Effect of Early Bilingualism on Voicing in Russian Stops

Introduction

The Russian language is what is known as a 'true voice' language. That is, the laryngeal contrast in Russian stops is between voiceless unaspirated and prevoiced. In contrast, English is an aspirating language. The contrast in stops is between voiceless unaspirated and voiceless aspirated (Beckman, Jessen, & Ringen, 2013).

Previous research by Ringen (2012) and Caramaza (1974) has established that influence from a dominant aspirating language can cause speakers of a true voice language to produce less consistent and pronounced prevoicing in voiced stops. However, uninfluenced Russian speakers produced very consistent prevoicing (Ringen & Kilikov, Voicing in Russian stops: cross-linguistic implications, 2012).

Will a Russian speaker bilingual in English (an aspirating language), living in a primarily English environment, exhibit the same level of prevoicing in voiced stops as uninfluenced Russian speakers? If the theories presented by Caramazza and Yeni-Komshian (1974) are correct, the overwhelming influence of English will result in the loss of prevoicing in voiced stops.

Previous studies have not found aspiration in voiceless stops of heavily influenced true voice speakers (Beckman, Jessen, & Ringen, Empirical Evidence for Laryngeal Features: Aspirating vs. True Voice Languages, 2013). Will the high level of influence in my language consultant result in the appearance of voiceless aspirated stops in Russian, as in English?

Background

Voicing of stops can be determined by measuring voice onset time (VOT). In true voice languages, voiced stops exhibit long negative VOT, and voiceless stops short positive VOT, while in aspirating languages voiced stops exhibit short positive VOT and voiceless stops long positive VOT (Lisker & Abramson, A cross-language study of voicing in intial stops : acoustical measurements, 1964).

Research on stops in true voice languages has found differences between the stops produced by speakers of true voice languages in regions heavily influenced by a non-true voice language and those produced by uninfluenced speakers. A study of Fenno-Swedish stops found that only 87% of utterance-initial voiced stops actually exhibited negative VOT. (Ringen & Suomi, The voicing contrast in Fenno-Swedish stops, 2012). This could be attributed to the influence of Finnish, in which there are only voiceless unaspirated stops. Even more drastic results were found in Canadian French, where only 42% of voiced stops were actually produced with prevoicing (Caramazza & Yeni-Komshian, 1974). The obvious source of influence in this case is English.

A recent study on Russian stops aimed to test the theory that inconsistent voicing in true voice languages is caused by influence from a non true voice language. The study looked at voicing in stops by Russian speakers with minimal exposure to other languages, and found that 97% of voiced stops exhibited negative VOT (Ringen & Kilikov, Voicing in Russian Stops: Cross-Linguistic Implications, 2012).

There are three places of articulation for stops in Russian- bilabial, alveolar, and velar. Each place of articulation includes a voiced and voiceless form, and each of these have a palatized and unpalatized form (Cubberley, Russian : A Linguisitic Introduction, 2002). Palatization has not been shown to affect voicing (Ringen & Kilikov, Voicing in Russian Stops: Cross-Linguistic Implications, 2012).

In uninfluenced Russian, utterance-initial voiced stops have been found to have a mean VOT of between -70 and -78 ms, depending on place of articulation. Utterance initial voiceless stops have a mean VOT of 18 to 38 ms (Ringen & Kilikov, Voicing in Russian Stops: Cross-Linguistic Implications, 2012).

Methodology

In order to answer the question of English influence on Russian stops in my language consultant, I conducted a phonetic experiment. The details of this experiment are explained in the following sections. The participants section describes my language consultant. The procedure section explains how the experiment was conducted. The materials section contains the word list used. Finally, the acoustic analysis section details how the acoustic data was analyzed.

Participants

My language consultant was born in Russia in the Moscow area. Russian is his first language. He lived in Russia until he was eleven years old. His family then moved to Israel, staying there for a year before finally coming to Ottawa, Canada. He speaks Russian and English fluently and has some familiarity with Hebrew and French, though he is not fluent in either. His English is nearly unaccented and comparable to a native speaker.

Procedure

I compiled a list of words for my language consultant to read. Because the experiment was concerned only with the qualities of utterance-initial stops, I did not use a carrier phrase. I created a slideshow by randomizing the order of my words and creating a slide for each. My language consultant was provided with the slideshow and instructed to record himself reading each word in a natural voice, leaving a few seconds pause between words. Word lists are a standard elicitation method, and the

instructions given are typical for such an activity (Ringen & Kilikov, Voicing in Russian Stops: Cross-Linguistic Implications, 2012).

