Journal of Phonetics 58 (2016) 71–86

Contents lists available at ScienceDirect

Journal of Phonetics

journal homepage: www.elsevier.com/locate/phonetics

Research Article

L2 immersion causes non-native-like L1 pronunciation in German attriters

Christopher Bergmann [a,*], Amber Nota [a], Simone A. Sprenger [a], Monika S. Schmid [b]

[a] Department of English Linguistics, University of Groningen, P.O. Box 716, 9700 AS Groningen, The Netherlands
[b] Centre for Research in Language Development throughout the Lifespan, Department of Language and Linguistics, University of Essex, Wivenhoe Park, Colchester CO4 3SQ, United Kingdom

ARTICLE INFO

Article history:
Received 4 February 2015
Received in revised form
17 June 2016
Accepted 8 July 2016

Keywords:
Language attrition
Bilingualism
Segmental articulation
Speech Learning Model
German
English

ABSTRACT

According to Flege's *Speech Learning Model,* the speech sounds of a bilingual's languages are contained in one common phonological space. This predicts bidirectional influence on the articulation of these speech sounds. We investigated the influence of a late-learned second language (L2) on the first language (L1) in a group of German L1 attriters in Anglophone North America (i.e., long-term emigrants in L2 immersion). These speakers were compared to a control group of monolingual German L1 speakers in two analyses: First, L1 speech samples of both groups were rated for native-likeness. Attriters sounded less native-like to raters, with 40% of the attriters rated below the monolingual range. Native-likeness was negatively associated with length of residence abroad and positively associated with L1 use. Second, formant analyses on four speech sounds of German—/aː/, /ɛ/, /ɔ/ and /l/—were conducted for attriters and controls. For these analyses, two attriter subgroups were formed: one with speakers who sounded native-like to raters and one with speakers who did not. It was hypothesised that the formants in both groups would shift in the direction of similar L2 speech sounds and that the shift would be stronger in non-native-like attriters. The first hypothesis was partly confirmed: At least one attriter group differed from the control group on one formant of /aː/ and /l/. These differences were consistent with predictions based on the L2. The second hypothesis was not confirmed: There was no evidence that the formants of the non-native-like attriters deviated more strongly from the monolingual baseline than those of the native-like attriters. Additionally, the formant values and the ratings were found to be only weakly associated, suggesting a different source of the perceptibly non-native-like pronunciation in some attriters.

1. Introduction

In their second language (L2), many speakers have an accent that is shaped by their first language (L1) and is therefore perceived as non-native-like. It is less well attested if and under what conditions prolonged exposure to an L2 influences the way one pronounces L1 speech sounds. Flege's (1995) *Speech Learning Model* assumes that the speech sounds of a bilingual's languages are represented in one common phonological space. In this space, bidirectional influence between the sounds of both languages is likely to occur, predicting articulatory changes in the L1 in a similar fashion as in the L2. This may result in the assimilation of the articulation of individual speech sounds towards the L2 settings. Questions arise regarding how the articulation of individual speech sounds, as represented in the phonological space, relates to the perceived global native-likeness of a speaker's pronunciation.

In this study, we focused on the spontaneous speech of a group of late bilinguals, namely L1 German speakers who, as adults, emigrated to a North-American L2 English environment. Potential changes in their L1 pronunciation were investigated from two angles: We first tried to establish if immersion in an L2 environment leads to global changes in pronunciation. This was assessed by means of a rating study in which native raters judged speech samples by these bilingual speakers and predominantly monolingual controls. The results of such a rating study, however, cannot tell us why some speakers sound more native-like than others: Do they pronounce individual speech sounds differently? To gain more insight into this, we then compared one group of monolinguals and two groups of bilinguals—one rated as sounding native-like, the other as non-native-like—on the segmental articulation of selected phonemes. If changes in segmental articulation are the main source of sounding non-native-like, the groups should differ from one

* Corresponding author.
E-mail addresses: c.bergmann@rug.nl (C. Bergmann), a.g.r.nota@rug.nl (A. Nota), s.a.sprenger@rug.nl (S.A. Sprenger), mschmid@essex.ac.uk (M.S. Schmid).

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http://dx.doi.org/10.1016/j.wocn.2016.07.001

another in how far they deviate from monolinguals in their pronunciation of the speech sounds we analysed. Also, it should be possible to establish a relationship between the native-likeness ratings and the articulatory deviance in individual speakers.

Furthermore, the native-likeness of a speaker's pronunciation—both globally and on the level of individual speech sounds—is likely to be related to individual characteristics of this speaker, such as general L1 proficiency, frequency of L1 use and length of residence in the L2 environment. Therefore, we also determined if any of these factors was associated with the results of our analyses.

