PRODUCTION AND PERCEPTION OF PHONETIC CONTRAST DURING PHONETIC CHANGE*

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Abstract. Ten productions of each of the two words cod and card in the southeastern subdialect of the Eastern New England dialect, said to differ phonetically only in vowel length (and a number of foil words involving other phonetic contrasts) were recorded in a neutral carrier sentence by each of nine phonetically naive urban-Eastern New England speakers unaware of the purpose of the investigation. Spectrographic measurements revealed fairly consistent differences in the vocalic segment durations of cod and card for most speakers. But no speaker could reliably identify his own intended productions (though identification of foils was perfect). Evidently a phonetic change is in progress, and our results suggest that during such a change, contrasts in production may persist after they have ceased to be perceptually relevant.

It is usually taken for granted in phonetics that given a regular alternation in the production of two distinct lexical items, these two items will be perceived as different. Labov, Yaeger, and Steiner (1972), however, have reported instances of "partial mergers," in which, despite consistent acoustic differences between two phonetic types in a dialect, speakers of the dialect failed informal commutation tests. The purpose of this study is to examine another such situation in which the common assumption seems to be contradicted. The case in point is taken from the southeastern subdialect of the Eastern New England dialect—henceforth SENE—spoken in and around Fall River, Massachusetts.

It has been stated by Thomas (1958) and by Kenyon (1937), on the basis of data collected in the 30's for the Linguistic Atlas of New England, that in the case of low vowels, vowel length is distinctive for SENE. For example, there is said to be only a vowel length distinction between the two words cod [kəd] and card [kɔ:d]. This implies that the acoustic signals for such pairs may differ solely in the duration of the vocalic segment. We have found, however, that while there is a fairly reliable durational difference in the production of cod and card, speakers of this dialect cannot consistently label their own productions. In other words, the distinction in production is virtually ignored in perception.

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PRODUCTIONS AND NORMALIZED VOCALIC SEGMENT DURATIONS

INTENDED

[kad] (90)

[ka:d] (89)

NUMBER OF PRODUCTIONS

S.D. (DURATION)

Figure 1
We recently carried out a production experiment and a perception experiment with nine SENE speakers. In the production experiment, we collected acoustic data from the informants with which the acoustic correlates of the vowel length distinction between cod and card could be measured. The materials for each production experiment consisted of five sets of two minimally paired common English words differing with respect to a single feature: goat-coat, grate-grade, spit-spin, bit-pit, and cod-card. The first four pairs acted as foils. Each word was put into one of three carrier sentences so that it would be spoken at a natural tempo. A list in which all sentences appeared ten times, in random order, was prepared. The subject's task was to speak each sentence at a normal tempo. These utterances were recorded.

In a subsequent meeting with each subject, which took place from one hour to two days after the production experiment, a perception test was given. The stimuli for each subject were the 100 sentences he had spoken in the production experiment. Word pairs other than card and cod remained as foils. Each subject was asked to write down the test word in each sentence.

Wide band spectrograms were made of the ten tokens of cod and the ten tokens of card as spoken by each subject. Three successive durational measurements were noted: 1) the voice onset time for [k], 2) the vocalic duration measured from voice onset to the [d] closure, and 3) the closure duration for [d]. For each speaker the VOT and closure duration varied from token to token without a consistent pattern. On the other hand, the time measurements for the vocalic duration formed a rather consistent pattern. Measurements of vocalic duration plus VOT, or closure duration, or both, were less consistent than vocalic duration alone. Vocalic duration averages for the ten speakers for cod ranged from 210 to 320 msec, while averages for card ranged from 240 to 400 msec. The difference in the speaker average ranged from 30 to 40 msec. In all, three subjects made a definite split in their productions, four subjects were moderately consistent, and two were very inconsistent.

In order to pool the data in a way that would exclude, so far as possible, intersubject variation in speaking rate, we represented the vocalic duration of each token in signed units of standard deviation, using the average of each subject's durations for both cod and card as the mean for that subject. Thus, if each subject had produced all his tokens of card with longer durations than any of his tokens of cod, all card tokens would have greater signed values of standard deviation than any cod token.

Figure 1 shows the data pooled in this way. The number of cod productions for a particular range of standard deviation values is plotted as a histogram above the horizontal axis. In the same way, card productions are plotted below the horizontal axis. While there is a substantial overlap, it is clear that the proportion of cod productions decreases, and the proportion of card productions increases, as the standard deviation goes from extreme negative values (corresponding to relatively short durations) at the left, to extreme positive values (corresponding to relatively long durations) at the right. Thus the production data are consistent with the vowel length distinction described by Thomas and by Kenyon: the two words do differ in vocalic duration in production.
JUDGMENTS AND NORMALIZED VOCALIC SEGMENT DURATIONS

JUDGED AS:

[kad] (80)

ka: d] (99)

Figure 2
Perception is a different matter. Individual labeling results break the subjects down into three groups: two speakers with relatively consistent perception; four with inconsistent perception, and three with an overwhelming response bias towards one target or the other.

Figure 1 also shows the pooled labeling data, correct responses being indicated by the darkened portion of each histogram and errors by the white portion. It is obvious that subjects are identifying the intended productions at chance level: they cannot distinguish cod from card.

To determine whether subject's judgments were influenced by vocalic duration, regardless of what they had intended as speakers, we re-plotted the same data according to perceptual judgments. In Figure 2 cod judgments are plotted above the horizontal axis and card judgments below. If duration had influenced these judgments, the proportion of cod responses would have decreased, and the proportion of card judgments would have increased from left to right with increasing values of standard deviation. But no such correlation appears. Not even the positive and negative extremes of standard deviation are consistently labeled. Thus we have evidence that a distinction reliably made in production has no effect upon perception.

A possible explanation for this curious state of affairs is that, since the thirties, when the data were gathered on which Kenyon's and Thomas' descriptions were based, long and short /O/ have begun to merge in this dialect. If such a linguistic change were in progress, we might indeed expect to find that habits of production persisted after a distinction had ceased to have any linguistic significance. This would mean merely that speakers were wasting effort in distinguishing words that had effectively become homophones. Note that the converse possibility—a linguistic distinction maintained in perception but unsupported in production—is unlikely, since it would result in misunderstandings.

The descriptions of Thomas and Kenyon, however, are based on impressionistic data, and we cannot be certain that the perceptual distinction existed even when the dialect was described. If it did not, then we cannot conclude that a change is in progress.

But whether a change is in progress or not, there is another way to interpret this phenomenon. The pronunciations of such words as cod and card may function to mark a dialectal rather than a lexical difference. It would be interesting to determine whether subjects could make a dialect judgment on the basis of these words if, and only if, they knew what lexical items were intended. We intend to pursue this question further.

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