Training category expansion with stops and ejectives in Ktunaxa*

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Abstract: Ktunaxa is an isolate spoken in the interior of BC and northern Idaho and Montana, and like most Northwest languages, it employs a distinctive sound system that is markedly different from English. Included in the sound inventory are ejective counterparts for all stops in the language, as well as glottalized nasals and vowels. The ejectives in particular are difficult for English speakers to perceive. This is an important issue for efforts to teach adult members of the community to speak their heritage language, because the adult learners, all of whom are L1 speakers of English, have difficulty perceiving the difference, making it all but impossible for them to learn to produce the different sounds (Flege 1995).

This study therefore is intended to expand the categorical perception of certain sounds in a program that is sensitive to the needs, resources, and constraints of the community. Because of their salience, in terms both of frequency and of the cultural significance of these distinctive sounds, I have concentrated on the velar and uvular stops, but this should be viewed as the beginning of a process of category expansion that could (and should) continue to cover the other stops in the language.

1 Ktunaxa phonetics

1.1 The sound inventory of Ktunaxa

The four sounds under consideration in this paper are [k], [k'], [q], and [q']. Because the production and perception of a particular sound can be influenced by those sounds that surround it, a brief discussion of the phonetics of Ktunaxa is in order. The stimuli were recorded using orthographic prompts, so a brief mention of how the phonetics maps to the orthography will be included as well.

The Ktunaxa sound inventory includes five stops and an affricate, and their ejective counterparts, as well as four fricatives, two nasals, and two glottalized nasals, as indicated in Table 1. Morgan (1991) advocates for a three vowel system phonemically, /i u a/, the vowel inventory based on phonetic properties appears to

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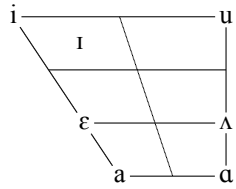
be much richer, including [ɛ, ʌ, ɑ, ɪ] at least on the phonetic level.[1] Morgan (1991), Gravelle and Morgan (1988) and my own observations suggest that both creaky and modal vowels are phonemic, though this is an area in need of much further research. Stress in Ktunaxa is on the penultimate syllable of a prosodic word.

Table 1: Ktunaxa consonants

	bilabial	dental	lateral	velar	uvular	laryngeal
stops	p	t		k	q	ʔ
affricate		ʦ				
ejectives	p'	t'		k'	q'	
ejective affricate		ʦ'				
fricatives		s	ɬ		x	h
nasals	m	n				
glottalized nasals	m̰	n̰				

Source: Morgan (1991)

Table 2: Ktunaxa vowels (phonetic, modified)



Ktunaxa orthography is roughly phonemic, with a few important differences. The writing system employs only three vowels, 'a', 'i', and 'u', with /ɪ/ and /ɛ/ generally overlapping in pronunciation where 'i' is written, /ʌ/ overlapping where 'u' is written, and /ɑ/ overlapping with 'a'. However, this variability is more pronounced in right-edge morphology or in function words, whereas the contrasts employed in this study are primarily in the root or stem and do not interact with right-edge morphology.

[1]The early research of Morgan (1991) suggests that the phonemic vowels include only /i/, /u/ and /a/, but as the analysis rests on a number of hypothetical recreations, I find it less than convincing. No other in-depth phonological analysis has been attempted, and indeed, there is a need for a more rigorous understanding of both the phonetics and phonology of the vowel system.

The consonant orthography is slightly more significant for our purposes, as the written information presented to the speakers making the recording and to the learners hearing the tokens is in orthography. The differences are as follows:

Table 3: Mapping orthography to IPA

Orth.	IPA
'	ʔ
¢	ʦ
ɬ	ɬ
m̀	m̰
ǹ	n̰

1.2 Ktunaxa ejectives

Ktunaxa ejectives are difficult for non-fluent speakers to perceive because, while there are clearly phonetic differences between stops and ejectives, those differences in amplitude of release, length of pause, and other measure, are not extreme. They are subtle in the sense that, for fluent speakers the difference is clear, but for learners, the presence of an ejective quality is easy to overlook, if it is perceived at all. For learners, one of the chief difficulties with production stems from perception, in that only in the most exaggerated, controlled conditions can learners perceive the contrast, an observation supported by the learners themselves (Melanie Sam, Director of Traditional Knowledge and Language describing nation-internal learner feedback, personal communication, 2013).

