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BRIEF REPORT

Tolerance for inconsistency in foreign-accented speech

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Abstract Are listeners able to adapt to a foreign-accented speaker who has, as is often the case, an inconsistent accent? Two groups of native Dutch listeners participated in a cross-modal priming experiment, either in a consistent-accent condition (German-accented items only) or in an inconsistent-accent condition (German-accented and nativelike pronunciations intermixed). The experimental words were identical for both groups (words with vowel substitutions characteristic of German-accented speech); additional contextual words differed in accentedness (German-accented or nativelike words). All items were spoken by the same speaker: a German native who could produce the accented forms but could also pass for a Dutch native speaker. Listeners in the consistent-accent group were able to adapt quickly to the speaker (i.e., showed facilitatory priming for words with vocalic substitutions). Listeners in the inconsistent-accent condition showed adaptation to words with vocalic substitutions only in the second half of the experiment. These results indicate that adaptation to foreign-accented speech is rapid. Accent inconsistency slows listeners down initially, but a short period of additional exposure is enough for them to adapt to the speaker. Listeners can therefore tolerate inconsistency in foreign-accented speech.

Keywords Foreign-accented speech · German-accented Dutch · Cross-modal priming · Accent consistency · Perceptual learning

Foreign-accented speech deviates noticeably from native speech. Nevertheless, listeners can handle this variation remarkably well. Just a few minutes of exposure, or a couple of sentences, can be enough to "tune in" to a foreign-accented speaker (e.g., Bradlow & Bent, 2008; Clarke & Garrett, 2004; Witteman, Weber, & McQueen, 2013). Here, we investigate the boundaries of this kind of perceptual learning. Specifically, we ask whether listeners are able to adapt to mispronounced words of a speaker who has an inconsistent accent.

Listeners can adapt quickly to different kinds of variation in native speech: for example, when sounds are replaced by an ambiguous sound (e.g., McQueen, Norris, & Cutler, 2006; Norris, McQueen, & Cutler, 2003), by another native sound (e.g., Maye, Aslin, & Tanenhaus, 2008), or even by a nonnative sound (Sjerps & McQueen, 2010). The perceptual system is thus highly flexible, but this flexibility must also be limited. While adapting to a speaker's lisp is useful for future encounters with that speaker, adapting to their drunken speech is not (Kraljic, Samuel, & Brennan, 2008). The perceptual system must find a balance between flexibility and stability. The question, then, is whether the system is flexible enough to cope with inconsistency in foreign-accented speech.

Very few late second-language (L2) learners achieve nativelike pronunciation (Flege, Munro, & MacKay, 1995). A foreign accent is driven by the speaker's native language. Segmental variation can arise when a target phoneme either does not exist in the speaker's native language or is very

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similar to a native phoneme. In such cases, foreign-accented speakers frequently substitute the L2 sound with a native sound, as when Dutch learners of English say *penda* for *panda* (Weber & Cutler, 2004). But nonnative speakers also tend to be more variable in their pronunciation than native speakers (Wade, Jongman, & Sereno, 2007), such that their realizations of particular segments often vary from moment to moment. This means that sometimes they succeed in producing canonical sounds and sometimes they do not (Hanulíková & Weber, 2012).

It is possible that when listeners identify a speaker as being nonnative, they more readily adapt than they would to a native speaker, simply because they can anticipate frequent mispronunciations. Listeners can take their knowledge of a speaker's idiosyncrasies into account: They are more forgiving in accepting grammatical errors made by L2 than by first-language (L1) speakers (Hanulíková, van Alphen, van Goch, & Weber, 2012), and they relax their vowel categories more readily for L2 than for L1 speakers (Hay, Nolan, & Drager, 2006). But listeners also put boundaries on their adaptation: They generalize what they have learned about certain deviations if they are spoken by foreign-accented speakers but not by native speakers (Eisner, Melinger, & Weber, 2013). Moreover, when listeners learn that an L1 speaker's mispronunciations are incidental (i.e., not characteristic of the speaker), they do not show perceptual learning effects (Kraljic & Samuel, 2011; Kraljic et al., 2008). But no prior study has systematically asked whether adaptation to foreign-accented speech depends on consistency. Are listeners more or less inclined to adapt to a specific pronunciation variant depending on whether the speaker's accent is consistent or not?

