

THE EFFECT OF AN UNFAMILIAR REGIONAL ACCENT ON SPOKEN WORD COMPREHENSION

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ABSTRACT

This study aimed first to determine whether there is a delay associated with processing words in an unfamiliar regional accent compared to words in a familiar regional accent, and second to establish whether short-term exposure to an unfamiliar accent affects the speed and accuracy of comprehension of words spoken in that accent. Listeners performed an animacy decision task for words spoken in their own and in an unfamiliar accent. Next, they were exposed to approximately 20 minutes of speech in one of these two accents. After exposure, they repeated the animacy decision task. Results showed a considerable delay in word processing for the unfamiliar accent, but no effect of short-term exposure.

Keywords: spoken-word comprehension, regional accents, short-term exposure, perceptual learning.

1. INTRODUCTION

Listeners frequently encounter speakers with a regional accent that they are unfamiliar with. Whenever this occurs, they have to deal with the phonological/phonetic variability in the speaker's accent. Usually, when first confronted with the unfamiliar accent, listeners may have some difficulty understanding the speaker, but they generally find that it becomes easier to understand the speaker after a short while.

The aims of this study were twofold. The first was to determine if word comprehension shows a delay when processing words spoken in an unfamiliar regional accent. It has been shown that listening to speech in a foreign accent delays the processing of spoken sentences [5], and results of other studies indicate that such a delay (albeit smaller) also occurs for regionally accented sentences [3, 7]. But it is unclear how phonetic and phonological variability due to regional accent affects the processing of individual spoken words. Floccia et al. [7] found that lexical decisions to words at the ends of sentences were faster when

the words were spoken in a familiar than in an unfamiliar accent. But this effect was absent when the sentences were very short and when words (excised from longer sentences) were presented in isolation. One aim of the present experiment was thus to establish whether accent effects can arise for words which were spoken in isolation.

The second aim was to establish whether short-term exposure to an unfamiliar regional accent affects any initial delay associated with processing that accent. Recent studies demonstrated that listeners adapt to a foreign accent after short-term exposure to that accent [4, 5, 7]. Clarke & Garrett [5], for instance, presented listeners with sentences spoken in their native accent (General American English) and a foreign accent (Spanish or Mandarin English). They found that listeners' initial processing delay for the foreign-accented speech became smaller after exposure to two to four sentences spoken in the accent, but they did not test comprehension of individual words.

Other studies showed that long-term exposure to a regional accent (e.g., through the media) affects processing of accented speech [3, 6]. Adank et al. [3] presented listeners from Glasgow (Scotland) with two regional accents: Glaswegian English (their own accent) and Southern English, which functions as the socio-economically dominant variety of English across the UK and is available to Glaswegian listeners through UK national broadcasting media. Listeners performed a sentence verification task and results showed that they were equally fast for both accents. As these listeners were not explicitly trained on Southern English, and none had ever lived in Southern England, it appears that long-term exposure affects processing speed. In contrast, when listeners from Southern England performed the same task in another experiment, delays of more than 100 ms were found for the Glaswegian English sentences. Once again, comprehension of individual words was not tested.

It is unclear, therefore, whether only short-term

exposure to a regional accent can affect the speed or accuracy of processing of words spoken in that accent. Exposure to specific speaker-related phonetic variation concerning a given phoneme affects the category boundary of that phoneme after short-term exposure to that speaker [9]. Furthermore, Evans & Iverson [6] showed that listeners shift their best exemplar locations for specific vowels after brief exposure to an unfamiliar regional accent. Only one study has so far addressed the effect of limited exposure on the speed of word processing. Maye et al. [8] found an effect of 20-minute exposure to a novel accent on whether stimuli were judged to be words or nonwords, but not on the speed of those decisions.

We therefore investigated whether short-term exposure to an unfamiliar accent affects speed of comprehension of words spoken in that accent. Listeners' initial processing ability was determined using an animacy decision task (their task was to decide if words referred to living or non-living entities). They were presented with words in a familiar accent (the accent spoken in the region they live in) and an unfamiliar accent. One group of listeners was then exposed to a series of sentences spoken in the familiar accent, and a second group was exposed to sentences in the unfamiliar accent. After this exposure phase, both listener groups were tested again on the animacy decision task to establish if exposure affected the speed or accuracy of word processing.

2. METHOD

2.1. Participants

Thirty participants (ten male) were paid or received course credit. Fifteen were randomly assigned to each exposure group. The age range for the group with familiar accent exposure was 18-26 years (mean 22 years); for the other group it was 18-49 years (mean 27 years). All participants came from the middle of the Netherlands, and were screened for their familiarity with Flemish. They were all native speakers of Dutch who had lived in the Netherlands all their lives, and who claimed to be unfamiliar with the East Flemish accent.