A spectral analysis comparing [aka] in Figure 1 and [ak'a] in Figure 2 highlights two subtle but important differences; these waveforms and spectrograms, along with those in Figure 3 and Figure 4 are of carrier nonce words that nevertheless demonstrate the pattern found in real words and discourse. The ejective burst in Figure 2 is slight, but it is followed by an absence of airflow during the glottal closure, which in turn is followed by an amplified vowel when the closure is released. The non-ejective stop in Figure 1 is, by contrast, followed by mild vibration of a duration similar to that of the delayed glottal release shown in Figure 2, but the vowel does not exhibit the same amplification.

The comparison between the uvular stop and ejective reveals similar differences. The ejective burst in Figure 4 is more pronounced than in Figure 2, but it is still followed by a pause before the release of the glottis, and the following vowel is also amplified. And although it is of greater amplitude, it cannot be said to be extreme or exaggerated; as far as ejectives go, it is still quite subtle.

As McAuliffe (2011) observed, a salient difference is in the vowel after the ejective, in that there are fewer formant transitions; this observation is supported

Figure 1: Spectrograph of [aka]

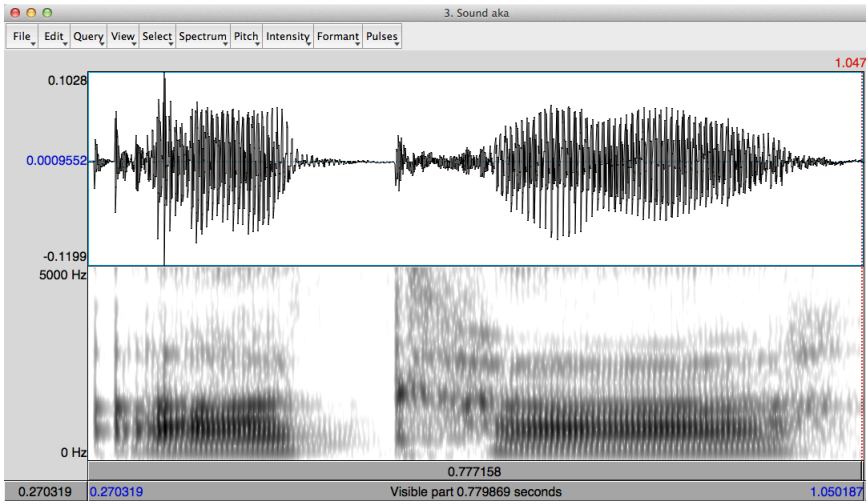


Figure 2: Spectrograph of [ak'a]

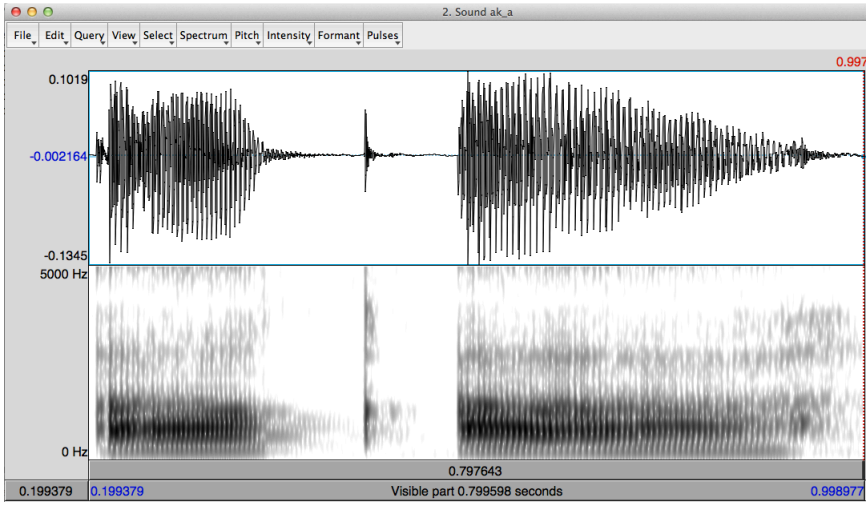


Figure 3: Spectrograph of [aqa]

