Authentic and imitated stop consonant realizations in two Norwegian dialects

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Abstract

This study investigates the ability of speakers to imitate features from another dialect of their native language. Speakers from two different Norwegian dialects spoken in Stavanger and Trondheim produced speech material using their own and each other’s dialect. Acoustic analysis involved the realization of lenited fortis stop consonants compared with lenis stops.

In general, imitations by both groups were not completely successful. While Trondheim speakers showed insufficient reduction of closure voicing in imitated lenis and lenited stops, Stavanger speakers’ imitations of lenis stops fell short of the Trondheim reference value for voicing. Imitations by both speaker groups were characterized by overshoot in the temporal domain in that V/C duration ratios for imitated lenis as well as lenited fortis stops were larger than the reference values.

Introduction

This study is part of a larger project investigating the ability of untrained speakers to imitate features from another dialect in their native language. Two Norwegian dialects spoken in Stavanger and Trondheim were chosen. Among the features that are generally considered as typical for the Stavanger dialect is the production of fortis stops (/p, t, k/) as voiced lenis (/b, d, g/) after a long vowel (Christiansen, 1976). According to impressionistic observations, Norwegian lenis stops are fully voiced intervocically and partially or fully voiced in codas (Kristoffersen, 2000:74). Research questions were:

1) Do speakers from Stavanger always realize /p, t, k/ in intervocalic and final position as [b, d, g]?
2) Are authentic lenited fortis stops in the Stavanger dialect indistinguishable from lenis stops?
3) How successful are Trondheim speakers in imitating Stavanger lenis and lenited fortis stops?
4) How successful are Stavanger speakers in imitating Trondheim lenis stops?

Method

Recordings and subjects

Recordings were made in sound-treated studios at the University of Science and Technology in Trondheim and the University of Stavanger with a sampling rate of 44.1 kHz and 16-bit quantization. In order to collect as authentic as possible dialectal speech material speakers were recruited who had spent most of their lives in their hometown. While in Trondheim 14 speakers (seven females, seven males) aged 19-65 years (median: 25.5 years) were recorded, the group in Stavanger comprised 13 speakers (eight females, five males) aged 20-66 (median: 28.0 years). Six Stavanger speakers had been living for a certain period in Trondheim (on average 2.3 years), but none of the Trondheim speakers had been living in Stavanger.

Recording sessions were organized as follows. Speakers were presented via headphones with a short recording of spontaneous speech from the dialect they had to imitate. Then, they read a total of 60 short sentences using that dialect. The sentences were written in standard Norwegian orthography (so-called Bokmål) and printed on a sheet of paper. Finally, the speakers produced the same sentences but this time using their own dialect. They were instructed to speak as if they were talking to a close acquaintance with the same dialect. It was pointed out that it was allowed to substitute written words or phrases by suited expressions from their own dialect. Indeed, a number of speakers followed this suggestion for some words.

Analysis

The investigation of stop lenition started with an auditory analysis of the speech material produced by the Stavanger subjects speaking their own dialect. The analysis involved all words containing stops that can potentially be lenited, i.e. voiceless stops in intervocalic or postvocalic word-final position. For each speaker and all 60 sentences, cases of lenited stops were collected. The analysis of the material produced by the Trondheim speakers revealed that lenition occurred in the same words apart from one oc-
currence of tomaten (English: the tomato) and one occurrence of salaten (the salad). These two tokens were excluded from further analysis. For each word, occurrences were expressed as a percentage of the total number of possible lenitions. For example, the word møtet (/moːts/; the meeting) was pronounced with a lenited stop 25 times in total by nine Stavanger speakers. Since the sentence material contained this word four times the maximum number of occurrences was 4 x 13 (subjects) = 52. Its relative occurrence was therefore 100 x 25/52 = 48.1 %.

In addition to counting the occurrences of lenition these cases were analyzed acoustically. Measurements were performed using Praat (Boersma and Weenink, 2011) and involved duration of the vowel and closure as well as phonetic voicing during the closure. For each speaker also five words containing a lenis stop were measured for comparison (formoeide [pleased; adj. pl.]; sjokolade [chocolate]; sjokoladen [the chocolate]; hodet [the head] and jaget [chased]). For some speakers fewer than five occurrences were found due to their choice of a dialectal variant, as hāve (/hɔːvə/) instead of hodet (/huːdə/).

