Intonation of yes/no questions in Sḵwx̱wu7mesh

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This paper is a preliminary investigation into the pitch on yes/no questions in Sḵwx̱wu7mesh (a.k.a. Squamish). It has been commonly assumed that Salish languages do not utilize rising pitch to indicate yes/no questions, although until recently no formal studies have been done to substantiate this claim. In this paper I compare the pitch of declarative sentences to yes/no questions. I find that there is no phrase final rise in pitch for yes/no questions. Rather, both sentence types have an overall declination. But, the declination for the yes/no question is less than that of the declarative sentence. What this results in is relatively higher pitch for the predicate in the yes/no question.

1 Introduction

This study is a preliminary investigation into the intonational phrasing of yes/no questions compared to the declarative clauses in Sḵwx̱wu7mesh[1]. A collection of declarative sentences and yes/no questions was elicited. The pitch of these sentences was recorded and analyzed.

2 Background

2.1 Intonation of yes/no questions

Salishanists have observed that Salish languages have no sentence final rise for yes/no questions, although until recently no formal studies have been done to substantiate this. For Saanich, Benner (2005) has described the intonational pattern of the yes/no question as being identical to the declarative sentence pattern with no sentence final rise. She described both sentence types as having a drop on the final syllable of the given sentence. What makes this

[1] A complete chart of IPA equivalents to the Sḵwx̱wu7mesh orthography is present in Appendix 2.

Thank you to Dr. Guy Carden for help in designing this study and to Karsten Koch and Donald Derrick for their assistance with the statistics. Responsibility ultimately lies with the author. Chen kw'enmantumi, ta new, n-si7la kwis i7x̱w ta na s7usuntsaxw. (Thank you especially to my grandmother, Lena Jacobs).

description interesting is that rising intonation is considered as a near universal for questions. For example, Ladd's (1981) *Strong Univeralist Hypothesis* claims that pitch rising indicates questions and that pitch falling indicates statements. Sḵwx̱wu7mesh, and Saanich, would then seem to provide counter-evidence for this claim.

While it might seem unnecessary in a given language to have both morphological marking for yes/no questions, as well as a special intonation pattern, I am assuming that Sḵwx̱wu7mesh does. Chinese is a language which has both a yes/no question particle and also a specific intonational pattern for yes/no questions (Yuan, et al, 2002). Yuan, et al. examine yes/no questions without the question particle. They find that Chinese does have a sentence final phrase curve that differs compared to a declarative clause. Their study involves phrase 'curves' instead of simply rising pitch since Chinese is a tonal language. The curve is essentially an overall rise at the end of the question sentence compared to the declarative sentence (Yuan, et al. 2002). Thus Chinese is an example of a language with rising pitch for yes/questions.

There are languages, though, which don't fit this putative universal pattern of having rising pitch for questions, languages such as Bengali and Chickasaw. Declaratives in Chickasaw have a high-rise contour for declaratives and a falling contour for interrogatives – the almost exact opposite pattern of English. In Chickasaw, there is no rising pitch associated with interrogatives. Bengali has a low fall for neutral declaratives, and a post-rise step fall for interrogatives. Both sentence types have falling pitch, but questions differ in having a high falling pitch (Gussenhoven 2004). Bengali, then, does have higher pitch associated with questions, just not rising pitch.

Hungarian is another language which has high pitch for questions, but not rising pitch. Questions have a high-falling pitch associated with the right edge. This falling pitch, to an English speaker, sounds like a declarative falling accent (Ladd, 1996).

Other languages have identical intonational patterns for questions and declaratives, and simply raise the pitch register to differentiate questions from declaratives. Jiti, a tonal language does this (Downing 1996, cited in Gussenhoven 2004). Malay, a non-tonal language, simply begins a question at a higher pitch as compared to a declarative sentence, but the intonational patterns do not differ (Gussenhoven 2004).

Impressionistically, Sḵwx̱wu7mesh yes/no questions do not pattern the same as many Indo-European languages, which typically have some type of sentence final rise. Preliminary evidence from wh-questions in Sḵwx̱wu7mesh seems to indicate that these types of questions at least do utilize some type of rising pitch on the wh-question word. This rise, though, is not sentence finally.

