

# ON THE PERCEPTION OF EPENTHETIC STOPS

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## BACKGROUND AND RESEARCH QUESTIONS

- ❖ Studies such as Fourakis and Port (1986) have shown that in American English the distinction between epenthetic stops—e.g. the [t] in *prince*—and underlying stops—e.g. the [t] in *prints*—is a case of incomplete neutralization: epenthetic [t]s show shorter closure duration and are less likely to have a burst than underlying [t]s.
- ❖ However, speakers usually maintain that words such as *prints* and *prince* “sound the same.”
- ❖ Could it be the case that speakers’ claims illustrate a shift towards complete neutralization? This possibility is supported by Yoo and Blankenship (2003) and Arvaniti (2006) which show that epenthetic and underlying [t]s are almost identical in production.
- ❖ If so, confusion between minimal pairs should be greater for frequent and familiar words (since these are more likely to have undergone change first).
- ❖ Or is [t] epenthesis still an instance of incomplete neutralization? In this case, it should still be possible to perceptually distinguish minimal pairs with epenthetic and underlying [t].
- ❖ If so, what are the acoustic parameters that affect the perception of [t]?

## HYPOTHESES

- ❖ Frequent and familiar words (*prints-prince*) should be more difficult to distinguish than infrequent and unfamiliar words (*quince-quints*) resulting in longer reaction times; familiar but infrequent words (*mince-mints*) should show an intermediate level of difficulty.
- ❖ The presence of a burst and longer closure duration should favor “nts” responses, particularly in infrequent and unfamiliar words; the reverse should be the case for stimuli with short closure durations and no burst.

## METHODS

### Stimuli

- ❖ Tokens of *prince*, *prints*, *mince*, *mints*, *quince*, *quints* elicited from one male and one female speaker of Southern California English, both in their early 20s.
- ❖ All traces of [t] closure and burst were first removed from the tokens; 0-72 ms of silence were spliced in between [n] and [s], in 12 ms steps; for each adulterated token, two stimuli were created, one without a burst and one with a representative burst (identical for all stimuli with bursts).

### Listeners

- ❖ 26 native speakers of American English 18-23 years old.
- ❖ The data of two subjects, who failed to respond to more than 40% of the stimuli, were removed.

### Procedures

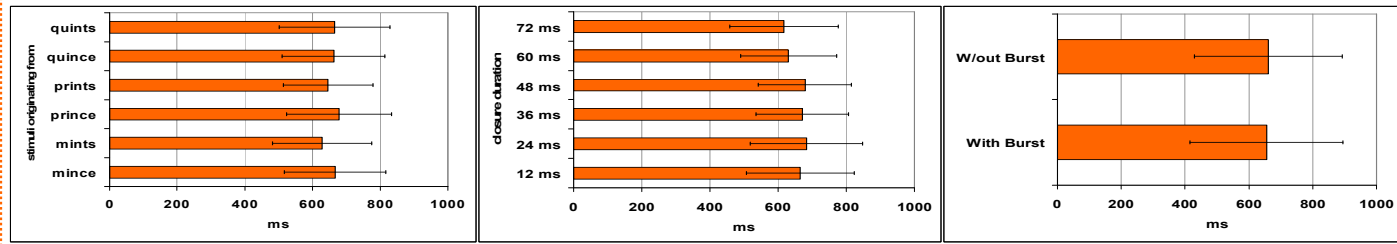
- ❖ Forced-choice identification using SuperLab Pro 2.0.4: subjects saw a minimal pair on screen (e.g. *quints quince*) and selected the word they thought they heard.
- ❖ Responses and reaction times (RTs) were recorded, unless the subject failed to respond within 1500 ms after the onset of a stimulus.
- ❖ The position of the words on the screen (left, right), and the order in which stimuli from the two speakers were heard were counterbalanced.
- ❖ Stimuli were heard in random order, three times each, in blocks of ten.
- ❖ Stimuli were interspersed with fillers, at a rate of one filler for every two stimuli.