In this cross-modal priming experiment, Dutch listeners were exposed to a set of Dutch words spoken with a typical German-accented vowel substitution. These words were randomly mixed with a large, additional set of words, spoken either in the same accent (presented to one group of listeners) or in a nativelike accent (presented to another group). All materials were spoken by a native German who was highly fluent in Dutch and could speak Dutch either with a German accent or like a Dutch native. This speaker thus appeared to one group to have a consistent German accent or, to the other group, to have an inconsistent accent.

The participants listened to these prime words and, after each, made lexical decisions to visually presented target words. Reaction times (RTs) are shorter when primes and targets are identical, as compared with unrelated pairs (Marslen-Wilson, Nix, & Gaskell, 1995). Even small prime–target differences will prevent priming (Van Alphen & McQueen, 2006). Priming will therefore be taken as a measure of successful online word recognition (Marslen-Wilson, Moss, & van Halen, 1996) and, hence, of accent adaptation.

On the basis of the cross-modal priming findings of Witteman et al. (2013), we expected that listeners in the consistent-accent condition would learn to adapt quickly to the speaker's accent. It was less clear, however, whether the listeners in the inconsistent-accent condition would adapt. While listeners are quick to adapt to foreign-accented speech in general (e.g., Bradlow & Bent, 2008; Clarke & Garrett, 2004; Floccia, Butler, Goslin, & Ellis, 2009; Witteman et al., 2013), they are not known to do so in native speech when confronted with incidental mispronunciations (e.g., Kraljic & Samuel, 2011; Kraljic et al., 2008). Listeners might be less inclined to adapt to a speaker who demonstrates the ability to sometimes pronounce words correctly and, hence, for whom the mispronunciations may be incidental than to someone who appears to mispronounce words consistently. If listeners in the inconsistent-accent group are not affected by within-speaker variability, there should be no differences in priming between groups. If, however, the conflicting information does interfere with adaptation, listeners in the inconsistent-accent group should show slower adaptation than the consistent-accent group (e.g., priming only in the second half of the experiment), or maybe no adaptation at all.

Method

Design

There was a between-subjects design, with consistent- and inconsistent-accent participant groups and three trial types (see Table 1). Experimental trials involved prime words with a typical German-accented vowel substitution (these words also appeared in canonical form as the visual targets) and primes without categorical vowel substitutions (unrelated to the targets). Control trials involved primes without categorical vowel substitutions paired with identical or unrelated targets. Experimental and control trials were identical across groups. Contextual trials involved the same prime–target pairs for both groups, but the primes were spoken differently: German-accented for the consistent-accent group and nativelike for the inconsistent-accent group. The main question was whether this difference in contextual prime pronunciation would influence learning about the foreign accent, as measured in the experimental trials. Trials were equally divided across two experiment halves to allow examination of changes in performance over time.

Participants

We tested 48 native Dutch speakers, half in the consistent-accent condition (22 females, *M* age 21.2), half in the inconsistent-accent condition (21 females, *M* age 22.3). They were recruited through the participant database of Utrecht University and paid a small fee. They reported normal hearing, normal or corrected-to-normal vision, and no language

Table 1 Design and number of trials per type, per participant group

Trial type	Stimuli	Participant group	
		Consistent accent	Inconsistent accent
Experimental	Identical primes	12 words with German vowel substitution	Same as other group
	Unrelated primes	12 words without German vowel substitution	Same as other group
	Targets	24 words (12 identical to primes, 12 unrelated)	Same as other group
Control	Primes	24 words without German vowel substitution	Same as other group
	Targets	24 words (12 identical to primes, 12 unrelated)	Same as other group
Contextual	Primes	54 German-accented words	54 nativelike words
		42 German-accented nonwords	42 nativelike nonwords
	Targets	12 words and 84 nonwords (48 identical to primes, 48 unrelated)	Same as other group

problems. None were fluent in German, and all said English was their most fluent nonnative language. On the basis of a language-history questionnaire, we selected listeners with only limited experience with German-accented Dutch (i.e., they heard this form of Dutch less than once a week; for a similar procedure, see Witteman et al., 2013). Sixteen additional participants were tested but then excluded. All listeners in the final set thus had some prior experience with German-accented Dutch, but to a limited degree, so they could still show accent adaptation (Witteman et al., 2013).