The word list and slideshow were chosen due to their simple and self-explanatory nature, as well as the ease of distributing them through email. I was not able to be present while my language consultant made his recording, which necessitated a method that required little instruction or monitoring.

Because the recording was created using my language consultant's own equipment (a standard headset mic), the quality is not ideal. However, it is still possible to obtain clear VOT measurements (as detailed in the acoustic analysis section).

Materials

I based my word list on the one used by Rigen and Kilikov (2012). Their list contains words with both utterance-initial and intervocalic stops. I trimmed the words containing only intervocalic stops and added a few words of my own to even out the count for each stop. I also added distracter words which do not include initial stops, in a ratio of one distracter to three meaningful words.

I considered six stop phonemes for this word list. These are /b/, /d/, /g/, /p/, /t/, and /k/. None of the words used contain the palatized versions of these stops in initial position. As mentioned in the background section, palatization has not been shown to affect VOT (Ringen & Kilikov, Voicing in Russian Stops: Cross-Linguistic Implications, 2012). My list contains four words for each stop phoneme, for a total of twenty four meaningful words. There are eight distracter words, none of which contain initial stops. Thus the full list is thirty-two words long.

Cyrillic	IPA	Gloss	Category
Баба	/bɑbə/	'(old) woman'	/b/
Барабан	/bərəbɑn/	'drum'	/b/
Большие луга	/bəlʲjiə lugə/	'big meadows'	/b/

баклажан	/bəkläʒɑn/	'eggplant'	/b/
Падарки	/pədɑrki/	'gifts'	/p/
Папа	/pɑpə/	'Dad'	/p/
По капле	/pəkɑpli/	'by drop'	/p/
Парик	/pərik/	'wig'	/p/
Друга	/drugə/	'friend$_{GEN.SG}$'	/d/
Для Папу[1]	/dlʲəpɑpu/	'for Dad$_{DAT.SG}$'	/d/
Два года	/dvɑ gədɑ/	'two years'	/d/
Дуга	/dugə/	'bow'	/d/
Танцевать	/tɑntsivətʲ/	'to dance'	/t/
Туман	/tumɑn/	'fog'	/t/
Табак	/tɑbək/	'tobacco'	/t/
Туфли	/tufli/	'shoes'	/t/
Год	/gɔt/	'year'	/g/
Город	/gorət/	'city'	/g/
Готов	/gətof/	'ready'	/g/
Газы	/gɑzi/	'gases'	/g/
Капкан	/kɑpkən/	'trap'	/k/
Карандаш	/kərəndɑʃ/	'pencil'	/k/
Китайский[2]	/kitajski/	'Chinese'	/k/
Кошка	/koʃkə/	'cat'	/k/
Врага	/vrɑgə/	'enemy$_{GEN.SG}$'	Distracter
Все взято	/vsʲɛ vzʲætə/	'everything is taken'	Distracter
Лапа	/lɑpə/	'paw'	Distracter
Читать	/tʃitətʲ/	'to read'	Distracter
Шапка	/ʃɑpkə/	'hat'	Distracter
Холодно	/xolədnə/	'cold'	Distracter
Новости	/novəsti/	'news'	Distracter
Радио	/rɑdio/	'radio'	Distracter

Table 1 - word list

Acoustic Analysis

I measured the mean voice onset time (VOT) for each of the six relevant stop phonemes in the utterance initial position using Praat. VOT can be used to distinguish between voiced and voiceless stops (Lisker & Abramson, A cross-language study of voicing in intial stops : acoustical measurements,

[1] There was a grammatical error on my part with this entry. It should be для Папы (/dlʲəpɑpɨ/). My language consultant pronounced the correct grammatical form during the recording and alerted me to the error afterwards. This entry was not excluded, as the error did not affect the initial stop, and in any case, the word was produced correctly in the recording.

[2] This word was produced with a voiceless vowel following the initial stop. Due to this, it was excluded from the final data.

1964). VOT of an initial stop can be determined in Praat by looking for the presence of pitch (Boersma & Weenink, 2013).

To measure stops with negative VOT, I selected the region between the first voice pulse (pitch) and the onset of clear formants in the following vowel, lateral, or rhotic. To measure stops with positive VOT, I selected the region between the initial stop burst and the onset of formants. In each case I used the 'get selection length' feature to take a duration measurement of the selected region.

