The Acquisition of Third Language German Consonant Clusters by Cantonese-English Bilinguals

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ABSTRACT

The study investigated the production of third language (L3) German consonant clusters by 26 Cantonese-English bilinguals. The analysis of their production accuracy and modification strategies found an asymmetry in onset and coda productions, a lack of vowel epenthesis, reduction clusters to unmarked syllable structure, English-accented initial /ʃ/, /v/, and postvocalic /l/, and varied repair strategies. Such patterns are collectively caused by syllable complexity and language transfer, but influence from L2 seems to be the more salient one.

1. Introduction

Consonant clusters are found in some of the world's languages but not in others, and this structure often causes difficulty in language acquisition. However, second language acquisition (SLA) studies [1], [2] found that not all consonant clusters are equally difficult. The clusters acquired early with high accuracy happen to be those 1) observing the Sonority Sequencing Principle (SSP) with an ideal sonority curve ascending from onset to nucleus and descending from nucleus to coda; 2) short ones which are more similar to the unmarked simple CV syllable structure. In addition, since L2 speakers of different native languages are documented to differ in their production patterns [1], language transfer should also play a role here. However, such predictions have not been substantiated in an L3 context yet, which motivates the present study that examines a special learner group with L1 Cantonese, L2 English and L3 German. English consonant clusters are difficult for Cantonese natives whose first language does not allow consonant clusters. When those speakers learn consonant clusters in an L3 German, would they exhibit similar features as those found in L2 acquisition?

2. Methods

Twenty-six Cantonese-English bilinguals (mean age 22.1 years, range of 20-25) learning German at the Chinese University of Hong Kong took part in the experiment. Their German proficiency corresponded to level B2 (intermediate) in Common European Framework. Participants showed high L2 English proficiency in their IELTS scores ranging from 7.0 to 8.0. A control group of two female native speakers of standard German did the same task.

Subjects were recorded reading a word list that exemplified common German consonant clusters. The target words were put at the end of the carrier sentence "Ich sage das Wort ___." Participants spent around 20 minutes reading 208 such sentences that tested a total of 17 onset (/bl, fl, gl, kl, kn, lv, ps, sk, ʃl, ʃm, ʃn, ʃp, ʃt, ʃv, pfl, tsv/) and 21 coda consonant cluster types (/ft, kt, lf, ln, lp, ls, lt, mt, nf, ns, nʃ, nt, pʃ, ʃt, fst, lmt, lts, mpf, mpt, nts, ltst/). Speeches were recorded using a solid state recorder at a sampling rate of 44.1kHz in a quiet room.

The produced clusters were transcribed separately by a native German teacher and the first author who had trainings in linguistics and had spent one year in Germany studying advanced German courses, using IPA aided with spectrograms. Disagreements between the two transcribers were discarded to obtain the final transcription. Incorrect renditions of German consonant clusters were classified into three main types: "insertion", "substitution" and "reduction" with eight subdivisions as given in Table 1.

Table 1. Repair strategies with examples

Repair type	Example	
	onset	coda
Insertion		
Between	knapp /**kn**ap/→[**kən**ap]	rufst /ru:**fst**/→[ru:**fɪst**], greifst /grai**fst**/→[grai**ftst**]
After	Stein /**ʃt**ain/→[**ʃtr**ain]	Allianz /alia**nts**/→[alia**ntsɪ**], Pilz /pɪ**lts**/→[pɪ**ltst**]
Before	flach /**fl**ax/→[**pfl**ax]	oft /ɔ**ft**/→[ɔ**pft**]
Switch		Pelz /pe**lts**/→[**p**l**e**ts]
Reduction		
Deletion	Knie /**kn**i:/→[**n**i:]	Geld /ge**lt**/→[ge**l**]
Coalescence	zwar /**tsv**a:ɐ̯/→[**zw**a:ɐ̯]	prompt /prɔ**mpt**/→[prɔ**nt**]
Substitution		
Modification	Spaß /**ʃp**a:s/→[**sp**a:s]	Bild /bɪ**lt**/→[bɪ**ɫt**]
Replacement	flach /**fl**ax/→[**fr**ax]	Pfand /pfa**nt**/→[pfa**nf**]

3. Results

A multiple regression on accuracy ($p < .05$, $R^2 = .318$) found no effect of sonority sequencing and cluster length. Instead, the accuracy of a consonant cluster was predicted by the percentage of L1 ($\beta = .390$, $p < .05$) and L2 ($\beta = -.453$, $p < .05$) consonants in this cluster, as well as whether this cluster was an existing L2 consonant cluster ($\beta = .340$, $p < .05$)

For repair types, as shown in Figure 1, in spite of individual differences on the total number of repairs, insertion was consistently outnumbered by other types and this difference was confirmed by a one-way ANOVA, $F(2, 75) = 38.565, p < .001$.