2.2. Design

Two accents of Standard Dutch were selected to serve as familiar and unfamiliar regional accents. As the study was conducted in Nijmegen, the Netherlands, materials spoken by speakers from

the area around Nijmegen were used for the familiar accent. A recent study [1, 2] on the vowel systems of eight regional varieties of Dutch showed that the Dutch spoken in the Belgian province of East Flanders deviates most from the Dutch spoken in the region around Nijmegen (referred to as Local Dutch). Recordings from speakers from East Flanders were thus used for the unfamiliar accent.

Materials were available from a previously recorded database which consisted of recordings of 160 speakers of Dutch, selected from eight regions in the Netherlands and Flanders. For details about this database, including information on recording procedure and speakers, see [1] and [2].

2.3. Stimulus material

The stimulus material for the two animacy decision tests (test 1 and test 2) consisted of 120 Dutch nouns, such as *hoen* ("hen") and *stoel* ("chair"). These words were spoken by two female speakers of the Local Dutch accent and by two female speakers from East Flanders. The stimulus material for the exposure phase consisted of recordings of 50 declarative sentences from a further twelve female speakers (six from each accent area). The exposure material thus consisted of 300 sentences in total for each accent.

2.4. Experimental procedure

Participants were tested individually in a sound-treated booth. They received written instructions. Responses were made using a button box; "living" responses were made with the left index finger, and "non-living" with the right index finger (counterbalanced across participants). All stimuli were presented over headphones at a sound level that was kept constant for all participants.

Each test trial proceeded as follows. First, the stimulus word was presented. Second, the program waited for 3.5 seconds before playing the next stimulus. Participants were asked to respond as quickly and as accurately as they could and to always make a response. Stimulus presentation was randomized across accent and speaker. Each test consisted of 30 words from both speakers, counterbalanced across participants. Words were presented only once during the course of the entire experiment, and were presented equally often in both accents across all participants. Twenty trials were presented before test 1 to familiarize participants with the task. The familiarization

words had been produced by a female speaker of Standard Dutch who was not included in the actual experiment. Each test phase lasted 5 minutes.

In the exposure phase, listeners performed a distracter task. For each of the 300 sentences, listeners had to decide whether the subject of the sentence was singular or plural. Listeners were told that they did not have to wait until the sentence had finished playing. Responses were made using a button box, with the left button for singular and the right for plural. Sentences were blocked by speaker (50 sentences per block). There were short pauses of 13 seconds between blocks. One half of the participants listened to the familiar accent, and the other half listened to the unfamiliar accent. The exposure phase lasted approximately 23 minutes.

To ensure that adaptation occurred speaker-independently, none of the test speakers were included in the exposure phase, and test speakers were different across the two test phases (i.e., speakers in the two tests were counterbalanced across participants).

3. RESULTS

3.1. Errors

Error scores were based on the percentage of incorrect responses per participant per test and per accent (see Table I). These percentages were converted to rationalized arcsine units [10]. A repeated measures ANOVA was run with the transformed error rates as the dependent variable and with accent and test as within-subject factors and with exposure as a between-subject factor. There was a main effect of test ($F[1,28]=5.7$, $p<0.05$, $\eta=0.17$, $\varepsilon=1$), but no other effects. These results indicate that listeners made fewer errors in test 2 than in test 1, but that the type of accent in both exposure and test did not affect the errors.

Table 1: Percent errors by exposure and test accent.

% Error	Test Accent	Exposure Accent	
		Familiar	Unfamiliar
Test 1	Familiar	9	12
	Unfamiliar	12	11
Test 2	Familiar	7	9
	Unfamiliar	10	8

3.2. Response times

Response times were measured from word offset. The latency analysis included only correct responses. Figure 1 shows the average Reaction Times (RTs) for the group exposed to the familiar

accent, and Figure 2 shows the results for the group exposed to the unfamiliar accent.

A repeated measures ANOVA was carried out on the RTs, with accent and test as within-subject factors, and with exposure as a between-subject factor. All values larger than the grand mean plus 3 standard deviations were excluded. There was a main effect of accent ($F[1,28]=143.2$, $p<0.05$, $\eta=0.84$, $\varepsilon=1$). No further effects were found.

Figure 1: Mean animacy decision RTs for words in familiar and unfamiliar accents before (test 1) and after (test 2) exposure to familiar-accent sentences. Bars represent one standard error.

