

Imperceptible incomplete neutralization: Production, non-identifiability, and non-discriminability in American English flapping



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Received 1 November 2012; received in revised form 6 September 2014; accepted 9 September 2014

Available online 22 October 2014

Abstract

Flapping in American English has been put forward as a case of incomplete neutralization—in other words, /d/-flaps and /t/-flaps differ at the phonetic level. This paper first presents a production experiment which shows that, in line with previous work, flapping in American English is incompletely neutralizing: vowels before /d/-flaps are slightly longer than those before /t/-flaps—even in nonce words.

Early studies on the perceptibility of this difference, almost exclusively identification tasks, have shown mixed results. However, recent identification experiments (including one reported here) show that listeners are unable to properly categorize /d/- and /t/-flaps. Listeners' poor performance on identification tasks can be due to two factors: either (a) listeners' grammars lacking the relevant phonological categories, or (b) an effect of the type of perception tasks employed. In a 2AFC discrimination task presented here, listeners were unable to distinguish between /d/- and /t/-flaps, suggesting that poor perception performance generalizes to multiple task types.

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Keywords: Incomplete neutralization; Flapping; Phonetics; American English

1. Introduction

In American English flapping, underlying /d/ and /t/ become [ɾ] in certain prosodic configurations (e.g., Kahn, 1980). A number of studies have examined the possibility that flapping is a case of incomplete neutralization—that is, that the underlying voicing status of a flap might be discernible on the surface, most notably by means of the duration of the preceding vowel (see, e.g., Joos, 1942; Fisher and Hirsh, 1976; Port, 1976; Fox and Terbeek, 1977; Zue and Laferriere, 1979; Huff, 1980; Patterson and Connine, 2001:264–267; Herd et al., 2010). The experiments presented in this paper test two main claims: (i) flapping in American English is incompletely neutralizing, and (ii) listeners are unable to label and categorize /d/-flaps and /t/-flaps based on their surface distinction. The production experiment described in section 2 provides additional evidence that speakers of (Mid-Atlantic) American English maintain a trace of the underlying laryngeal contrast in /d/-flaps and /t/-flaps. Further, on the basis of both identification and discrimination tasks (sections 3 and 4), I argue that listeners are unable to perceive the surface distinction between /d/-flaps and /t/-flaps.

Flapping has traditionally been described as a phonological rule which maps intervocalic /t/ and /d/ to [ɾ]; however, the precise mechanism and environment of this mapping varies from one description to the next. Turk (1992) divides these various rule-based accounts into three groups based on the prosodic environment of flapping: (i) flaps are ambisyllabic

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(Kahn, 1980; Gussenhoven, 1986), (ii) flaps are syllable final (Selkirk, 1982; Inouye, 1989), and (iii) flaps are non-foot-initial (Kiparsky, 1979). What these three accounts have in common, though, is that they all assume that (complete) neutralization takes place—an underlying contrast between /t/ and /d/ neutralizes to [ɾ] in the given prosodic environment. Under all such traditional analyses, flaps that result from lenition of /t/ and flaps that result from lenition of /d/ are predicted to be identical. Similarly, these traditional analyses do not predict any effects to surrounding vowel duration.

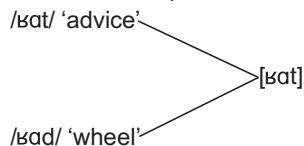
The rest of the paper is organized as follows. The remainder of this section discusses incomplete neutralization both in flapping and more generally. Section 2 describes a production experiment (Experiment 1) comprised of two tasks: a minimal pair reading task and a ‘wug’-type task (Berko, 1958). In section 3, I present an identification task (Experiment 2) using stimuli from the production task. A two-alternative forced-choice (2AFC) discrimination task (Experiment 3) is presented in section 4. The concluding section discusses the theoretical claims which have been made about incomplete neutralization and evaluates them in light of the present experiments.

1.1. Incomplete neutralization

Traditionally, phonologists posited that languages were rife with complete neutralization—when two underlyingly distinct sounds become identical on the surface. However, researchers have suggested for some time that even the “classic” cases of complete neutralization are not quite as they seem.

Take as an example German final devoicing, which has classically been cited as a case of complete neutralization (Bloomfield, 1933/1984:218–219; Trubetzkoy, 1939/1969:235; Jakobson et al., 1952/1975:9; Hyman, 1975:29, 71–72). Early views of this process can be characterized as follows: an underlying voicing contrast is not preserved on the surface, where only voiceless segments are allowed syllable-finally (schematized in (1)).

(1) The traditional picture of German coda devoicing



A number of studies show, however, that the picture is not quite so simple. While the contrast between underlyingly voiced and voiceless segments is reduced (or partly neutralized) when they are ‘devoiced’, a trace of the underlying voicing distinction remains on the surface (Dinnsen and Garcia-Zamor, 1971 (in disyllables only); Taylor, 1975 (for some places of articulation); Mitleb, 1981a,b; Port and O’Dell, 1985; Smith et al., 2009; Kleber et al., 2010; Röttger et al., 2011, 2014). In other words, German /ʁat/ is not identical to /ʁad/—even on the surface.¹ Port and O’Dell (1985), for example, show that the vowel preceding a devoiced segment in German is in fact longer than the vowel preceding an underlyingly voiceless segment by about 15 ms on average.

Phenomena such as this one have been termed *incomplete neutralization* (Port et al., 1981; Fourakis and Iverson, 1984). While two underlyingly distinct segments move toward convergence, some trace of their underlying distinction remains on the surface (schematized in (2b), with the surface trace notated as a superscript feature value). In the German example above, the ‘trace’ of voicing is the vowel duration distinction. In contrast, in *complete* neutralization (2a), two underlyingly distinct segments become phonetically identical—with no trace of the underlying distinction.

- (2) a. Complete neutralization
 /X/ → [Z] / (Context A)
_[αF]
 /Y/ → [Z] / (Context A)
_[βF]
- b. Incomplete neutralization
 /X/ → [Z^(αF)] / (Context A)
_[αF]
 /Y/ → [Z^(βF)] / (Context A)
_[βF]

¹ Fourakis and Iverson’s (1984) study of German final devoicing argues that when a speaker is aware of an experiment’s focus on pronunciation, incomplete neutralization results, but that when this focus is disguised, final devoicing is completely neutralizing. See section 1.2.3 for further discussion of this and related views.

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