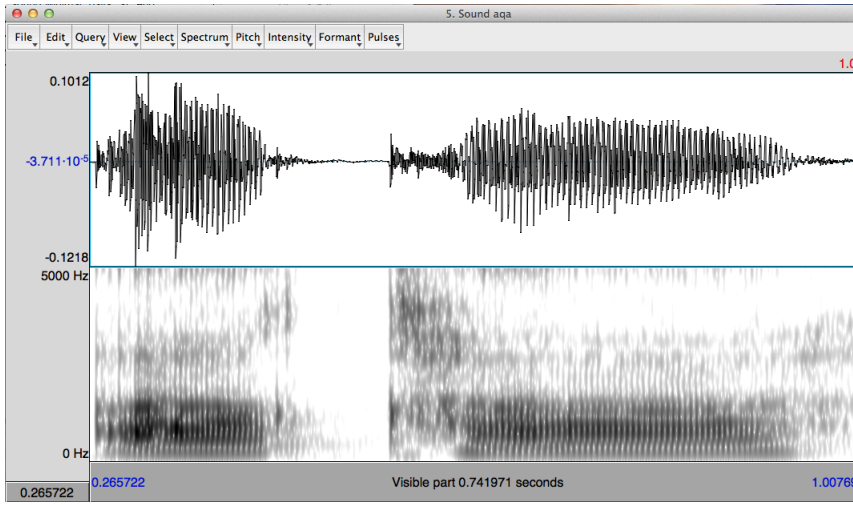
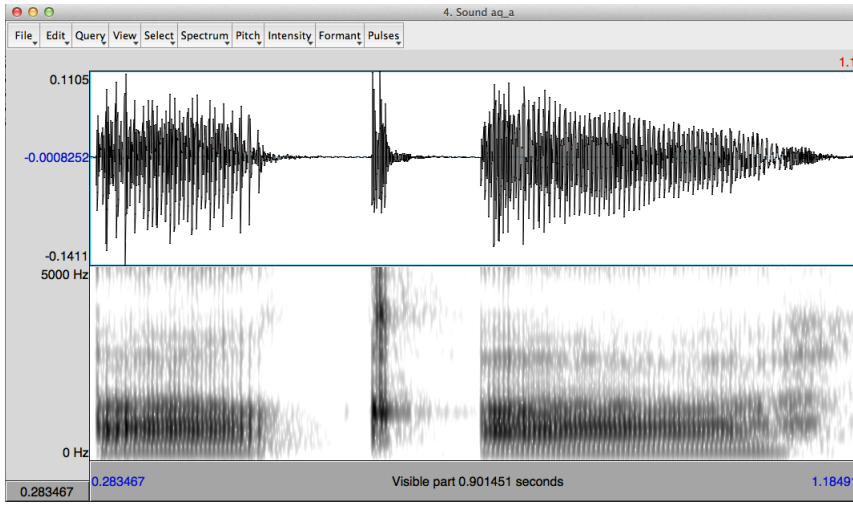


Figure 4: Spectrograph of [aq'a]



in Figure 2 and Figure 1, in which the ejective displays a more stable vowel afterwards. Other languages, he reports, have slightly creaky vowels after ejectives because of carryover effects, whereas post-ejective vowels in Ktunaxa are more modal. He compares this to the nasalization of post-nasal vowels, an alteration which is unavailable in languages that contrast nasal and modal vowels. This is consistent with the notion that creaky vowels may be phonemic in Ktunaxa.