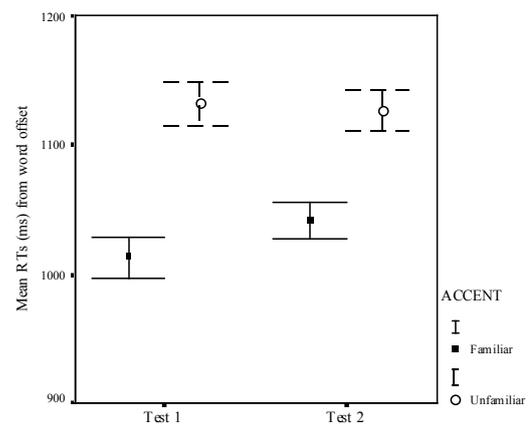
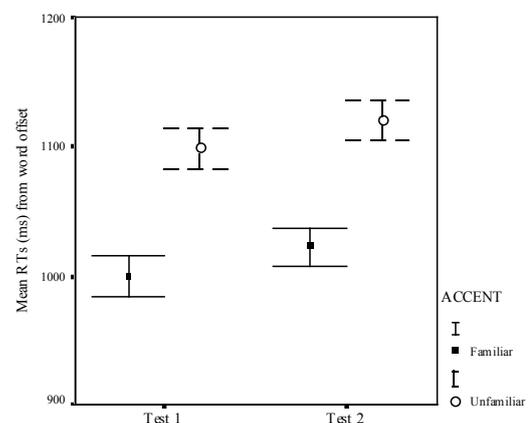


Figure 2: Mean animacy decision RTs for words in familiar and unfamiliar accents before (test 1) and after (test 2) exposure to unfamiliar-accent sentences. Bars represent one standard error.



These findings indicate first that performance across both groups was similar, second that performance across tests (pre- and post-exposure) was equal for both groups, and third that short-term exposure to the unfamiliar accent did not affect the speed of word comprehension for words spoken in either accent. All listeners, however,

were considerably slower (104 ms, on average) on the words spoken in the unfamiliar accent.

4. DISCUSSION

This experiment sought to determine whether there is a delay associated with processing words in an unfamiliar regional accent compared to a familiar regional accent. The results showed a considerable delay for words spoken in the unfamiliar accent. This effect replicates effects of an unfamiliar regional accent on sentence processing [3], and shows that accent effects on speed of word comprehension previously found only for responses to words in sentences [7] can also be found for words spoken in isolation. This suggests that the influence of accent on perception is not limited to processes which are responsible for continuous speech comprehension (e.g., segmentation processes or parsing processes based on sentence intonation), but must also at least in part apply to processes which are involved in the recognition of words themselves (e.g., extraction of segmental information from the speech signal).

An explanation for the difference between the effect for words found here and the lack of an effect for isolated words in [7] may simply be that the accents we used differed more than those in [7]. Alternatively, it could be that no effect was found in [7] because of a difference between tasks. Effects of accent familiarity may be stronger in animacy decision than in lexical decision.

We also sought to establish whether short-term exposure to an unfamiliar accent affects the speed of comprehension of words spoken in that accent. There was no effect of short-term exposure. It is unclear why not, as other studies have found such effects [4, 5, 8]. [5] used a between-subjects design, and presented each group with speech of one speaker only, either with a foreign accent, or with their own accent. [8] used only one synthetic voice, with standard settings in one experimental condition and with altered vowels in another condition. For both of these studies it is not clear whether learning was speaker- or accent-specific as they both used one speaker (or voice). Effects of short-term exposure across speakers have been observed, however, for foreign accents [4].

Another explanation for the absence of an exposure effect could be that the accents of the Flemish test speakers differed from the Flemish exposure speakers. This seems implausible, as the speakers were carefully selected for socio-

economic status and regional background. It could however be the case that an effect of exposure would have been found if the test speakers had been included in the exposure set. We decided against this, as one of our aims was to test whether accent adaptation can occur speaker independently.

But does the fact that no exposure effect was found mean that speaker-independent adaptation to a regional accent is impossible? This seems unlikely, given speaker-independent adaptation to a foreign accent [4]. Instead, listeners may have adapted to the accent, but may have been unable to apply what they had learned. Since words were presented randomized for accent, listeners did not know what accent to expect from trial to trial. This uncertainty may have prevented them from using what they had learned during the exposure phase. We are therefore currently running a version of the experiment with test items blocked by accent. This may allow listeners to apply at test what they have learned about the accent during exposure.

It therefore remains to be determined whether short-term exposure to a regional accent can reduce or even eliminate the delay that we found when listeners were initially tested. What is clear, however, is that an initial delay exists: Comprehension of spoken words is strikingly impaired when listeners hear those words in an unfamiliar regional accent.

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