word if there was no discernible boundary between them.

9) Claire said that sour and bitter (*are*) both...
   [klɜɹɻ ɹɜ ɜɻd ð ɑy so ɹθ̊ boθ]
   (Dilley and Pitt, 2010)

With the speed increased, one could imagine how [bɪɾɹ̩ boθ] might become [bɪɾɹ̩ boθ]. With the sentences created for this study, sentences with an expletive or referential *it* were able to blend into the following word in a similar way, not through coarticulation, but through the minimization of weak prosodic material. In fact, some of the participants in this study did not produce a complete [ɪt sims], and would sometimes minimize their production to [tsims]. This occurred a in total of four tokens. These occurrences were counted as “Pronoun Produced” when coding data, as they still made some effort to include some phonetic material before the *seems*, and there were not enough instances of this to warrant the creation of its own data code. There is no possibility of coarticulation or minimization of expletive *there* however. The rhotic ending in [ðɹ̊] does not coarticulate easily with the alveolar fricative beginning of [sims], and it is much harder to minimize it, possibly due to its higher sonority. With these differences in mind, it would make sense that we see a difference between the pronoun types. In order to look further into this, another set of sentences would need to be crafted explicitly with expletive *there* in mind by using a different raising verb. An example of an alternative raising verb is shown in (10).

10) There appears to be...
   [ðɹ̊ ɻə ꞊pɪɻ tu ɹi]

By using the raising verb *appears*, we are providing a better environment for the ending of *there* to coarticulate to a degree. It is at least possible with a sentence like this to imagine participants producing something like [ɻə ꞊pɪɻ tu ɹi], which is closer to the minimization we were seeing with [tsims], and would potentially make it easier for participants to delete.
Considering the differences between expletive and referential it in Table 2, there may also be an effect emerging suggesting that participants would be less likely to delete a referential subject pronoun. This would be a logical result as the referential subject pronoun contains semantic information and would be slightly more difficult to recover, even with context. Looking back at the results of Weir (2019), we do see results of referential it being treated differently than expletive it, with participants still having a lower F0 on the word seems in the referential sentences, even with the pronoun being deleted. From this we can conclude that referential it has some sort of lexical stress on it due to the semantic content that it has, which causes it to have phonetic effects on its surrounding environment that we do not observe in any of the expletive pronoun variants. Combining with this idea with the F0 results that we observe in the present study, we do not see the same effect that was observed in Weir (2019). This lack of an effect when using audio stimulus delivery and audio responses means that there may be something unique about the cross-modal methodology of Mack et al. (2012) and Weir (2019). If participants are able to take notice of the sentences with referential pronoun subjects, and produce them in a different way with regards to the lexical stress that they put on the subject when reading them aloud, but do not when hearing them, suggests that there is something else afoot.

The effect that occurred when comparing bilingual participants and monolingual participants appears to occur because of the particular second language that these participants have. Participants who speak either Mandarin or Cantonese as their L2 appear to be significantly more likely to incorporate subject pronoun deletion in their English L1. While there is a record of their languages they claim to speak, no questions were asked regarding claimed level of fluency, or family history of language use. The idea that an L2 may impact the structure of an L1 is one that is not entirely unfounded, especially if these participants were bilingual learners from a young age. Sato (2014) looks at data from Colloquial Singapore English (CSE) concerning strict/sloppy readings with null subjects and null objects. He describes CSE as “an English-lexified contact variety which has evolved with a constant Sinitic/Malay substratum in the multilingual endogenous contact ecology in Singapore” (Sato, 2014, p. 3). While still being considered a contact language, CSE has reached a point in its growth where speakers are learning it as their native language despite its low prestige in Singapore (Sato, 2014). The grammar of CSE exhibits influences from multiple sources including English, Malay, Cantonese, Mandarin and several other native languages, but recent language policy changes have made the influences from Mandarin more prominent. Sato (2014) presents data showing subject/object asymmetry in interpreting sloppy/quantificational sentences containing empty arguments. This asymmetry would need to come from one of the substrate languages such as Mandarin, or Cantonese rather than the lexifier language English. By attempting to draw a parallel from this to the present study, we can claim that the particular variety of English spoken by the bilingual participants in this study may have been influenced by their L2. Because Mandarin and Cantonese are both pro-drop languages, it is possible that the increased frequency of subject pronoun deletion we see in these English sentences comes from this influence. This hypothesis is not airtight, however, as Arabic is also a pro-drop language, and there is no significant increase in that particular participant’s pronoun deletion. Because no data was collected regarding family histories or degree of fluency, it is difficult to make any strong claims on this particular data, however, the data does align with this possible explanation.
5 Conclusion

The results of this study were substantially different from what was seen in Mack et al. (2012). This may be due to regional dialectical differences, as well as other underlying factors that could not be compared. The lack of a positive result regarding the main hypothesis is informative for how participants are processing these types of sentences and recovering them. The strict divide between participants' willingness to delete pronouns suggests that there is certainly a strong inter-speaker phonological difference. A useful direction that I would like to look at in the future would involve recreating both the study from Weir (2019) and the present study as a two-part single study rather than two separate studies. This would allow us to draw a link between participants who are more likely to naturally speak sentences without a subject pronoun and observe whether they make significantly different phonetic adjustments when reading these sentences aloud compared to participants who resist deleting the subject pronouns.