All four of these spectrograms reflect the ejective/stop contrast in a nonce word. Even in this controlled context, the ejective is present, but its amplitude is slight, especially compared to languages such as Tlingit (Maddieson, Smith, & Bessell 2001). Connected speech does not offer this kind of isolation, and while the ejective is no less present, it is pronounced with similar characteristics, so that for many L2 speakers, the ejective is lost in the stream of rapid speech.

1.3 Perceptual difficulties for L2 learners

The contrast between uvular and velar stops and ejectives may be subtle, but it is one of the most socially salient contrasts in Ktunaxa. Where L2 speakers fail to produce ejectives, fluent Ktunaxa speakers comment that, although it is clear what learners are trying to say, it is nonetheless awkward or incorrect (Birdstone, personal communication, 2012). Fluent speakers do not express the same level of attention to, for example, glottalized nasals (Birdstone, personal communication, 2013). Learners feel a sense of frustration that they are missing a key part of the language, as they are often aware that a distinction exists, but they cannot hear it themselves. (Sam, personal communication, 2013).

This notion of salience is hardly unique to Ktunaxa, and indeed social salience is a recurring theme by many authors in *Handbook of Language Variation and Change* (Chambers, Trudgill, & Schilling-Estes 2008), in which Kerswill (2008) describes how salient features are selected (or discarded) when new dialects of a language emerge through Koineization, and Wolfram (2008) describes how salient features become intensified in languages that are critically endangered.

2 Category expansion and training research

The primary methodological influences on the training program outlined in Section 3 come from research that trained Japanese speakers to perceive the difference between /l/ and /ɹ/ in American English, conducted by Logan, Lively, and Pisoni (1991). Their training design used high variability in the presentation of the stimuli, using the recordings of six talkers reading 207 minimal pairs with the target sounds as singletons, as clusters and at different positions in the words.

Their procedure involved a pretest with 16 minimal pairs, three weeks of training, and then a posttest that was identical to the pretest. The training program itself involved a two-alternative identification task, in which participants listened

to one member of a minimal pair and selected an alternative. Feedback was given immediately, and if the participant selected the wrong answer, the pair would be repeated with the correct response highlighted on a CRT screen. Training sessions lasted about 40 minutes each, and over the three week training period, listeners were presented with 68 minimal pairs read by 5 different speakers.

The reason that this particular study was chosen as a model was because of the persistency of the benefits. Six months after the training concluded, participants still exhibit a 4.5% improvement in perceiving the contrast, despite undergoing no further training (Lively, Pisoni, Yamada, Tohkura, & Yamada 1994). It is worth mentioning, however, that although formal training did not continue, the participants were all Japanese native speakers studying in the United States; their exposure to the contrast certainly continued beyond the term of the training regime.

3 Training program design

3.1 Design considerations

This program was designed with the specific purpose of training Ktunaxa members who live in one of the four Ktunaxa communities in Canada to better perceive the contrast between specific phones in Ktunaxa, namely ejective and non-ejective stops. This population was chosen because they will have been exposed to fluent Ktunaxa through their involvement in their community and nation, as the language is used in ceremonies, cultural gatherings and other events. Even though the participants may not speak or understand Ktunaxa, Haynes (2010) identifies previous exposure, either "ambient" or passive exposure or direct exposure through classes or family members who are speakers, as providing these learners with an advantage over those who have no exposure to the language.

An important design consideration is the limited availability of minimal pairs due to the morphological complexity of Ktunaxa. In lieu of minimal pairs, a number of ``words'' have been identified which include the sounds under investigation in similar environments. These tokens are listed in the dictionary (Gravelle & Morgan 1988), but they should not be viewed as free-standing units. The controlled sequences are for the most part CVCVC or #VCVC, where the middle C is the ejective or stop under investigation. I have also controlled for stress, so that if one of the adjacent vowels is stressed, the same adjacent vowel will be stressed in both members of a pair. Most of the tokens are in word- initial or internal positions, very few are word final. This is because of the left edge morphology of Ktunaxa, in that, of the four phones used in this study, /k/ is overwhelmingly the most common, including in word-final position, and the ejectives in particular are almost never word final.