Materials

There were 144 trials (24 experimental, 24 control, and 96 contextual; see Table 1). A trial consisted of an auditory prime (a Dutch word or nonword) followed by a visual target (a Dutch word or nonword). Experimental and control targets were paired with identical and unrelated primes (see Supplementary Materials). Experimental targets (and their identical primes) contained the Dutch vowel /œy/ (e.g., /dœym/, thumb) which is commonly mispronounced as [ɔɪ] by German speakers and serves as a strong marker of a German accent in Dutch (see Witteman et al., 2013). The control targets (and their identical primes) and the unrelated primes for the experimental targets contained a range of vowels and consonants shared between German and Dutch (e.g., /dɛkɪŋ/, cover) and, therefore, did not contain substitutions characteristic of German-accented Dutch.

The contextual primes contained a variety of segments that are noticeably accented when produced by German speakers. Twenty-five percent (12 words, 12 nonwords) contained /œy/ (the vowel in the experimental trials). These contextual primes were all paired with unrelated nonword targets, so that not every prime containing /œy/ would require a subsequent *yes* response. The other contextual primes (42 words, 30 nonwords) had different accent markers: For example, in German-accented Dutch, word-initial /p, k, t/ are strongly aspirated, word-final schwas are substituted by syllabic nasals (e.g., “lopen” pronounced as /lopn/, not as /lopə/), and /ɛɪ/ is replaced with /aɪ/ (Doeleman, 1998). Most contextual targets were nonwords, such that, over the entire experiment, 41.67 % of trials had word targets. For all three trial types, prime–target pairs were 50 % identical and 50 % unrelated. Some contextual primes were nonwords, so that when primes and targets were identical, this did not always predict a *yes* response.

Two versions of the experiment were identical, except that the contextual primes were spoken either with a German accent (for the consistent-accent group) or in a nativelike manner (for the inconsistent-accent group). For both versions, we created two counterbalanced lists, so that every experimental and control target appeared once in a given list, with either an identical or an unrelated prime. List orders were pseudorandomized: Experimental and control trials were always preceded and followed by at least one contextual trial.

Recording

The speaker was a male native German who was fluent in Dutch. He was judged by Dutch natives to sound native. He grew up in Nordrhein-Westfalen and started learning Dutch at the age of 20 years, when he moved to The Netherlands. At the time of recording, he had lived in The Netherlands for 6 years and spoke Dutch and German every day.

Multiple tokens of the primes were recorded one by one, in clear citation style. First, all unrelated experimental, control, and contextual primes were recorded in the speaker’s natural (nativelike) accent. Next, the experimental primes with /œy/ were recorded with the German-accented vowel substitution [ɔɪ] (e.g., /dœym/ as [dɔɪm]), along with the German-accented contextual primes. For these items, the speaker modeled his productions on those of a strongly accented female German speaker. The nativelike recordings were checked by two native Dutch speakers, who corrected the speaker only when a German accent could be heard, which occurred very rarely. The female German speaker confirmed that all German-accented items were pronounced as intended.

Recordings were made in a sound-attenuated booth using a Sennheiser microphone and were stored digitally (44-kHz sample rate). The best tokens were selected by the first author (a Dutch native speaker) using Praat (Boersma & Weenink, 2009).

Rating experiment

To make sure that the contextual primes differed in accentedness, we asked an additional ten native Dutch speakers to rate them. They heard 54 German-accented and 54 nativelike contextual primes, plus 72 other Dutch words (half produced by an American and half by an Italian). Listeners heard one word at a time, over closed headphones, immediately followed by a visual rating scale on which they indicated how accented the word was on a scale of 1 (*no accent at all*) to 9 (*very strongly accented*). Paired-sample *t*-tests indicated that the German-accented primes (M = 6.46, SD = 1.01) were rated as more accented than the nativelike primes (M = 1.79, SD = 0.68), $t(9) = 13.83$, $p < .001$. This was true for the stimuli with /œy/ (M = 7.35 vs. 1.71), $t(9) = 15.28$, $p < .001$, and for those without /œy/ (M = 6.20 vs. 1.82), $t(9) = 12.85$, $p < .001$.

