

THERE IS MORE TO THE STORY: FIRST-MENTION LENGTHENING IN THAI INTERACTIVE DISCOURSE

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ABSTRACT

We investigate the effect of previous mention on word duration in interactive Thai discourse. Words that are mentioned for the first time are reliably longer than words that have already been mentioned, with no significant difference in duration between second and subsequent mentions, suggesting first-mention lengthening rather than repetition-driven reduction. In addition, we find that word duration is "reset" to its original value at the beginning of a new story, even if the story involves the same referents as the old story, indicating that the effect is not driven by lexical access difficulties. The observed robustness of first-mention lengthening suggests that localization of relevant processing difficulties to lexical access, as in [7], or referent repetition, as in [11, 12, 14, 15], is premature.

Keywords: speech production, phonological reduction, duration, listener-oriented, Thai

1. INTRODUCTION

Several researchers have found that words that are repeated within a conversation are phonologically reduced [2, 3, 5-7, 11, 12, 14, 15, 17]. Various theoretical accounts of the effect have been proposed. Bybee suggests that the effect could be explained by automatization of repeated articulatory sequences [9]. This hypothesis predicts that additional repetitions should lead to additional reduction. There was only one study so far that explicitly tested this prediction. The researchers were unable to find the expected difference in duration between second and subsequent mentions [7]. However, as the authors note, the effect of mention was relatively small and thus the lack of a significant difference between second and subsequent mentions could be due to insufficient statistical power.

An alternative explanation of second-mention reduction suggests that repetition effects arise as a side-effect of processing difficulty. Bard, et al. [6], and Bell, et al. [7] hypothesize that modeling the

listener (as proposed by Aylett & Turk, Fowler and Lindblom) is too computationally complex to be carried out and influence duration in real time. Bell, et al. [7] p.106 argue that "there is... a mechanism of fluent speech that helps coordinate lexical access and/or phonological encoding and the execution of the articulatory plan. This would come into play when the specification of the current... phonological word... is slowed, but not so severely as to require disfluent adaptations. In order to maintain coordination of the flow on the two levels, the subsequent phasing and/or strength of the gestural articulation of this unit would then be modified slightly, so that it is executed with a longer duration". Thus, according to Bell et al., the effect might be better termed "first-mention lengthening" rather than "phonological reduction": when the processor encounters a lexical-access difficulty, articulation is slowed and words are lengthened.

High-frequency words tend to be shorter than low-frequency words, even if segmental content is controlled, e.g., [13]. One could argue that for both lengthening and shortening there is a limit: words can only get so short before they are difficult to perceive, and only so long before they sound disfluent. Thus, if the effect is due to shortening, high-frequency words are closer to the limit and should shorten less, while if the effect is due to lengthening, high-frequency words are further from the limit and can lengthen more. Bell et al. found the latter, supporting the lengthening account [7].

Speaker-oriented accounts like [7] and [9] can be contrasted with listener-oriented accounts like [3], [11] and [14]. Fowler [11] suggested that the presence of a listener makes a significant contribution to speakers' shortening of words. She found that there is a greater difference between first and second mention when speakers are asked to speak on a predetermined topic (to a listener) than when what they had said is transcribed and they are asked to read it into a microphone. Based

on this finding, Fowler concluded that “shortening reflects the talkers’ estimate that a listener has other information available to help identify a word, and so the word need not be carefully produced” [11] p.317, (see also [3, 10, 15]). Hence, according to Fowler, word shortening is context dependent and demonstrates speakers’ judgment of the amount of information that needs to be conveyed to the listener. However, a lexical access explanation along the lines of [7] is also possible: first and second mentions in a read text do not differ as much in access difficulty as first and second mentions in a spontaneously produced speech.