Results and Discussion

The goal of this experiment was to investigate the VOT values of utterance-initial stops in a Russian speaker heavily influenced by English. Russian is a true voice language, meaning the voicing contrast in stops is between prevoiced (high negative VOT) stops and voiceless unaspirated (low positive VOT) stops. Past research has found that Russian speakers uninfluenced by aspirating languages clearly follow this pattern very predictably (Ringen & Kilikov, Voicing in Russian stops: cross-linguistic implications, 2012).

However, speakers of true voice languages who are heavily influenced by aspirating languages (such as English) are often affected, with reduced negative VOTs in voiced stops, increased positive VOTs in voiceless stops, and less predictable patterns overall (Beckman, Jessen, & Ringen, Empirical Evidence for Laryngeal Features: Aspirating vs. True Voice Languages, 2013). Thus, for a Russian speaker heavily influenced by English, research predicts that voiced stops will have lower negative VOT values and higher positive VOT values than a typical Russian speaker, and that they may be inconsistent in producing prevoiced stops.

The mean VOTs measured for each phoneme are presented in the table and graph below. Mean VOT values for Russian (Ringen & Kilikov, Voicing in Russian stops: cross-linguistic implications, 2012)

and English (Lisker & Abramson, A cross-language study of voicing in intial stops : acoustical measurements, 1964) are included for comparison. The complete data for all words is available in the appendix.

Phoneme	Voice Quality	Expected Mean VOT for English (ms)	Expected Mean VOT for Russian (ms)	Observed Mean VOT (ms)
/b/	Voiced	1	-70	-24
/d/	Voiced	5	-75	-60
/g/	Voiced	21	-78	-40
/p/	Voiceless	77	18	11
/t/	Voiceless	75	20	22
/k/	Voiceless	87	38	53