Acoustic measurements

We analyzed the speaker's /œy/ vowels by measuring 12 nativelike contextual primes, 12 German-accented contextual primes, and 24 German-accented related experimental primes. We measured the first two formants 25 % and 75 % through each diphthong. The resulting trajectories are compared in Fig. 1 with average values of Dutch [œy] taken from Adank, Van Hout, and Smits (2004). Although our speaker's $F1$ and $F2$ are lower overall than those of the average Dutch male, the trajectory of his nativelike vowel is very similar to average Dutch trajectories and differs substantially from his pronunciation of German [ɔɪ]. The speaker's German-accented vowels in the experimental and contextual primes are almost identical.

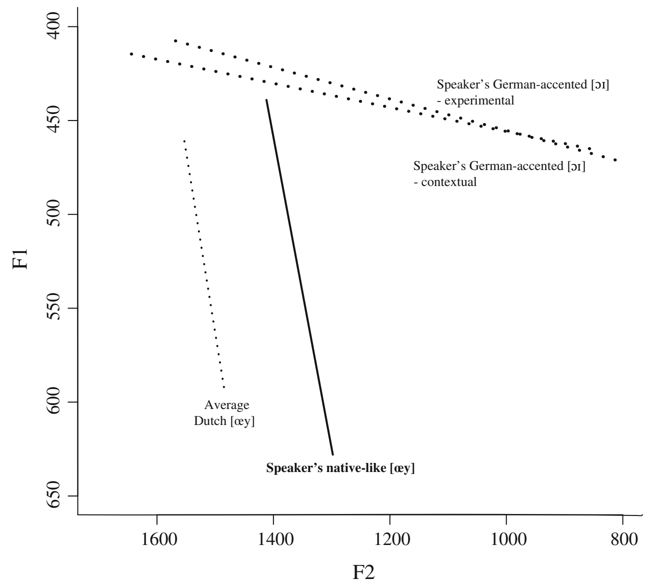

Fig. 1 Average $F1$ and $F2$ formant trajectories for the critical vowel from 25 % into the vowel (higher $F1$, lower $F2$) to 75 % into the vowel (lower $F1$, higher $F2$). The present speaker's nativelike [œy] (*solid line*) and German-accented [ɔɪ] in each type of item (*bold dotted lines*) are compared with average Dutch male [œy] pronunciations (*thin dotted line*; data from Adank, Van Hout, & Smits, 2004)

Procedure

The experiment was administered in a sound-attenuated booth. Participants were informed that they would hear words and nonwords and then see words and nonwords on a computer screen. They made lexical decisions to the visually presented words as quickly and accurately as possible by pressing one of two response buttons. They always made *yes* responses with their dominant hand. RTs were measured from target onset. Participants received no information about the speaker's native language.

Primes were presented binaurally over closed headphones at a comfortable listening level. Targets were presented in white lowercase 24-point Tahoma letters on a black background, 500 ms after the acoustic offset of the primes. The maximum RT for each target was 2,000 ms. The experiment was created in Presentation (version 13, Neurobehavioural Systems Inc.) and controlled with NESU hardware (Nijmegen Experiment Set-Up). After the experiment, participants filled out the language-history questionnaire.

Results

Mean RTs and error rates for both groups, by trial type (experimental, control) and halves of the experiment, are displayed in Table 2. RT priming effects are shown in Fig. 2. Our primary question was whether the performance of the two groups differed on the experimental trials and whether that changed over the experiment. Repeated measures analyses of variance (ANOVAs) were carried out on the experimental RT data by participant (F_1) and item (F_2), with *group* (consistent accent, inconsistent accent), *priming* (identical, unrelated) and experiment *half* (first, second) as factors. The results are summarized in the upper part of Table 3. Lexical decisions were faster on identical than on unrelated trials, on trials in the second half, and for participants who heard the consistent accent (the main effects of priming, half, and group, respectively). The difference between groups was stronger in the first half (the interaction of group and half), and priming was stronger later (the interaction of priming and half). The three-way interaction shows that the priming effects for the two groups differed over the course of the experiment.