Stronger evidence of sensitivity to the listener is provided by the finding, in [14], that speakers asked to retell stories to old addressees show more reduction than speakers asked to retell stories to new addressees. Countering Bell et al., Galati & Brennan suggest that the computations involved may not be necessarily complex and could involve a “one-bit” model: “my audience has heard this before” vs. not. However, repetition of the same story to the same listener is a rather special case: not only are the referents of the repeated words given to the listener but the entire story has been said before, thus there is pragmatic pressure to produce the story as fast as possible in order not to bore the listener. This may well produce less first-mention lengthening but it is not clear that it explains the existence of first-mention lengthening.

The present study builds on previous work in several ways. First, all previous studies examine Germanic languages, and all but [17] examine English, which has led some researchers (e.g., [5]) to wonder if it occurs in all languages. The current study examines Thai, a tone language with rather different prosodic characteristics. Second, we examine production of multiple “stories” that involve the same referents to an old or new listener. Thus, when a new story begins, the referents are given but the story is new. This removes the pragmatic pressure to avoid first-mention lengthening while not removing the hypothetical pressure [11, 14] to reduce easy-to-access words whose referents are known to the listener. Third, following [7], we compare second mentions and subsequent mentions to further examine whether repetition continuously influences duration, as in [9], or if there is something special about first mentions, as in [7].

2. METHODS

Participants were three female native speakers of Standard/Central Thai. All participants are graduate students whose approximate length of stay in the United States is three years. Furthermore, participants reported having been active within the Thai community and had been regularly exposed to Thai in both the written and spoken discourse.

Each participant was asked to describe two different spatial arrangements of ten common creatures (two different “stories”), in Thai, to a native Thai listener. They then repeated the stories, in the same order, to a new listener, thus resulting in the following sequence: Story 1 then Story 2 then Listener Switch then Story 1 then Story 2. This order avoided the speaker telling the same story twice in a row or twice to the same listener.

Both stories included the same pictures, and differed *only* in the arrangement of the pictures on the board. An example of an arrangement to be described is shown in Figure 1. All critical words whose durations were measured were monosyllabic names of the familiar creatures shown.

Figure 1: An arrangement of the creatures to be described in a “story”.



The task of the listener was to arrange their own set of pictures on the board to match the speaker's arrangement. The speaker could see the listener's board but the listener could not see the speaker's board. The task was not timed. The two listeners did not serve as speakers in the experiment.

Participants’ speech was recorded using the Marantz PMD 671 digital audio recorder. The WAV audio files were analyzed using Praat [8].

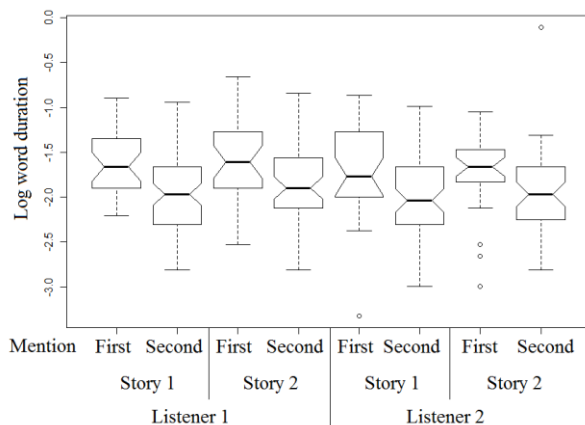
The dependent variable measured was vowel duration (from the release of the syllable-initial consonant until the end of vowel formants, cf. [1]). The fixed factors were 1) mention within story (first vs. second vs. subsequent), 2) story repetition

(first vs. second telling of a story), 3) listener repetition (first vs. second story told to a listener), and 4) speech rate (syllables per second within the utterance). We restricted the analysis to utterance-medial mentions because they comprised the vast majority of the data and were the only targets for which speech rate could be measured both before and after the target. Data were analyzed using linear mixed effects models R [18], with the packages languageR and lme4 [4]. Subject and word were included into the model as random effects. P values were generated using Monte Carlo resampling (by means of the pvals.fnc function) in languageR due to calculation of degrees of freedom for mixed-effects models being controversial (cf. [4]).