Table 2 - Mean VOT

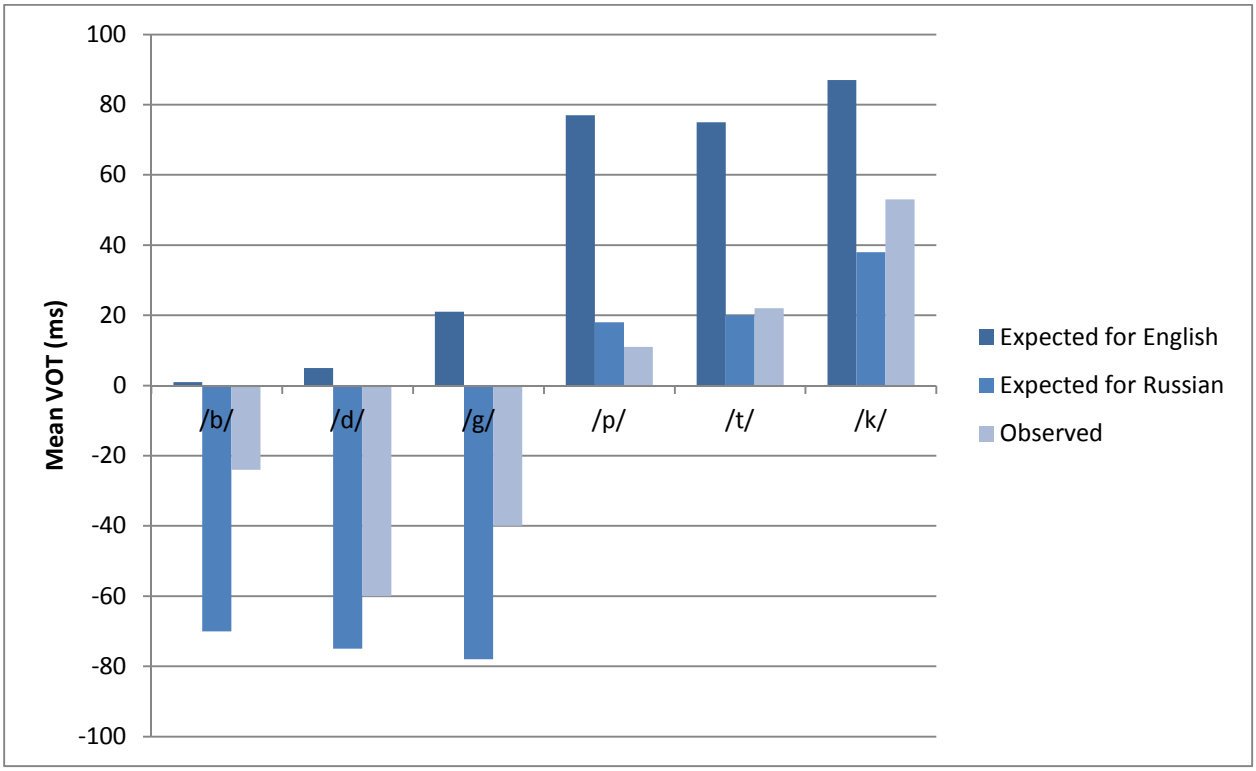

Figure 1 - Mean VOT

My language consultant produced VOTs which were much closer to the expected values for Russian than for English. His voiced stops all showed negative VOT, though the length of negative VOT varied significantly. His voiceless stops were all produced with positive or near zero VOT, and the values

were more consistent than the voiced stops within a single phoneme, but varied significantly between different phonemes.

My language consultant did not produce the type of voiceless aspirated stops we see in English. Although the values for /k/ are approaching the long lag we expect for English, the aspiration is very quiet and unemphasized. Additionally, velar stops typically have longer positive VOTs in Russian than the other two places of articulation, and this pattern is preserved with my language consultant.

The negative VOTs produced by my language consultant were overall much lower than expected for a Russian speaker. However, some of this difference may be due to speech rate and small sample size. There is a possibility that my language consultant's prevoiced stops are influenced by English to be shorter, but the data is not clear enough to prove this is the case. In response to my research question, I can say only that the influence of English is not enough to cause my language consultant to use an English voicing contrast in his stops when speaking Russian.

This result is not inconsistent with previous research. Beckman, Jessen and Ringen (2013) predicted reduced prevoicing in speakers of true voice languages who have been heavily influenced by looking at an average of many speakers and words. My language consultant constitutes a single additional data point, which falls within a reasonable range of their predictions. Although his VOT values do not conclusively show influence from English, taken in concert with the rest of the available data, I believe this experiment supports the predictions of Beckman, Jessen, and Ringen.

Conclusions and Future Work

My language consultant does not conclusively show influence of a dominant aspirating language when producing Russian stops. However, the VOT values he produced are not inconsistent with

predictions from previous research. The results of this study support the possibility of true voice language speakers being influenced by dominant non-true voice languages.

In the future I hope to do further study on stop production of Russian native speakers living in English speaking countries. This study looked at only utterance-initial stops, but further research could cover intervocalic stops as well. Increasing the number of participants would allow me to draw more solid conclusions. I would also be interested in testing whether priming a bilingual speaker with English words would affect their stop production in Russian immediately afterwards.

Works Cited

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Appendix

Measured VOT Values

Phoneme	IPA	Gloss	VOT	Notes
/b/	/bɑbə/	'(old) woman'	-0.0178	
/b/	/bəkläʒɑn/	'eggplant'	-0.0146	
/b/	/bərəbɑn/	'drum'	-0.0175	
/b/	/bəlʲʃiə lugə/	'big meadows'	-0.0451	
/d/	/dvɑ gədɑ/	'two years'	-0.0604	
/d/	/drugə/	'friend$_{GEN.SG}$'	-0.0919	
/d/	/dugə/	'bow'	-0.0211	
/d/	/dlʲəpɑpu/	'for Dad$_{DAT.SG}$'	-0.0653	Mistake in word list- /dlʲəpɑpu/ written, /dlʲəpɑpɨ/ pronounced
/g/	/gorət/	'city'	-0.0583	
/g/	/gɑzi/	'gases'	-0.0353	
/g/	/got/	'year'	-0.0337	
/g/	/gətof/	'ready'	-0.0327	
/p/	/pəkɑpli/	'by drop'	0.0079	
/p/	/pɑpə/	'Dad'	0.0189	
/p/	/pədɑrki/	'gifts'	0.0133	
/p/	/pərik/	'wig'	0.0057	
/t/	/tumɑn/	'fog'	0.0276	
/t/	/tɑbək/	'tobacco'	0.0179	
/t/	/tufli/	'shoes'	0.0326	
/t/	/tɑntsivətʲ/	'to dance'	0.0079	
/k/	/kitajski/	'Chinese'	N/A	Excluded due to voiceless vowel
/k/	/kərəndɑʃ/	'pencil'	0.0509	
/k/	/kɑpkən/	'trap'	0.0532	
/k/	/koʃkə/	'cat'	0.0553	

Table 3 - Acoustic measurements