The control trial data were not included in the above analyses because we had predicted that both groups would show

Table 2 Overview of mean reaction times (RTs) and mean error rates (in percentages) for participants in the consistent- and inconsistent-accent groups for each trial type and in each half of the experiment (*SD*s in brackets)

Participant group	Trial type	Half	RTs		Errors	
			Identical	Unrelated	Identical	Unrelated
Consistent accent	Experimental	First	612 (77)	661 (76)	0.7	0.7
		Second	606 (89)	654 (83)	0.0	2.1
		Overall	608 (168)	656 (122)	0.3	1.4
	Control	First	576 (78)	674 (68)	2.8	0.7
		Second	570 (83)	642 (73)	3.5	4.9
		Overall	572 (133)	655 (117)	3.1	2.8
Inconsistent accent	Experimental	First	725 (139)	728 (108)	0.7	1.4
		Second	609 (108)	686 (111)	0.7	0.7
		Overall	661 (194)	704 (154)	0.7	1.0
	Control	First	648 (112)	727 (116)	2.8	2.8
		Second	637 (113)	701 (102)	4.9	6.9
		Overall	641 (168)	714 (164)	3.8	4.9

priming on these trials (the control primes were not heavily accented and thus did not need to be adapted to). ANOVAs on the control data confirmed that there was indeed robust facilitation (the main effect of priming; see the lower part of Table 3). The only other effect was that, as in the experimental trials, the responses of the participants who heard the consistent accent were faster (the main effect of group).

Further ANOVAs examined performance in each half separately, with the factors *group* (consistent accent, inconsistent accent), *priming* (identical, unrelated), and *trial type* (experimental, control). These analyses (see Table 4) tested the prediction, derived from the initial analysis, that there would be differences in the priming effects between groups in the first but not the second half. The control data were included to test the additional prediction that there would be differences in the priming effects between trial types in the first but not the second half.

In the first half, lexical decisions were faster on identical than on unrelated trials, on control than on experimental trials, and for participants who heard the inconsistent accent (the

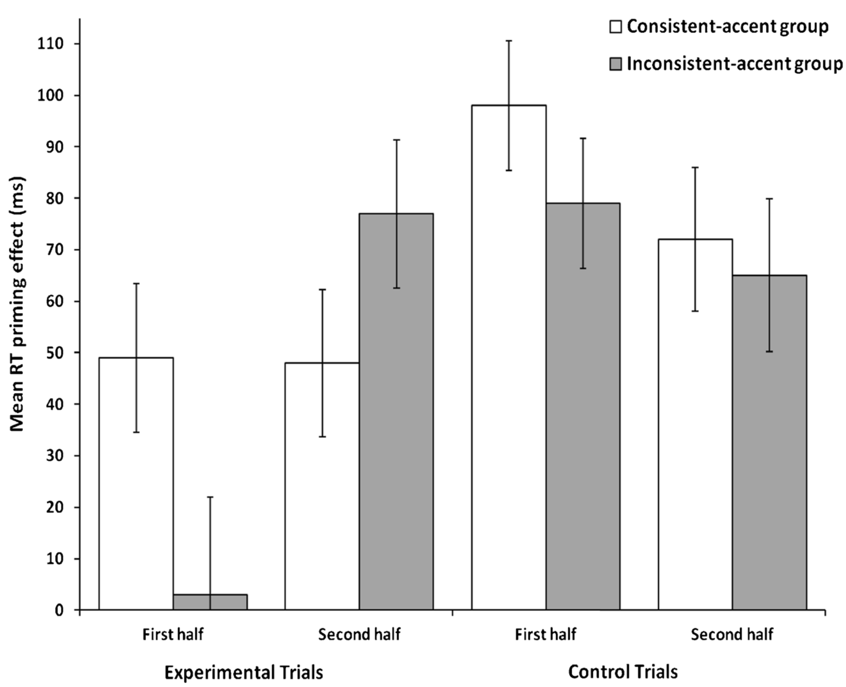

Fig. 2 Reaction time (RT) priming effects (in milliseconds) for the consistent- and inconsistent-accent groups in each half of the experiment on the experimental and control trials. Error bars are ±1 standard error of the mean