3. RESULTS

The strongest effect was the effect of mention within story: second mentions within a story are shorter (Figure 2, $t=6.61$, $p<.0001$). There was no significant difference between second and subsequent mentions ($t<1$). Mention accounted for 14% of unique variance (compared to 23% for all other factors combined). There was also a relatively small effect of story repetition: when a story is told for the second time to a new listener, the words within the story are shorter ($t=2.17$, $p=.03$), despite the fact that the story is being told to a new listener.

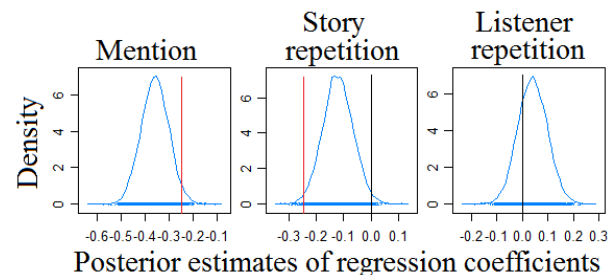
Figure 2: A boxplot showing word duration as a function of mention within story/arrangement within listener. First mentions are shorter than subsequent mentions. The thick horizontal lines in the boxes show median durations, notches show 95% confidence intervals for the median.



The effect of story repetition accounts for 2% of unique variance, which is significantly less than the 14% accounted for by word repetition within a

story based on the posterior distributions of coefficient values for the two effects in Monte Carlo resampling (Figure 3). The effect of referent repetition across stories within a listener was not significant. However, its magnitude is also not significantly different from the magnitude of the effect of story repetition.

Figure 3: Posterior probability distributions for regression coefficients for the effects of mention within story (left), story repetition across listeners (middle), and referent repetition across stories within listeners (right). Negative coefficients indicate that repetition is associated with reduction. The vertical lines are drawn to simplify comparison of believable coefficient magnitudes across the effects: the effect of repetition within a story is significantly stronger than the effect of story repetition while the effects of story repetition and referent+listener repetition are not significantly different from each other.



4. DISCUSSION

To summarize, words are reliably longer when they are mentioned for the first time within a coherent stretch of discourse. When the speaker starts a new story, words are lengthened again for their first mention, even if the new story contains the same referents as the story that was just told to the same listener.

These results are problematic for current theories of reduction/lengthening that view reduction as deriving from *lexical access* difficulties for either the speaker [7] or the listener [3, 14, 16] as well as speakers' signaling of given/new status of the words' referents [10-12]. On these accounts, we would not expect lengthening to occur at the beginning of a new story describing new locations of *old* referents.

The effect of story repetition is in agreement with a speaker-internal processing difficulty account [7, 9]: a new listener hearing a story that the speaker has not produced before should not be benefitting from the speaker's previous experience with telling the story, whereas the processing load on the speaker is lessened by prior experience with describing the same spatial arrangement.

What could be causing first-mention lengthening? One possibility is a broader version of the processing difficulty account. Instead of claiming that first-mention lengthening is driven specifically by lexical-access difficulties, one could say that it is caused by any kind of processing difficulty, as long as that processing difficulty competes for the same resources with articulatory planning. In the present experiment, when a creature is first mentioned in a story, the speaker may be in the midst of planning how to describe the spatial relations between the creatures. In addition, the listener needs time to locate the creature in her pile of pictures and to place the first few landmark creatures that can serve as a reference frame for placing the rest. Thus, both the speaker and the listener are facing some processing difficulties, which may slow down speech production in order to avoid awkward pauses and disfluency [7].

One potential issue for this account is that the effect of within-story mention remained when speech rate was included in the regression model. However, this may be due to different word classes being subject to lengthening to different degree: the regression model in the present study was significantly improved by including word-specific random deviations in the slopes of the effect of mention.