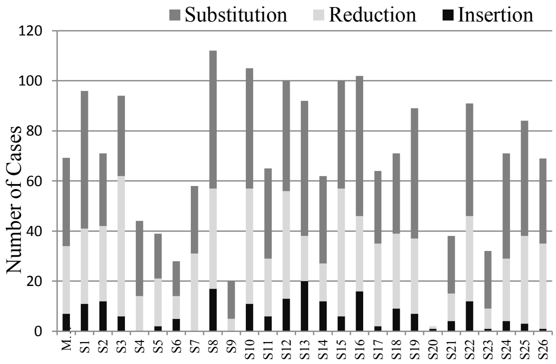

Figure 1. An overview of three major repair types by subjects

Insertion included not only the customary vowel epenthesis but also other modifications that added vowels and consonants to various positions of a cluster. The vowel /ə/ and consonants /t/ and /s/ were often inserted to break up or to bridge clusters. This should be natural since dental-alveolar region is unmarked [3], and schwa is the vowel with a neutral place of articulation. Coda insertion rate was four times as much as that of onset, and similar asymmetry was also observed in L2 studies [4]. Notably, there was a negative correlation between accuracy and the percentage of vowel epenthesis, $r= -.686$, n=26, $p<.001$, meaning less accurate individuals adopted more vowel epenthesis. A unique insertion type named "switch" involves moving nuclear in between a coda cluster, so the word *Senf* became *Snef*, but this strategy was restricted to the CVCC structure.

Both deletion and coalescence were counted as reduction, the first one being more typical in subjects' production. Direct deletion simply leaves out members of a consonant cluster, and it occurred more often in coda (13%) than in onset (9.8%). There is a tendency for deleting a less sonorous segment resulting in clusters that did not violate SSP, with the only exception of /ts/ in coda. For example, the sonority reversal in coda /pʃ/ was eliminated by reducing /pʃ/ into /ʃ/, while the /lts/→ /ts/ reduction did not make an SSP-conforming sonority contour. Coalescence happened occasionally due to a combination of substitution and deletion such as /tsw/→ /zw/.

Substitution of individual consonants caused nearly half of erroneous clusters, which could be seen on the spectrogram. Compared with natives, L3 speakers' utterances showed lower F2 minus F1 values corresponding to heavier velarization in postvocalic /l/, a lack of frication and F2 decrease in /v/, and concentration of energy on higher frequencies in /ʃ/, making them sounded more like the English phonemes /ɫ/, /w/ and /s/ respectively.

4. Discussion and Conclusion

We have not found direct effects of cluster complexity on the overall accuracy, yet the L3 consonant production shows language universal properties. The prevalence of insertion and deletion in codas as opposed to onsets reflects the Maximal Onset Principle that tends to assign segments to onset. Thus, onset clusters are less susceptible to reduction than coda ones, and this is indeed the case in the present study where onsets underwent less modification. CVCC to CCVC change can also be captured under this rationale by considering it as a way to simplify coda at the expense of increasing onset complexity. Besides, the observation that all subjects' productions after reduction preserved an ideal sonority curve (excluding s cluster) demonstrates both the existence of SSP and the special status of s cluster that is repeatedly found in phonology studies.

A more influential factor seems to be language transfer, for the overall accuracy and transfer factors correlate significantly. English turns out to be the major source of transfer in L3 production. The most direct evidence is that clusters shared by L2 and L3 have higher accuracies than other types. Furthermore, most of the modifications still resulted in consonant clusters and this is not likely to be L1 influenced. Resistance to L1 CV structure is also observed in the avoidance of vowel epenthesis especially in more phonetically able speakers. Finally, L2 transfer appears in the modifications of individual L3 consonants such as post-vocalic /l/, /v/, and initial /ʃ/, all of which do not exist in the L1 inventory. It is possible that L2 and L3 phonemes are merged into one category, so that no distinction is made between clear and dark /l/, /w/ and /v/, as well as initial /s/ and /ʃ/ [5]. Such an extensive L2 transfer necessitates a conscious comparison of L2 and L3 in language classroom in order to help students overcome problems when developing L3 phonology.

References

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