Results

Frequency of occurrence

The auditory analysis of the speech material revealed different usage of lenition for speakers from Trondheim vs. Stavanger (cf. Table 1). As can be seen from the table, the latter group lenited canonically fortis stops in 155 out of 351 (44.2 %) cases. More than half of the total number of relevant stop consonants were thus produced in accordance with the standard Norwegian lexical specification. The imitations of the Stavanger dialect by the Trondheim subjects contained even less lenition, only 11.1 %. According to a χ²-test the difference between the two groups was highly significant (χ²(1) = 101, p < 0.001). At the level of individual speakers the analysis showed that all Stavanger subjects had used lenition, be it to strongly different degrees (ranging from 3.7 % to 88.9 %). In contrast, eight out of the 14 Trondheim speakers did not apply lenition at all. For the remaining six subjects (three males, three females) percentages varied between 3.7 % and 48.1 %. Finally, whereas Stavanger males produced lenited stops more often than the females (five males: 53.3 % vs. eight females: 38.4 %; χ²(1) = 7.49, p = 0.006), no gender-specific effect was present in the Trondheim productions (males vs. females: 8.5 % vs. 13.8 %; χ²(1) = 2.68, p = 0.102).

Table 1. Occurrence of lenited stops in percent for 13 speakers from Stavanger and 14 from Trondheim speaking Stavanger dialect. M: males; F: females. Absolute numbers in parentheses.

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<th>Stavanger</th>
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<th>Trondheim</th>
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<tr>
<td></td>
<td>(155/351)</td>
<td></td>
<td>(26/189)</td>
</tr>
<tr>
<td>F</td>
<td>38.4</td>
<td>13.8</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>53.3</td>
<td>8.5</td>
<td></td>
</tr>
<tr>
<td>all</td>
<td>44.2</td>
<td>11.1</td>
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Voicing

We shall start the investigation of stop consonant realization with the amount of phonetic voicing during the closure. Table 2 presents average voicing values for lenited and lenis stops for all Stavanger subjects, six Trondheim speakers who had produced lenited stops and eight non-leniting Trondheim speakers. From the table it can be seen that canonical lenis /b, d, g/ produced by Stavanger speakers contained on average 66 % voicing, while the amount of voicing in lenited /p, t, k/ closures was somewhat smaller (53 %). In contrast, lenis stops produced by both Trondheim subgroups were almost fully voiced (98 % and 99 % for leniting and non-leniting subjects, respectively).

These data suggest that speakers from both towns had to adapt their voicing production in order to obtain appropriate imitations of stop consonants in each other’s dialect. Indeed, our measurements showed that while Stavanger speakers’ imitations of Trondheim lenis stops contained 17 % points more voicing (83 %) than their own dialect’s counterparts, marginally reduced voicing was observed for imitations of Stavanger lenis stops by Trondheim speakers (from 98 % to 92 %). The latter group imitated lenited stops by reducing the amount of their standard lenis stop voicing to 70 % and did thus not really succeed in achieving the reference value of 53 %. To investigate the reliability of these observations an ANOVA with the factors Group (Stavanger; Trondheim), Realization (own dialect; imitation) and Gender was run. The analysis confirmed that stops produced by Stavanger speakers generally contained less voicing than those from Trondheim speakers and at the same time the fact that voicing imitations did not fully attain reference values (effect of Group: F(1, 348) = 16.4, p < 0.001; no interaction with Realization: F < 1). Further, the...
factor realization was highly significant (F(2, 348) = 21.3, p < 0.001), thus supporting the observation of generally changed voicing production in imitations: increased voicing for Stavanger and reduced voicing for Trondheim speakers. Only the latter group’s reduction from 98 % to 92 % for imitated Stavanger lenis stops did not reach significance (t(40.1) = -1.35, p = 0.185). Speaker gender did not have any impact on voicing production (F< 1). Nor were there significant interactions between gender and the other factors.

V/C duration ratio

This section focuses on temporal structure aspects of the selected test words. In Norwegian VC dyads, closure duration will usually be shorter in a lenis than in a fortis stop, and at the same time the duration of the preceding vowel will be longer (van Dommelen & Ringen, 2007). In our analysis, vowel and consonant duration can thus be used as a measure of similarity of lenited and canonically lenis stops. For the sake of clarity, the following description of data for vowel and consonant durations will focus on the most important effects without reporting any statistical results. The subsequent presentation of V/C ratios, however, will include statistical details.