5. CONCLUSION

Speakers lengthen the first mention of a word within a story even when the word has been mentioned in a previous story about the same referents, without much influence from whether the listener has heard the speaker say the word before. These results are problematic for current theories of first-mention lengthening / articulatory reduction. The inability to account for the present data can be traced back to assuming that the effect must be caused by differences in accessibility between referents, either for the speaker or the listener. The present data indicate that first-mention lengthening occurs even when the referents are accessible. The data may be explained by either a more general processing difficulty account or we may have to accept that initial lengthening is simply a matter of linguistic convention on the discourse level that usually has a function (to facilitate lexical access) but can persist even in contexts in which it is not needed.

6. REFERENCES

- [1] Abramson, A. 2002. The stability of distinctive vowel length in Thai. In Tingsabadh, K., Abramson, A.S. (eds.), *Essays in Tai Linguistics*. Bangkok: Chulalongkorn University Press, 13-26.
- [2] Anderson, A.H., Howarth, B. 2002. Referential form and word duration in video-mediated and face-to-face dialogues. In Bos, J., Foster, M.E., Matheson, C. (eds.), *Proceedings of EDILOG 2002*. Edinburgh: Cognitive Science Centre, University of Edinburgh.
- [3] Aylett, M., Turk, A. 2004. The smooth signal redundancy hypothesis: A functional explanation for relationships between redundancy, prosodic prominence, and duration in spontaneous speech. *Language and Speech* 47, 31-56.
- [4] Baayen, R.H. 2008. *Analyzing Linguistic Data: A Practical Introduction to Statistics Using R*. Cambridge: Cambridge University Press.
- [5] Baker, R.E., Bradlow, A.R. 2009. Variability in word duration as a function of probability, speech style, and prosody. *Language and Speech* 52, 391-413.
- [6] Bard, E.C., Anderson, A.H., Sotillo, C., Aylett, M., Doherty-Sneddon, G., Newlands, A. 2000. Controlling the intelligibility of referring expressions in dialogue. *J of Mem. & Lg.* 42, 1-22.
- [7] Bell, A., Brenier, J.M., Gregory, M., Girand, C., Jurafsky, D. 2009. Predictability effects on durations of content and function words in conversational English. *J of Mem. & Lg.* 60, 92-111.
- [8] Boersma, P., Weenink, D. 2010. Praat: doing phonetics by computer (Version 5.1.25) [Software]. Available from <http://www.praat.org/>
- [9] Bybee, J. 2002. Word frequency and context of use in the lexical diffusion of phonetically conditioned sound change. *Language Variation and Change* 14, 261-290.
- [10] Chafe, W. 1976. Givenness, contrastiveness, definiteness, subjects, topics, and point of view. In Li, C.N. (ed.), *Subject and Topic*. New York: Academic Press.
- [11] Fowler, C. 1988. Differential shortening of repeated content words produced in various communicative contexts. *Language and Speech* 31, 307-319.
- [12] Fowler, C., Housum, J. 1987. Talkers' signaling of "new" and "old" words in speech and listeners' perception and use of the distinction. *J of Mem. & Lg.* 26, 489-504.
- [13] Gahl, S. 2008. Time and thyme are not homophones: The effect of lemma frequency on word durations in spontaneous speech. *Language* 84, 474-492.
- [14] Galati, A., Brennan, S.E. 2010. Attenuating information in spoken communication: For the speaker or for the addressee? *J of Mem. & Lg.* 62, 35-51.
- [15] Lam, T.Q., Watson, D.G. 2010. Repetition is easy: Why repeated referents have reduced prominence. *Memory & Cognition* 38, 1137-46.
- [16] Lindblom, B. 1990. Explaining phonetic variation: A sketch of the H&H theory. In Hardcastle, W., Marchal, A. (eds.), *Speech Production and Speech Modeling*. Dordrecht: Kluwer.
- [17] Pluymaekers, M., Ernestus, M., Baayen, R.H. 2005. Articulatory planning is continuous and sensitive to informational redundancy. *Phonetica* 62, 146-59.
- [18] R Development Core Team. 2009. R: A language and environment for statistical computing. Vienna: R Foundation for Statistical Computing. Available from: <http://www.R-project.org>