3.2 Participants

All participants were recruited through an open invitation issued by the Ktunaxa Nation Traditional Knowledge and Language sector, which was distributed through Facebook, email and word-of-mouth. Each participant was given an intake questionnaire when they volunteered, which included questions to confirm their age group and gender, their exposure to Ktunaxa and other languages, where they grew up, and how long they have lived in their present community. These questions were intended to get a sense of their exposure, whether it was ambient or direct.

3.3 Training tokens

In addition to the samples included in Figure 1 to Figure 4, the following minimal pairs were used, as well as one triplet. Learners were not expected to identify a three way contrast using the triplet; instead it was used in pairwise contrasts, consistent with the other tokens. All of the tokens in the tables are in IPA; they are not ordered in any particular way. They were recorded with a single fluent speaker in a sound dampened room using a MarantzPMD660 and a hand-held microphone.

One talker recorded all of these tokens over the course of several sessions. While the speaker was the same, the recordings are nonetheless varied, for instance in their overall pitch, pacing and vocal quality.

Table 4: Token triplet

Token	aqaɬ	aq'aɬ	akaɬ
Translation	*cloud*	*glove*	*sack*

Source: Morgan (1991)

In addition to these tokens, a number of nonce words were included as well, so that a four-way contrast could be established in controlled environments.

3.4 Methodology

A pretest was administered in which 36 tokens from above were selected from the Ktunaxa lists, representing 18 minimal pairs. The tokens from each pair were not played adjacent to each other and were otherwise randomized. There were two seconds between the presentations of each token and four seconds between each token. Before beginning the testing, participants heard the audio recordings of the [aCa] sequence twice during the instructions, with the correct way to identify the sound. The same procedure was followed during the post-test. For each question, participants could select any one of the four segments under consideration.

Table 5: Token minimal pairs – aka/aqa

Token A	translation	Token B	translation
haqaq'o	*to have*	hakak'u	*to have traps*
wuqa	*to be long*	wukat	*did you see?*
ʔakałxa	*to carry out in one's mouth (like a dog)*	ʔaqałwi	*to feel displeased*
ʔakułaxni't	*to taste or sample food*	ʔaqułłiłik	*to buy sthg. from someone*
hak	*for there to be water*	haq	*to swim*
hakuł	*to have water or liquid to drink*	haquł	*to have muscles, or to row a boat*
kała	*black hawthorne berries*	qała	*who*
wak	*to take sthg. away*	waq	*to swim here*
łukin	*to take sthg off*	łuqi	*to be soft and runny*
mankin	*to put sthg. in the way*	manqay	*to roll sthg. in the way*
ʔitkak'u	*to trap*	ʔi:tqa	*for people to stop a while, to rest*

Table 6: Token minimal pairs – aka/ak'a

Token A	translation	Token B	translation
kupiłam	*name of owl*	k'upiłam	*Did he kill it?*
k'akin	*to sort things by hand*	kakin	*wolf*
aʦ'ki	*to tell a lie*	aʦ'k'i	*mountain goat kid*
hakumał	*to be bloody*	hak'unist	*to have a saddle*
pat'inku	*to thicken or harden by cooking*	pat'ink'u	*to thicken or harden by stirring*

Table 7: Token minimal pairs – aqa/aq'a

Token A	translation	Token B	translation
aqutał	*axe*	aq'utał	*fat or tallow*
aqa	*tallow*	aq'a	*thicket*

Table 8: Token minimal pairs – ak'a/aq'a

Token A	translation	Token B	translation
haqaq'o	*to have*	hak'ak'o	*to have a burned spot*
tak'u	*to be able to punch a hole in sthg.*	taq'umał	*to be filthy*
tak'aȼ	*squirrel*	taq'asłiti't	*to find the best way out*
pik'ak	*long ago*	p'iq'	*nighthawk*