Measurement results for the two types of consonants spoken by the two speaker groups are depicted in Fig. 1. It can be seen that Stavanger speakers’ tokens with lenited and lenis stops had very similar temporal patterns. While vowel durations in both types of words were virtually identical (157 ms), the lenited consonant itself was somewhat longer than its lenis counterpart (71 ms vs. 63 ms). Shorter vowel durations in lenis stop context were produced by both Trondheim subgroups (leniting speakers: 119 ms; non-leniting speakers: 131 ms). Since also stop closures in these tokens were shorter than for Stavanger subjects (leniting speakers: 45 ms; non-leniting speakers: 53 ms), V/C ratios for the three groups were rather similar (see below).

Looking now into imitation behavior, the data revealed that Stavanger speakers did not adapt their vowel durations in mimicking Trondheim lenis VC dyads (own dialect: 157 ms vs. imitation: 155 ms). Thus in this respect their imitations were not successful (cf. the mean value of 125 ms for all 14 Trondheim subjects). Closure durations, however, were modified in the right direction by a shortening from 63 ms (own dialect) to 57 ms (imitation) although this value was still somewhat longer than the mean Trondheim reference of 50 ms. Trondheim speakers mimicking Stavanger dialect used a different strategy. Their vowel durations in imitated lenited and lenis VC dyads were similar to the Stavanger reference (160 ms and 164 ms, respectively, vs. 157 ms). Their imitations thus involved substantially lengthened vowel durations compared to own dialect values. In contrast, their closure durations remained almost unchanged in imitated lenited (46 ms) and lenis (41 ms) compared to their own dialect version of a lenis closure (45 ms).

Now let us use the V/C ratio to summarize the results for temporal word structure. V/C ratios for Stavanger lenited and lenis stops were relatively similar to each other (2.4 and 2.8) and, more so, the latter value to the ratio for the Trondheim lenis (2.7 pooled across all 14 speakers). Although Stavanger speakers thus were not required to modify the temporal organization of their lenis stop to achieve an appropriate imitation, they increased their V/C ratio from 2.8 in their own dialect to 3.3 in imitating Trondheim lenis stops. Even stronger overshoots were observed for the leniting Trondheim subjects mimicking Stavanger lenis (increase from 2.9 to 4.5) and lenited fortis stops (increase from 2.9 to 4.2). To test the significance of these effects an ANOVA with the

Table 2. Amount of closure voicing (in %) in lenited fortis stop and lenis stop consonants for 13 speakers from Stavanger, and 6 leniting and 8 non-leniting speakers from Trondheim. Standard deviation in parenthesis. (O): Own dialect; (T)/(S): Imitated Trondheim/Stavanger dialect.

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<tr>
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<tr>
<td></td>
<td>lenited (O)</td>
<td>lenis (O)</td>
</tr>
<tr>
<td>F</td>
<td>55 (35)</td>
<td>62 (37)</td>
</tr>
<tr>
<td>M</td>
<td>51 (39)</td>
<td>74 (38)</td>
</tr>
<tr>
<td>all</td>
<td>53 (37)</td>
<td>66 (37)</td>
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Figure 1. Vowel (V) and consonant (C) durations (ms) in lenited fortis stop and lenis stop consonants for 13 speakers from Stavanger, and 6 leniting and 8 non-leniting speakers from Trondheim (left vertical axis). (O): Own dialect; (IT)/(IS): Imitated Trondheim/Stavanger dialect. Vertical bars indicate ±1 standard deviation. Right vertical axis: V/C ratio.

Discussion
According to Øvregaard (2008), /p, t, k/ will always be found as voiced /b, d, g/ after long vowels and intervocally in the Stavanger dialect. In the present study, however, speakers of the Stavanger dialect lenited canonically for-tis stops in less than half of the potential cases. In the absence of previous experimental evidence, it remains an open question whether this result is representative or maybe due to the formal recording situation in a studio, inducing people to use more standard pronunciation.

The varying occurrence of lenition in authentic Stavanger renders its use in imitations limited as a criterion of imitation quality. At the same time, however, it could be shown that both voicing and temporal structure details may reveal speakers’ imitation skills. Both groups changed their production behavior, but showed undershoot in the production of voicing and overshoot in the temporal domain.

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References