Table 3 Analyses of variance of reaction time data, by participant (F_1) and item (F_2), for each trial type

Trial type	Effect	Participant analysis			Item analysis		
		*df*s	F_1	*p*≤	*df*s	F_2	*p*≤
Experimental	Group	1,46	4.02	.051	1,96	20.55	.001
	Priming	1,46	26.15	.001	1,96	15.39	.001
	Half	1,46	28.15	.001	1,96	13.31	.001
	Group × priming	1,46	0.23	.631	1,96	0.09	.765
	Group × half	1,46	19.88	.001	1,96	7.89	.006
	Priming × half	1,46	6.78	.012	1,96	2.48	.119
	Group × priming × half	1,46	7.44	.009	1,96	2.43	.123
Control	Group	1,46	6.68	.013	1,96	23.14	.001
	Priming	1,46	138.37	.001	1,96	38.38	.001
	Half	1,46	3.48	.069	1,96	1.06	.305
	Group × priming	1,46	1.70	.198	1,96	0.14	.712
	Group × half	1,46	0.00	.990	1,96	0.04	.840
	Priming × half	1,46	0.93	.198	1,96	0.10	.751
	Group × priming × half	1,46	0.12	.732	1,96	0.07	.790

main effects of priming, trial type, and group, respectively). The priming effect was stronger for consistent-accent than for inconsistent-accent participants (the interaction of priming and group) and for control than for experimental trials (the interaction of priming and trial type). These two effects reflect the pattern shown in Fig. 2—namely, that in the first half of the experiment, the participants in the consistent-accent group showed priming in both types of trials, while those in the inconsistent-accent group showed priming only on control trials. Planned pairwise comparisons of the priming effects (see Table 5) indicated that there was indeed priming in all first-half cells, except for the inconsistent-accent group on experimental trials.

In the second half, lexical decisions were once again faster on identical than on unrelated trials (the main effect of priming). Although there were no overall differences between either the two groups or the two trial types, consistent-accent participants were faster on control than on experimental trials, while the reverse was true for inconsistent-accent participants (the interaction of group and trial type). Unlike in the first half, priming effects did not vary reliably across groups or trials (no interactions of priming and group or of priming and trial type).

Table 4 Analyses of variance of reaction time data, by participant (F_1) and item (F_2), in each half

Half	Effect	Participant analysis			Item analysis		
		*df*s	F_1	*p*≤	*df*s	F_2	*p*≤
First	Group	1,46	8.47	.006	1,96	35.01	.001
	Priming	1,46	72.34	.001	1,96	19.85	.001
	Trial type	1,46	9.63	.003	1,96	3.29	.073
	Group × priming	1,46	5.67	.021	1,96	1.36	.246
	Group × trial type	1,46	2.72	.106	1,96	0.47	.496
	Priming × trial type	1,46	12.46	.001	1,96	5.50	.021
	Group × priming × trial type	1,46	0.63	.432	1,96	0.25	.617
Second	Group	1,46	2.44	.125	1,96	11.27	.001
	Priming	1,46	77.49	.001	1,96	34.16	.001
	Trial type	1,46	0.02	.889	1,96	0.17	.682
	Group × priming	1,46	0.54	.468	1,96	0.29	.591
	Group × trial type	1,46	8.92	.005	1,96	2.96	.089
	Priming × trial type	1,46	0.19	.665	1,96	0.40	.531
	Group × priming × trial type	1,46	1.75	.192	1,96	0.43	.516

Table 5 Planned pairwise comparisons of priming effects across participants and items for participants in the consistent- and inconsistent-accent groups for each trial type and in each half of the experiment

Half	Participant group	Trial type	Participant analysis			Item analysis		
			df	t_1	*p*≤	*df*	t_2	*p*≤
First	Consistent accent	Experimental	23	3.40	.002	22	2.34	.029
		Control	23	7.75	.001	22	4.30	.001
	Inconsistent accent	Experimental	23	0.17	.865	22	0.22	.825
		Control	23	4.96	.001	22	2.40	.025
Second	Consistent accent	Experimental	23	3.32	.003	22	2.22	.037
		Control	23	5.16	.001	22	2.89	.009
	Inconsistent accent	Experimental	23	5.35	.001	22	3.24	.004
		Control	23	4.35	.001	22	3.35	.003

As is shown in Fig. 2 and as is confirmed by the planned pairwise comparisons (see Table 5), there was priming in all second-half cells.