In this study I will test four hypotheses. The first test will be to see if there is a sentence final rise for the yes/no question in Sḵwx̱wu7mesh between the last two syllables. This data also will help give a comparison of the nature of the final syllable with that in Saanich. Secondly, I will test to see if there is an overall pitch rise from the initial syllable to the final syllable of the yes/no

question. This test will help determine if Sḵwx̱wu7mesh fits Ladd's *Strong Univeralist Hypothesis*. Thirdly, I will test each individual syllable to see if there is a rise in pitch on any individual syllable in the sentence. Fourthly, I will test to see if there is simply a higher pitch on any individual syllable of the yes/no question as compared to the declarative sentence. This test will help to see if there is an initial higher pitch on the yes/no question like in Malay, or if there is a higher pitch on some other part of the sentence, as in Hungarian.

2.2 Sḵwx̱wu7mesh grammar

In this section I will present the basic grammar of Sḵwx̱wu7mesh as it relates to declarative clauses and to yes/no questions.

2.2.1 Word order of 1st and 2nd person subjects

Sḵwx̱wu7mesh has subject clitics for 1st and 2nd persons (but not for 3rd person). These clitics are:

chen	1st person singular subject; 1sub
chexw	2nd person singular subject; 2sub
chet	1st person plural subject; 1plsub
chap, chayap	2nd person plural subject; 2plsub

These subject clitics can appear either before or after the main predicate with differing effects on the tense/aspect/modality (TAM) of the clause. A subject clitic before the main predicate indicates past/present tense (1), and a subject clitic after the main predicate indicates future tense (2). All the sentences in this study use the first pattern[2].

1) chen ilhen
1sub eat
'I ate, or, I am eating.'

2) ilhen chen.
eat 1sub
'I will eat.'

2.2.2 Yes/no questions

A yes/no question in Sḵwx̱wu7mesh is constructed with a second position clitic (7)u. This clitic always attaches to the first word/clitic in the

2 Abbreviations are as follows: fut = future tense, pa = pluractional marker, pq = polarity question, rl = realis, sbj = subjunctive, tr = transitive, 1sub = 1st person singular subject clitic, 2sub = 2nd person singular subject clitic, 3conj = 3rd person conjunctive clitic.

clause. The yes/no question particle is attached to a reduced form of the realis clitic n(a) in example (3). Sentence (4) gives an example of the yes/no question particle following a word other than the realis clitic.

3) n-u chexw kw ilhn?
rl-pq 2sub already eat
'have you eaten?'

4) mi u chexw ek' ilhen
come pq 2subj fut eat
'will you come and eat?'

3 The experiment

The consultant for this study is a 94 year old native speaker of the Sḵwx̱wu7mesh language, who is also fluent in English.

A list of 20 declarative sentences in English with a first person singular subject along with 20 corresponding yes/no questions in the second person singular were orally presented to the consultant. I asked the consultant to translate the sentences one by one into Sḵwx̱wu7mesh after I said the English sentence. She repeated the Sḵwx̱wu7mesh sentence, usually twice. I tried to choose predicates that are bisyllabic with stress on the initial syllable. One of the verbs, though, was bisyllabic with stress on the final syllable. Not all the verbs were given in Sḵwx̱wu7mesh in their bisyllabic form but rather in their reduplicated, trisyllabic form (a form indicating an aspectual difference). In some cases the consultant misheard the English sentence which is why I don't have corresponding yes/no questions for all the declarative clauses.

The sentences were recorded onto a Sharp Minidisc recorder using an Audio-Technica 800 Series microphone.

The sentences were each digitized onto my PC computer using Microsoft Sound Recorder. The pitch of the vowel of each syllable was analyzed using Praat software. I made two tables, one for the values of the declarative sentence and one for the yes/no questions.