1.1. Speech Learning Model

The *Speech Learning Model* (SLM; Flege, Schirru, & MacKay, 2003; Flege, 1995, 2002) is primarily a model of L2 phonetic acquisition, formulated to account for the fact that individuals do not produce speech sounds in their L2 in a native-like fashion. The model is interesting for the investigation of L1 speech of bilinguals because it also postulates that the phonetic categories of both languages of a bilingual exist in a common phonological space, where they mutually influence each other. A common phonological space for all languages a bilingual speaks and an influence of those languages on one another are also assumed by other models of bilingual sound production, such as the *Perceptual Assimilation Model* (Best, 1995) and the *Native Language Magnet Model* (Kuhl, 1993, 2000).

In the context of L2 influence on L1 speech, two of the hypotheses derived from the SLM are most relevant: First, it is hypothesised that during L2 acquisition, no new categories are formed for L2 speech sounds that are perceived as similar to an L1 sound. Rather, the L2 speech sound is understood as a variant of an L1 sound; the relationship between the speech sounds is formed on an allophonic (rather than phonemic) level. This equivalence classification is based on individual perception, linking phones that sound most similar to a speaker. Speech sounds that have been linked this way are called 'diaphones' (Weinreich, 1957). Second, the SLM predicts 'category assimilation' in diaphones: This means that the mapping of L1 and L2 speech sounds onto one another leads to these sounds coming to resemble each other in production. It is proposed that one single long-term memory representation for diaphones evolves, yielding a 'merged' category for the L1 and L2 speech sound. The SLM not only predicts that L2 sounds are influenced by L1 diaphones, but also that L1 sounds are realised differently when they have been linked to L2 sounds.

1.2. What is language attrition?

Language attrition refers to changes (usually a decline) in an individual's abilities in a language, induced by decreased use of and input in this language. L1 attrition is commonly experienced in the context of migration when people move to an environment in which their mother tongue is not (widely) spoken (Schmid, 2004). L1 attriters often become very proficient in their L2—the language they use every day—and in some cases, language dominance reversal in favour of the L2 can take place (Mägiste, 1979; Opitz, 2010).

The individuals we are interested in are post-puberty L1 attriters (i.e., late bilinguals). When investigating the L2 of late learners, it can be difficult to trace differences from L1 speakers to discrete factors: Potential maturational constraints (see Newport, Bavelier, and Neville (2011) for a critical overview), socio-psychological aspects (Flege et al., 2006) and language competition between the L1 and the L2 (Bergmann, Sprenger, & Schmid, 2015; Dijkstra, 2005; Kroll, Bobb, Misra, & Guo, 2008) have been discussed as causes of performance differences between these bilingual and monolingual speakers. By contrast, late L1 attriters have acquired their L1 during infancy and childhood, only emigrating at an adult age after having reached full monolingual native proficiency. They have started from the same level of L1 mastery as other monolinguals and maturational factors do not apply to them. The only factor distinguishing them from monolingual speakers who have never emigrated from their home country is the mental presence of a permanently active L2 (Kroll, Bobb, & Wodniecka, 2006), possibly interfering with their L1. In these speakers, it is therefore easier than in L2 learners to isolate the effects of bilingualism from other factors constraining language development (Schmid, 2014).

L1 attrition in late emigrants has been found in a variety of domains: both in production (Schmid, 2002) and in perception (Major, 2010) as well as across a wide gamut of linguistic levels from lexical (Köpke, 2002; Pavlenko, 2000; Schmid & Jarvis, 2014) and morphological (Keijzer, 2010; Ribbert & Kuiken, 2010; Schmitt, 2010) to syntactic (Gürel, 2004, 2008; Tsimpli, Sorace, Heycock, & Filiaci, 2004) and pragmatic phenomena (Brown & Gullberg, 2008, 2011). It is conspicuous that in many studies, a subgroup of emigrants is found to remain native-like and even speakers who do experience attrition perform well, often better than highly proficient L2 speakers.

In the following, we review the existing evidence of attrition in the phonetic domain, focusing on global accent ratings and acoustical investigations of segmental phenomena. Most of these studies, similarly to the present one, investigate language attrition as a surface phenomenon, that is, as linguistic behaviour recorded at a given moment without any implications about the permanence of the findings. Attrition must not be understood as permanent 'loss', but rather as a change in L1 performance that is attributed to a language dominance reversal in favour of the L2 or simply to bilingualism as such (Paradis, 2004, 2007).

1.3. Literature review: phonetic attrition

Within the literature on phonetic attrition, only one publication that we are aware of reports the results of both native-likeness ratings and acoustical measurements on the speech of the same individual. It is a case study of a speaker of L1 Brazilian Portuguese and L2 American English (Sancier & Fowler, 1997). In her L1, the speaker sounded more accented to native raters after prolonged