Table 9: Nonce tokens

muCałni	mutałanaC
pitiCini	pitiC
Cułsit	aCułsit
upCixa	

Logan et al. (1991) listed minimal pairs on the answer interface, but as there are very few true minimal pairs in Ktunaxa, this option was not available. If the entire word were listed as a potential answer, participants would then be able to listen for other clues as to which is the correct answer, and any information about their ability to distinguish the contrast of stops and ejectives would be lost. Instead, the answer sheet and audio included item numbers for each token, along with a numeric key (1–4) to identify the relevant token.

The training portion was designed to include two different types of training. One part mimicked the testing phase, in that a token was presented and participants had to select which sound they heard. These tokens were repeated three times before the correct sound was identified for the participants, with two seconds between each repetition and 3 seconds between each token. The token was repeated after the correct answer was identified. Both minimal pairs and singlets (single tokens taken from minimal pairs) were used. For the second training type, the sound was identified before the tokens were presented. Ten tokens of each of the four sounds were presented during this excersise.

The purpose of having two types of training was because of the schedule of the trainings, which in turn were the result of a dialog between the community and myself concerning the training schedule. The community was interested in a workshop, and the amount of time on each day was long, but the number of days was small, and two different types of tasks allowed participants to stay involved and attentive throughout the duration of the training. Both types of trainings utilized both Ktunaxa and nonce words, but the nonce and Ktunaxa tokens were not mixed, so that each training repetition utilized one or the other. Tokens were broadcast to

the room with speakers attached to a laptop.

The first day began with a pretest, and the training on this day included two sessions of AX tasks and one session of single presentations. The tokens were all nonce words on this day, primarily so that the single presentations could include a four way contrast of the different sounds in identical environments. The second day included single presentations and AX tasks of both nonce and Ktunaxa tokens. Both of these sessions lasted approximately 3 hours. The third day included no additional training; it began with the post-test and included a debriefing session and a workshop component for community members to continue training on their own.

The training took place in the Ktunaxa Nation training office, in the government building for the nation (as opposed to one of the bands, or communities). All of the participants were present in the room at once, and because of the nature of the community, all of them knew each other, and indeed many had family ties.

Although participants responded to each token on their own during the training, after each session the group debriefed as a whole. The value of this exercise from a research perspective was that I could hear them express what it was that they found difficult and then compare it to the data from the pre- and post-tests. This also created a very supportive, relaxed environment, so that participants reported that they enjoyed the workshop and found it beneficial and engaging.

Twelve women participated in the training. The age range fell into two categories: 21–33 and 40–60, with the latter being the larger group. Additionally, two youths participated, both male and both 11 years of age. Their results are not included, however, as only participants who completed all three sections of questions on both the pre-test and post-test were included in the results. This also resulted in the exclusion of one other participant, a female aged 21.[2] Five of the women were unable to complete the entire training due to work or family commitments. Thus the results of seven participants are reflected in the following data.

All participants had exposure to Ktunaxa through a number of environments, including family/community members, courses, ceremonies and gatherings, and all participants reported direct exposure. Many also reported participation in adult level beginner classes, though they indicated that it was not recent and not continuing.

It is also interesting to note that a number of fluent speakers in the community heard about the workshop and decided to come see what was happening. They were hesitant to offer their own productions of the tokens to the group, so that the recorded tokens were used, but they did offer words of encouragement to the participants, in both Ktunaxa and in English, and offered to model other words that included the sounds under consideration after the workshop.

[2] A few blank items on an otherwise complete section was not sufficient to rule out a participant's inclusion; only if an entire section was left blank on one or both of the tests were a participant's results not included in the final results.

Finally, in keeping with the community's interest in a workshop, and taking advantage of my physical presence in the community, we spent some time explaining some of the differences between the stops and ejectives using tools such as waveforms (the same ones included in Figure 1 to Figure 4). The final day included a brief tutorial on how to look at wave forms and how to manipulate Praat images so that learners could have some kind of feedback when practicing on their own. Both in informal conversations and in anonymous feedback, participants indicated that these tools were helpful, as they demonstrated that there was truly a physical difference in the signal, and that the signal included certain cues that could be useful to them.