In the table for the declarative clauses, I recorded the initial, mid and final readings for the pitch of each syllable. These values are recorded as a, b, c for initial, mid and final readings respectively. The clitics at the beginning of the sentence are marked DC-1 (i.e. Declarative Clitic 1) for the first clitic in the sentence and then DC-2 (i.e. Declarative Clitic 2) for the second clitic in the sentence. Thus, the initial reading for the first syllable is marked DC-1a, and the mid reading for this syllable is DC-1b, etc. The final part of the sentence (as far as this study went) was the predicate. These are marked DP-1, DP-2, DP-3. For the reduplicated predicates, there were three syllables in the predicate. In the table, column DP-1 contains the values for the last syllable in the sentence, DP-2 represents the values for the penultimate syllable, and DP-3 represents the anti-penultimate syllable – that is, the few cases where the predicate was trisyllabic.

The final syllable of the sentence was always recorded in the same column to test for a phrase final rise.

For the yes/no questions, the clitics are marked as QC, and the syllables of the predicate are marked as QP. The rest of the numbering is the same as for the declarative clauses.

4 Results

4.1 Breakdown of clitic string in the samples

n-u
realis-yes/no

kw
already

wa
pluractional

chxw = chexw
2nd person subject

'mi
come, become

predicate
- in all cases for these sentences the predicate is the final word in the sentence.

4.2 Declarative sentences

1)	Chen ilhen.	*I ate.*
2)	Chen shukw'um.	*I bathed.*
3)	Chen lulum.	*I sang.*
4)	Chen tawtsm̓	*I bought food.*
5)	Chen t'ayak̲'	*I got angry.*
6)	Chen m̓i t'ixwi7.	*I came down.*
7)	Chen tl'iya7.	*I stopped.*
8)	Chen wa ts'úts'ulhum̓.	*I'm cold.*
9)	Chen wa sem̓úm̓at.	*I'm feeling lazy.*
10)	Chen umsm.	*I woke up.*
11)	Chen lhích'it.	*I cut it.*
12)	Chen lhích'it.	*I cut it.*
13)	Chen ts'its'áp'.	*I worked.*
14)	Chen ch'áwat.	*I helped.*
15)	Chen ítut.	*I slept.*

16) Chen p'áyaḵ. *I got better.*
17) Chen p'í7nexw. *I got it.*
18) Chen míkw'in. *I washed it.*
19) Chen míkw'in. *I washed it.*
20) Chen sáḵ'an. *I tore it.*

- the first column of numbers in the table below matches the numbers of the sentences above.

Table 1: Values for Declarative sentences

	DC -1a	DC -1b	DC -1c	DC -2a	DC -2b	DC -2c	DP -3a	DP -3b	DP -3c	Dr -2a	DP -2b	DP -2c	DP -1a	DP -1b	DP -1c
1	231	210	188							186	175	175	197	184	168
2	233	208	202							217	169	153	166	165	161
3	219	192	189							185	171	172	161	166	163
4	255	230	211							240	206	192	181	165	153
5	230	206	198							154	151	164	145	157	157
6	231	212	216	239	216	200				179	166	158	183	170	164
7	214	202	205							194	187	187	153	153	148
8	249	218	211	192	182	179	194	175	172	170	161	160	184	176	158
9	237	200	190	172	180	188	191	186	165	181	169	157	170	175	173
10	228	211	214							206	191	166	195	181	166
11	233	209	197							182	167	162	151	157	159
12	232	207	192							189	161	154	167	155	144
13	228	203	188							203	183	175	170	152	152
14	225	199	193							176	174	174	154	150	147
15	245	216	186							182	174	169	179	174	165
16	229	215	207							147	151	153	146	139	140
17	248	222	208							207	206	192	175	178	168
18	232	210	198							187	178	165	155	153	156
19	218	207	180							189	185	172	169	161	170
20	204	196	179							219	201	194	148	156	157
Mean	231	209	198							190	176	170	167	163	158
Sdev	12	9	11							22	16	13	16	12	9

