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VOT in English by Bilinguals with 2L1s: Different Approaches to Voiceless and Voiced Stops

LIU Sha (Center for Liberal Arts, Fukuoka Institute of Technology)
TAKEDA Kaye (Department of English, Faculty of Humanities, Fukuoka University)

Abstract

This study compares 2L1 bilinguals with monolinguals and second language learners. The experiment and statistical analysis suggest that the question of whether bilinguals adopt a more extreme, intermediate, or monolingual-like approach does not have a clear-cut answer. Our results show that 2L1 bilinguals resemble monolinguals more when they have greater control over their speech production. Additionally, 2L1 bilinguals take an extreme approach to positive VOTs, where they must distinguish between six stops in both Japanese and English, while for negative VOTs, they adopt a more intermediate approach, as they only need to distinguish between the three voiced stops.

Keywords : 2L1 bilingual, statistical analysis, VOT

1. INTRODUCTION

The phonological literature has long focused on the speech production of bilinguals with two first languages (hereafter 2L1 bilinguals). Caramazza et al. (1973) suggest that 2L1 bilinguals establish a separate phonetic category for each language. However, recent research indicates transfer between the two language systems, with both languages remaining active even when only one is being used (Dijkstra et al. 1998, Kroll et al. 2012). Studies show that even highly proficient bilinguals experience cross-linguistic interference during speech production (Hsin et al. 2013). On the other hand, Olson (2016) finds limited phonetic transfer in the production of voiceless stops by Spanish-English bilinguals. These inconsistencies in the literature highlight the need for further investigation into whether and how phonological systems interact in 2L1 bilinguals.

Most studies compare 2L1 bilinguals to monolinguals, but a comparison with second language speakers (henceforth L2 speakers) is also essential. Research has shown that L2 speakers' first-language articulatory timing influences their speech production (Anderson-Hsieh et al. 1992). A comparison between 2L1 bilinguals and L2 speakers could offer insights into cross-linguistic transfer, as L2 speakers serve as a useful benchmark. For instance, voice onset time (hereafter VOT) has been widely studied in both native and L2 speakers, particularly in English. Therefore, this study investigates VOT in English by English-Japanese 2L1 bilinguals, comparing their results with those of English monolinguals and Japanese L2 speakers of English.

VOT, defined as the interval between a stop release and vocal fold vibration, was first categorized by Lisker and Abramson (1964) into three categories: voicing lead, short lag, and long lag. Since then, various studies have refined the VOT classification (Keating

1984). For example, Takada (2011) found that Japanese voiceless stops have VOT values intermediate between short-lag and long-lag values.

VOT plays a crucial role in distinguishing voicing in most languages. In English, voiceless stops typically have long-lag VOT, while voiced stops may exhibit short-lag VOT, and occasionally voicing-lead VOT. This variation is most noticeable in syllable-initial positions, as intervocalic stops tend to be realized as voiced (Collier et al. 1979). VOT durations of word-initial stops in American English are summarized in various studies (Lisker and Abramson 1964). The general patterns across studies suggest a consistent relationship between VOT and voicing in English.

2. PROPOSAL OF THE PRESENT STUDY

This study examines the English speech production of Japanese-American English 2L1 bilinguals, considering factors of place of articulation, speech style, and gender. We record 2L1 bilinguals, monolingual speakers of American English, and Japanese speakers who speak English as a second language (henceforth ESL speakers), and compare their VOT values.

English monolinguals are defined as native speakers of English who do not speak another language, while Japanese-American English 2L1 bilinguals are those who acquired the two languages from infancy and are fluent in both. ESL speakers in this study are individuals who received English education in school but did not learn it in early childhood and have not lived in an English-speaking country for longer than a month. These ESL speakers have intermediate proficiency in English, as indicated by their TOEIC scores of around 550 points.

The study tests two hypotheses: (i) if 2L1 bilinguals establish separate phonetic categories for their two first languages, they will show results similar to monolinguals but different from ESL

speakers; alternatively, if the two languages are jointly active, the 2L1 bilinguals will show results closer to the ESL speakers than to the monolinguals; and (ii) if the 2L1 bilinguals have results more similar to the ESL speakers, the study will also explore how the influence of the Japanese phonetic pattern might transfer to English in 2L1 bilinguals, similar to the effect seen in ESL speakers.

In short, our goal is to determine whether 2L1 bilinguals' VOT falls within the monolingual range or if interference between their two first languages results in VOT values outside the typical monolingual range. We predict that the VOT of 2L1 bilinguals will be closer to that of monolinguals than to ESL speakers.

3. EXPERIMENT AND STATISTICAL ANALYSIS RESULTS

The experiment and statistical analysis results reveal statistically significant differences in VOT duration between monolinguals and 2L1 bilinguals in text reading (Generalized Linear Mixed model, $p = .001$). However, no significant differences were observed in word list reading (Generalized Linear Mixed model, $p = .151$). Overall, the 2L1 bilingual group's results were closer to the monolingual group in word list reading than in text reading. Two key findings emerged: (i) speaking style influences VOT, and (ii) 2L1 bilinguals can produce speech more similar to monolinguals when they regulate their speech carefully.

In terms of VOT polarity, the 2L1 bilinguals did not show significant differences from the monolingual group in text reading (Generalized Estimating Equations model, $p = .20$). This indicates that the difference between the two groups in text reading is not substantial in this study. In contrast, significant differences were observed between the monolingual and ESL groups in both VOT duration and polarity for both word list and text reading. These differences reflect a fundamental difference in VOT between the two groups. Significant differences in VOT duration for word list reading and in VOT polarity for text reading were also found between the 2L1 bilinguals and ESL groups, though the differences were not as large as those between the monolingual and ESL groups.