### Statistics

- ❖ Within-subjects ANOVAs on RTs with WORD, CLOSURE DURATION and BURST as repeated-measures factors.
- ❖ Binomial tests on the responses to individual stimuli to test the probability that responses were above chance level ( $p < 0.05$ ).

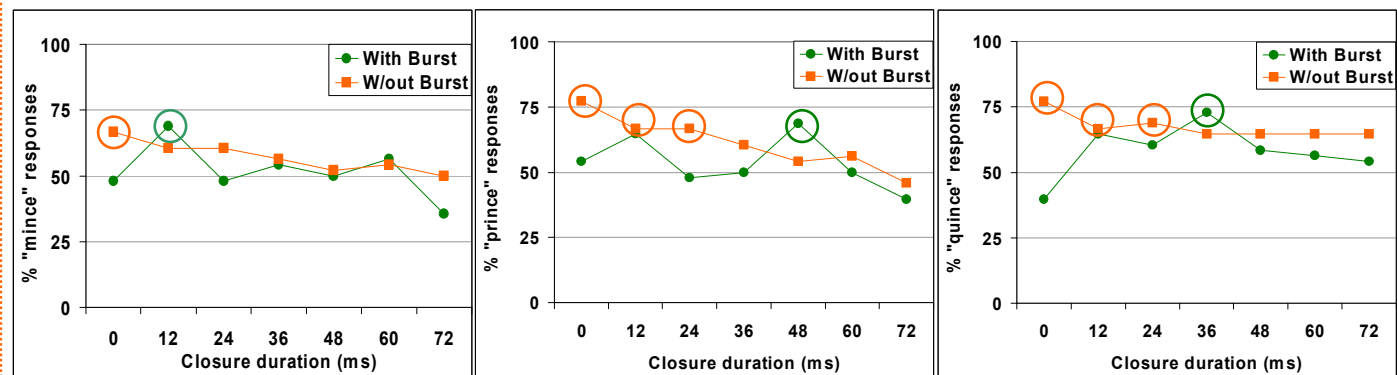
## RESULTS

### Response Times



Mean RTs and standard errors; RTs were relatively long, but not affected by the factors investigated, i.e. word identity, [t] closure duration, and burst.

### Identification Rates



Identification rates pooled over stimuli originating from the two members of each pair of words (*mince-mints*, *prince-prints*, *quince-quints*); binomial tests showed that identification rates were not significantly different from chance, except for the circled data points ( $p < 0.05$ ).

## DISCUSSION AND CONCLUSIONS

- ❖ Although RTs did not show any effects of WORD, BURST or CLOSURE DURATION, they are rather long, suggesting that the task was not easy for the listeners.
- ❖ This conclusion is supported by the identification rates which suggest that listeners often guessed at the answer.
- ❖ However, the identification rates also show that the listeners were biased towards “nce” responses in the absence of strong evidence for a [t]: when closure duration was short or absent, or when burst was not present, the listeners chose “nce” responses significantly more than chance. In this sense, closure duration and the presence or absence of a burst do influence subjects’ responses.
- ❖ Arvaniti (2006) showed that the similarity between epenthetic and underlying [t]s in Southern California English is due to the fact that speakers are more likely to elide underlying [t] than to epenthesize an intrusive [t]. In light of these production results, the perceptual bias towards “nce” words found in the present study suggests a mismatch between production and perception: speakers tend *not* to produce [t] in the [n\_s] context, but as listeners they expect it to be present if they are to perceive a word as having an underlying [t]. (Alternatively, this bias could be interpreted as an influence of orthography on the responses.)
- ❖ Significantly, identification rate and the bias towards “nce” responses were not affected by word frequency or familiarity, supporting the view that the contrast between [nts] and [ns] is currently neutralized in this variety of English.
- ❖ Further production and perceptual tests are underway to investigate the effect of orthography and determine the extent to which neutralization applies to different styles of speech.

### ACKNOWLEDGEMENTS

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