Participants asked a number of thoughtful questions about what the differences in the signal mean, and why some sounds still sound the same to their ears. This led to interesting discussions about categorial overlap, in which something that is acoustically identical can be classified in two different categories, and that difficulty in identifying such sounds should not be considered a failure. Our discussion also addressed questions as to what in the acoustic signal might be used by learners to differentiate sounds, including release bursts and the silence preceding ejective releases.

All participants were given a CD with all of the tokens, nonce and Ktunaxa, as well as an honorarium.

4 Results

Although most participants showed improvements between the pre- and the post-tests, I hesitate to call the results conclusive for a number of reasons. The most obvious problem is the paucity of data; seven learners, and pre- and post-tests with 36 items each, are both rather small data sets, and while they can provide compelling results, we cannot interpret those results too broadly. If the test had included 200 items and we had 30 learners to compare, the conclusions would be stronger, but the limited availability of test items and learner participants made such scale impossible.

Another reason to hesitate is that, although five participants showed improvement, only one participant got over 50% of the post-test responses correct, and this is the same person who got half of the responses correct on the pre-test. That the correct percentages are consistently rather low indicate that it is impossible to rule out guesswork as an explanation.

The limited timeframe of the workshop also is a reason to hesitate on drawing conclusions, as it would be very surprising indeed to see genuine category expansion in a matter of days. Indeed, category expansion should be evident long term, so that the improvement would be evident on test scores in 6 months or 8 months. That may not be possible for a number of reasons, however; all that we can say

conclusively now is that participants may be showing early signs of category expansion.

The biggest reason for hesitation is the modifications that were made during the course of implementation. Is it that the controlled training was most effective, or is it that an increased awareness of what they were hearing made the difference? It is impossible to say.

Many participants indicated during discussions that they felt like it was easier to differentiate ejectives from stops, regardless of placement. However, the results of the pre- and post-tests suggest that the participants did better at identifying stops. Overall, participants correctly identified ejectives 38% of the time but correctly identified stops almost 80% of the time, according to the pre-test. The correct identification on the post-test increased to 43% of the ejectives and 82% for stops. Another reported difficulty was distinguishing the correct sound before /u/, and indeed this is supported by the data; of the five test items in which the segment preceded /u/, only one was consistently identified correctly on the post-test. Other patterns, such as the effect of [a] as an adjacent vowel and the relative ease of identifying a final contrasting sound, were suggested by the data, but were inconclusive for the same reasons listed above.

What is illuminating is a more nuanced breakdown of the pre- and post-test results, broken down by sound, as in Table 10.

Table 10: Pre- and post-test responses

	Correct response %				
	/k/	/k'/	/q/	/q'/	Total
pretest	48	23	41	36	39
post-test	46	36	47	40	43
difference	-2	13	6	4	4

These results are encouraging beacuse there was such a marked improvement for the sounds that are not found in English, namely /k'/, /q/ and /q'/, while what might be described as the default category for English speakers, /k/ saw a lower score on the post-test. This is consistent with the notion that the preexisting category will have to break down in order for new categories to be created in a learner's perception. It also is consistent with the anecdotal evidence reported by learners involved in the study. A common refrain after the pre-test was, ``They all sound like k's to me.'' After the post-test, the learners reported that, while still challenging, they could hear the sounds better. The evidence suggests that this is indeed the case.

Also instructive, and particularly beneficial in planning future training, is the confusion matrix in Table 11. In both the pre- and posttest, /q'/ is unlikely to be given as an incorrect response, but is given as a correct response 36% and 40%

of the time respectively. Where /q'/ is given as an incorrect response, it is never the most common incorrect response, as learners regularly prefer the velars and/or stops as responses. My suspicion is that this may be related to the frequency of the the uvular ejective in the language overall. The sound is certainly distinctive, but even in the tokens presented in Subsection 3.3, which represent a fairly accurate crossection of the language, the uvular ejective is simply less common. Learners could be ``playing the odds'' in dispreferring /q'/ as a response.