Discussion

The present study explored the boundaries of adaptation to foreign-accented speech by investigating whether listeners can adapt to a speaker with an inconsistent accent. One group of Dutch listeners heard someone speak Dutch with a consistent German accent. A second group heard the same speaker producing a specific vowel, a marker of a German accent, inconsistently. Both groups recognized the accented words, but over a different time-course.

Listeners in the consistent-accent group were able to recognize words with German-accented vocalic mismatches right away. This suggests extremely rapid adaptation. Note that reliable adaptation to the same vocalic mispronunciation from a different speaker in Witteman et al. (2013) was not immediate (i.e., priming was found only in the second half of that experiment), but this could be due to the present speaker's mispronunciations being rated as less strongly accented. Nonetheless, this quick adaptation is good news for L2 speakers and listeners, since the listeners in the consistent-accent condition did not show any interpretation difficulties, even when words contained noticeable mispronunciations.

The different priming effects across experiment halves in the inconsistent-accent group suggest that these listeners did not fully recognize the words with vocalic mismatches initially (at least not robustly or quickly enough to generate priming) but could by the second half. Listeners in the inconsistent-accent group thus took longer to adapt than those in the consistent-accent group. Further research will be required to establish the source of this difference. It could be driven by inconsistency per se and/or by frequency differences (consistent speakers will normally provide listeners with more examples of a given accent characteristic than will inconsistent speakers).

The most important finding is that, although they took longer to do so, the listeners in the inconsistent-accent group were able to adapt. These listeners heard the speaker pronounce the critical vowel correctly (in 24 primes on contextual trials), and they heard nativelike versions of 108 other primes (i.e., almost all other primes). These listeners had very little indication that the speaker had a strong foreign accent: only 12 words with the characteristic German mispronounced vowel (relative to 108 strongly accented stimuli in the consistent-accent group). But still the inconsistent-accent group adapted. In contrast, listeners will not adapt to a native speaker if they first hear that speaker pronounce items correctly (Kraljic & Samuel, 2011; Kraljic et al., 2008). One difference between these studies is that here, nativelike and foreign-accented words were intermixed rather than presented consecutively. But if hearing correct pronunciations were always enough to block adaptation, there should have been no priming in the second half. A possible explanation is that listeners are aware that foreign-accented speech is naturally variable, even within speakers (Hanulíková & Weber, 2012), while native speech is much more consistent, and they therefore adapt to inconsistent input only if it is in a foreign accent. This is in line with other recent findings: English listeners generalized learning about devoicing mispronunciations across word positions if they heard non-native Dutch speakers, but not if they heard native English speakers (Eisner et al., 2013). Hence, at least for foreign-accented speech, adaptation appears not to be blocked if listeners hear a speaker sometimes using canonical pronunciations. This too is good news given that accented speakers are indeed often inconsistent.

These results suggest that the underlying perceptual learning mechanism is tolerant of inconsistency about whether vowels are accented or not. This suggests, in turn, that during recognition, there can be many-to-one mappings of a foreign-accented speaker's utterances onto the lexicon (i.e., accented and nativelike vowels mapping onto the same words). It is thus not the case that, for any given foreign speaker, there must be a one-to-one mapping between input vowels and stored phonological knowledge.

In summary, the speech–perception system appears to be flexible and able to adjust rapidly. Listeners are able to tune in to speakers with a foreign accent, including those who, as is often the case, have an inconsistent accent. Such inconsistencies, at least for the accented vowels studied here, seem to create no major problems for native listeners: Although their adaptation is slowed down, they need only a few minutes to catch up.

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