Previous studies of bilingual VOT production report varying results: (i) bilinguals produce more extreme VOTs than monolinguals (Whitworth 2000), (ii) bilinguals have similar VOTs to monolinguals (Magloire and Green 1999), or (iii) bilinguals have intermediate VOTs (Williams 1977). Results for this study indicate that the 2L1 bilinguals' VOT falls between the monolingual and ESL groups in terms of polarity for both word list and text reading. Regarding VOT duration, the 2L1 bilinguals had the most extreme positive VOTs in text reading, showing statistically significant differences from the monolinguals. This suggests that the 2L1 bilinguals tend to adopt an extreme approach in text reading, possibly to distinguish the stops between their two first languages. A similar tendency, although less prominent, was observed in word

list reading, where the 2L1 bilinguals had the most extreme positive VOT durations for all stops except /t/.

The lack of significant differences in VOT duration between monolinguals and 2L1 bilinguals in word list reading suggests that 2L1 bilinguals accentuate the differences between their two first languages when reading words but not to the extent as observed in text reading. The 2L1 bilinguals' negative VOT durations tended to be intermediate, reflecting the differences between English and Japanese VOTs, with Japanese having shorter negative VOTs.

4. CONCLUSIONS

In summary, the 2L1 bilinguals produced stops with extreme positive VOTs but intermediate negative VOTs. For the polarity of VOT, the 2L1 bilinguals were between the monolingual and ESL groups, with their ratios of voicing-leading VOTs falling between those of the two groups. These results differ from those of Johnson and Wilson (2002), who found that their bilingual subjects produced all voiceless stops as long-lag and all voiced stops as short-lag in both languages. In contrast, our results show that all three groups produced voiced stops as both short-lag and voicing-lead.

Our study offers a unique comparison by examining 2L1 bilinguals alongside monolinguals and L2 speakers. The question of whether 2L1 bilinguals produce speech more extreme than monolinguals or intermediate between monolinguals and L2 speakers does not have a simple answer. Broadly, the results suggest that 2L1 bilinguals produce more monolingual-like speech when they have greater control over their production, as in word list reading. Moreover, 2L1 bilinguals may use both extreme and intermediate approaches in speech production. We notice that for positive VOTs, 2L1 bilinguals tend to use extreme measures to differentiate between the six stops in Japanese and English, while for negative VOTs, they adopt an intermediate approach, as they only need to differentiate between the three voiced stops. Further studies are needed to explore whether similar patterns emerge in other areas, such as consonant clusters or speech rhythm, to fully understand the speech production approaches of 2L1 bilinguals.

5. ACKNOWLEDGMENT

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References

- (1) Anderson-Hsieh, Janet, Ruth Johnson & Kenneth Koehler: "The relationship between native speaker judgments of nonnative pronunciation and deviance in segmentals, prosody, and syllable structure", *Language learning*, Vol. 42, No. 4, pp.529–555 (1992)
- (2) Caramazza, Alfonso, Grace H. Yeni-Komshian, Edgar B. Zurif & Ettore Carbone: "The acquisition of a new phonological contrast: The case of stop consonants in French-English bilinguals", *The Journal of the Acoustical Society of America*, Vol. 54, No. 2, pp.421–428 (1973).
- (3) Collier, René, Leigh Lisker, Hajime Hirose & Tatsujiro Ushijima: "Voicing in intervocalic stops and fricatives in Dutch", *Journal of Phonetics*, Vol. 7, No. 4,

- pp.357–373 (1979).
- (4) Dijkstra, Ton, Henk van Jaarsveld & Sjoerd Ten Brinke: “Interlingual homograph recognition: Effects of task demands and language intermixing”, *Bilingualism: Language and Cognition*, Vol. 1, pp.51–66 (1998).
 - (5) Hsin, Lisa, Géraldine Legendre & Akira Omaki: “Priming cross-linguistic interference in Spanish-English bilingual children”, in Sarah Baiz, Nora Goldman & Rachel Hawkes (eds.): *Proceedings of the 37th Annual Boston University Conference on Language Development*, pp.165–177, Somerville, MA: Cascadilla (2013).
 - (6) Kroll, Judith F., Paola E. Dussias, Cari A. Bogulski & Jorge R. Valdes Kroff: “Juggling two languages in one mind: What bilinguals tell us about language processing and its consequences for cognition”, *Psychology of Learning and Motivation*, Vol. 56, pp.229–262 (2012).
 - (7) Lisker, Leigh & Arthur S. Abramson: “A cross-language study of voicing in initial stops: Acoustical measurements”, *Word*, Vol. 20, pp.384–422 (1964).
 - (8) Magloire, Joël & Kerry P. Green: “A cross-language comparison of speaking rate effects on the production of voice onset time in English and Spanish”, *Phonetica*, Vol. 56, pp.158–185 (1999).
 - (9) Olson, Daniel J.: *The role of code-switching and language context in bilingual phonetic transfer*, Amsterdam: John Benjamins (2016).
 - (10) Takada, Mieko: *Research on the word-initial stops of Japanese: Synchronic distribution and diachronic change in VOT*, Tokyo: Kurosio (2011).
 - (11) Whitworth, Nicole: “Acquisition of VOT and vowel length by English-German bilinguals: A pilot study”, *Leeds Working Papers in Linguistics and Phonetics*, Vol. 8, pp.15–25 (2000).
 - (12) Williams, Lee: “The perception of stop consonant voicing by Spanish-English bilinguals”, *Perception & Psychophysics*, Vol. 21, No. 4, pp.289–297 (1977).