The relationship between /k/ and /q'/ responses also suggests that learners are in fact able to distinguish something between the different sounds. Correct responses for the velar stops were high, 48% and 46% in the pre- and posttests, but when responses were wrong, the response was much more likely to be /k'/ or /q/, so that these two responses comprise 44% of the total responses when /k/ was the target sound.

The confusion matrix also seems to suggest that, for the uvular stop, the preferred response is the velar, as this was the most frequent incorrect response in both the pre- and posttest. This suggests that future training might benefit from focusing on this contrast first and then working on the stop/ejective contrasts after learners have developed more of a proficiency in distinquishing the place of articulation.

Table 11: Confusion matrix

		Participant response (number of total responses)								
		Pretest					Posttest			
Correct response		**k**	**k'**	**q**	**q'**		**k**	**k'**	**q**	**q'**
	k	**47**	22	21	8	k	**41**	21	23	13
	k'	24	**11**	14	7	k'	17	**15**	17	6
	q	23	9	**29**	8	q	18	12	**27**	11
	q'	4	8	6	**10**	q'	4	6	7	**11**

5 Conclusions

The results of this exercise were inconclusive when trying to answer the question of whether this method is successful at category expansion in the short term. However, the conclusions that we can draw, to my mind, focus on the larger question of category expansion in First Nations communities to meet First Nations needs. A number of techniques are likely appropriate, but techniques that incorporate a more interactive and responsive training methodology may find more support and increased participation from community members.

As mentioned in Section 4, questions remain as to the value of a more explicit training program in First Nations communities. Testing would require a control group of community members receiving conservative stiumulus-response training and another group receiving the explicit training, holding all other things–length of sessions, length of program, tokens used, pre- and post-tests–constant. This may be difficult to achieve in a First Nations community because of the extensive interpersonal ties within these communities provide a back-channel for information, making it challenging to truly control the information each participant is receiving.

Another important factor is the context in which First Nations community members are attempting to learn their heritage language. As one participant stated, ``I could learn the language if I could get over shame.'' Another participant echoed this sentiment: ``I grew up with shame, and then as a teenager I was actually expected to know the language, and I didn't.'' The participants, as mentioned, were all members of the same community who knew each other, many of whom had kinship ties, and there may have been benefits to a mutually supportive group learning environment because of the psychological issues attending language study. Research into this area is well beyond this paper, but the context is nonetheless important to acknowledge.

When conducting a workshop in future communities, one important step should be taken, that of minimizing cognitive load on participants. The response sheets for the pre- and the post-test were blank and asked participants to identify which of the four sounds were contained in the word. This, however, required that they listen to all of the sounds of the word, and other sounds, namely the lateral fricative and the velar fricative, are difficult for learners to perceive and therefore have the potential to cause other problems. A test response sheet that includes the word written out with only a blank for the sound under consideration may result in higher scores as a matter of the task being easier and of the listening being more focused.

The merits of this kind of interactive training need more work to be convincingly demonstrated, with three obvious questions to consider in the short term. The first is the replicability of these results, whether a new set of participants would perform similarly with respect to both the overall results and the confusion matrix. The second is whether a more tighly controlled training would yield different results, something more closely adhering to the work of Logan et al. (1991). The third question is the extent to which either or both of these two methodologies, either a workshop style or traditional training style, are more effective in a neutral population, namely English speakers between 18 and 24 years old. If training yields a better results in this population, i.e. results in which the improvement between pre- and posttest is more pronounced, then this suggests that another approach entirely might be appropriate in a community context, one that perhaps focuses on other factors such as the sociological or psychological characteristics of the communities. Such future work could have important implications not only for the Ktunaxa communities, but also for other communities' efforts to revitalize

indigenous languages.

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