Although there are many theories at play which describe the constraints and limitations of phenomenon such as subject deletion, there does not appear to be a unifying explanation that can account for all the data that we are observing at this point. Based on the data from Mack et al. (2012) and the study in this paper, the explanation appears to be mostly phonological. A phonological explanation does not account for the pattern observed in Weir (2019), which suggests that participants may be processing the syntactic structure of what they are reading, and making unconscious adjustments to the adjacent word to distinguish sentences which have a referential subject as opposed to an expletive subject. The results of Weir (2019) and their contrast with the results in this paper serve as evidence that deletion of material in spoken English may not solely be the responsibility of phonology. I argue that the context of participants' interaction with deleted material dictates what is 'responsible' for the deletion of phonetic information. If written deletion is indeed syntactic, and we are seeing consistent patterns emerging from it, one could argue that it is a syntactic rule that is causing this pattern. If spoken deletion is indeed phonological, and we observe that participants behave at highly variable rates, then one could argue that this is due to their own phonological system. There is no reason to state that it needs to be strictly phonology, or strictly syntax that is causing this. Both explanations are within the realm of possibility depending on the context. Although this may not be the simplest explanation of the data, I believe it captures all of the results we see in the written context of Weir (2019), and the audio contexts of the present study.
References


Appendix – Stimuli Sentences

Expletive it

1. Employment
Speaker A: I heard that Adam got a new job.
Speaker B: How is that going?
Speaker A: It seems he is much happier.

2. Food
Speaker A: I think I got food poisoning from the restaurant.
Speaker B: How did that happen?
Speaker A: It seems the meat wasn’t cooked through.

3. Baking
Speaker A: My mother made these cookies for us.
Speaker B: Why did she do that?
Speaker A: It seems she likes treating us well.

4. Doctor
Speaker A: James visited the doctor yesterday.
Speaker B: Is everything okay?
Speaker A: It seems he has an awful cold.

5. Cattle
Speaker A: Farmer Ted sold all of his cows.
Speaker B: Why did he do that?
Speaker A: It seems they were costing him lots.

6. Shoes
Speaker A: My shoes have a hole in the bottom.
Speaker B: Will they last through the summer?
Speaker A: It seems that I need new ones soon.

7. Dating
Speaker A: Andrew is trying online dating.
Speaker B: Is that working for him?
Speaker A: It seems he is having success.
8. Computer
Speaker A: Amy bought a new computer yesterday.
Speaker B: Why did she need to do that?
Speaker A: It seems her old one stopped working.

9. Friends
Speaker A: Hank looks unhappy.
Speaker B: Is everything okay with him?
Speaker A: It seems he needs to be cheered up.

10. Heat
Speaker A: It is very cold in my house.
Speaker B: Did you turn up the heat?
Speaker A: It seems that doesn't help at all.

Expletive there

1. Car Problems
Speaker A: My car broke down yesterday.
Speaker B: Do you know why?
Speaker A: There seems to be a fuse that blew.

2. Pests
Speaker A: You should call an exterminator.
Speaker B: Why is that?
Speaker A: There seems to be a rat issue.

3. Draft
Speaker A: I think I need to replace my windows.
Speaker B: What's the problem?
Speaker A: There seems to be a leaky seal.

4. Hair
Speaker A: Can you call the waiter.
Speaker B: Why do you need the waiter?
Speaker A: There seems to be no forks here.
5. Reading
Speaker A: Jake dropped his university classes.
Speaker B: Why did he do that?
Speaker A: There seems to be lots of reading.

6. Printing
Speaker A: My document will not print.
Speaker B: Do you know why?
Speaker A: There seems to be a paper jam.

7. Fire
Speaker A: I think there is a fire in that building.
Speaker B: How can you tell?
Speaker A: There seems to be smoke billowing.

8. President
Speaker A: The debate last night was interesting.
Speaker B: Were all the candidates equal?
Speaker A: There seems to be a clear favorite.

9. Choices
Speaker A: I think I need to break up with my partner.
Speaker B: What makes you say that?
Speaker A: There seems to be no better way.

10. Leftovers
Speaker A: Carol is trying to give me some turkey.
Speaker B: Why is she doing that?
Speaker A: There seems to be lots leftover.

**Referential it**

1. Cat
Speaker A: Look at my cat lying in the sunbeam.
Speaker B: What is happening?
Speaker A: It seems to be sleeping soundly.
2. Horse
Speaker A: The horse is running wild in the field.
Speaker B: Did something happen?
Speaker A: It seems to be spooked by something.

3. Toaster
Speaker A: My roommate wants to throw out our toaster.
Speaker B: Why is that?
Speaker A: It seems to always burn the bread.

4. Laptop
Speaker A: My laptop won’t turn on anymore.
Speaker B: What the problem?
Speaker A: It seems to have faulty hardware.

5. Rock
Speaker A: That rock is falling down the mountain.
Speaker B: Should we back up?
Speaker A: It seems to be picking up speed.

6. Vulture
Speaker A: That vulture has been circling us for a while.
Speaker B: Do we look that far gone?
Speaker A: It seems hungry this afternoon.

7. Fire
Speaker A: I am getting more wood for the fire.
Speaker B: Do you think you need to?
Speaker A: It seems to be going out quick.

8. Plants
Speaker A: My plant is looking brown.
Speaker B: Why not get some water?
Speaker A: It seems to be dead already.
9. Water Bottle
Speaker A: I need to replace my water bottle.
Speaker B: What is wrong?
Speaker A: It seems to be leaking on top.

10. Phone
Speaker A: I think I lost my phone.
Speaker B: How can you be sure?
Speaker A: It seems to have grown legs and left.
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