4.3 Yes/no questions

1)	nu chexw kw ilhen?	*did you already eat?*
2)	nu chexw kw ilhen?	*did you already eat?*
3)	nu chexw shukw'um?	*did you bathe?*
4)	nu chexw lulum?	*did you sing?*
5)	nu chexw táẇtsm?	*did you buy food?*
6)	nu chxw wa t'áyak̲'?	*were you angry?*
7)	nu chxw ṁi t'íxwi7?	*did you come down?*
8)	nu chexw tl'íya7?	*did you stop?*
9)	nu chxw wa ts'úts'ulhuṁ?	*are you cold?*
10)	nu chxw wa ts'úlhuṁ?	*are you cold?*
11)	nu chexw ts'áyakw? (1)	*are you worried?*
12)	nu chexw ts'áyakw? (2)	*are you worried?*
13)	nu chxw wa s7úmsm?	*are you awake?*
14)	nu chexw umsem?	*are you awake?*
15)	nu chexw lhích'it	*did you cut it?*
16)	nu chexw ts'its'áp'	*did you work?*
17)	nu chexw ch'áwat	*did you help him?*
18)	nu chexw ch'áwat	*did you help him?*
19)	nu chexw ítut	*did you sleep?*
20)	nu chexw p'áyak̲	*did you get better?*
21)	nu chexw p'í7nexw	*did you get it?*
22)	nu chexw míkw'in	*did you wash it?*
23)	nu chexw sák̲'an	*did you rip it?*

- the first column of numbers in the table below matches the numbers of the sentences above.

Table 2: Values for Yes/no question

	QC-1a	QC-1b	QC-1c	QC-2a	QC-2b	QC-2c	QP-3a	QP-3b	QP-3c	QP-2a	QP-2b	QP-2c	QP-1a	QP-1b	QP-1c
1	213	202	192	238	207	195				229	215	194	213	198	176
2	209	210	188	205	206	185				238	201	145	192	188	169
3	237	205	195	224	185	168				225	184	176	173	166	168
4	241	212	217	247	243	223				199	183	188	164	183	195
5	202	194	176	217	193	167				201	176	175	183	171	169
6	225	208	212	228	229	229				211	180	170	154	169	170
7	219	204	190	235	217	211				197	179	166	193	166	161
8	239	214	211	239	203	192				197	196	181	180	162	163
9	201	197	190	222	188	167	180	185	174	167	143	163	194	172	170
10	208	218	214	241	225	211				186	173	169	176	184	177
11	211	203	183	246	230	198				243	191	205	177	159	141
12	188	186	173	189	170	157				171	149	152	154	159	152
13	203	209	196	213	188	182				208	188	182	194	174	175
14	214	213	218	254	228	194				236	211	198	208	177	164
15	199	184	175	239	213	205				228	216	205	191	172	168
16	225	208	192	234	190	181				238	209	194	183	170	168
17	193	199	193	236	218	196				189	178	168	166	163	174
18	181	173	168	219	212	192				202	172	167	166	160	165
19	196	204	197	228	210	183				225	209	182	175	177	165
20	190	199	174	227	207	174				170	163	151	151	166	157
21	200	192	179	237	217	188				223	204	169	191	187	178
22	211	212	189	244	224	196				223	209	180	174	169	160
23	201	200	195	220	200	173				210	195	197	173	177	169
Mean	209	202	192	230	209	190				209	188	177	179	173	168
Sdev	16	11	15	15	18	18				23	20	17	16	10	10

4.4 Statistical Values

4.4.1 Final rise on yes/no questions

Table 3: t-test for sentence final rise on yes/no questions

	pitch values	t-test
QP-2b to QP-1b (yes/no questions)	188-173	$P < 0.0001$
DP-2b to DP-1b (declaratives)	176-163	$P < 0.0001$

For the final two syllables I tested for a rise in pitch from the penultimate syllable to the final syllable. In this comparison I used the mid-syllable value for each syllable. In both the yes/no questions and in the declaratives there is a drop in the average overall pitch. The t-tests for both clause types indicate that this drop in pitch is significant.

4.4.2 Test for overall pitch rise from the beginning of the sentence to the end

Table 4: Oneway Analysis of change in pitch from the start to the end of a sentence for declarative and yes/no questions (mid-point of syllable)

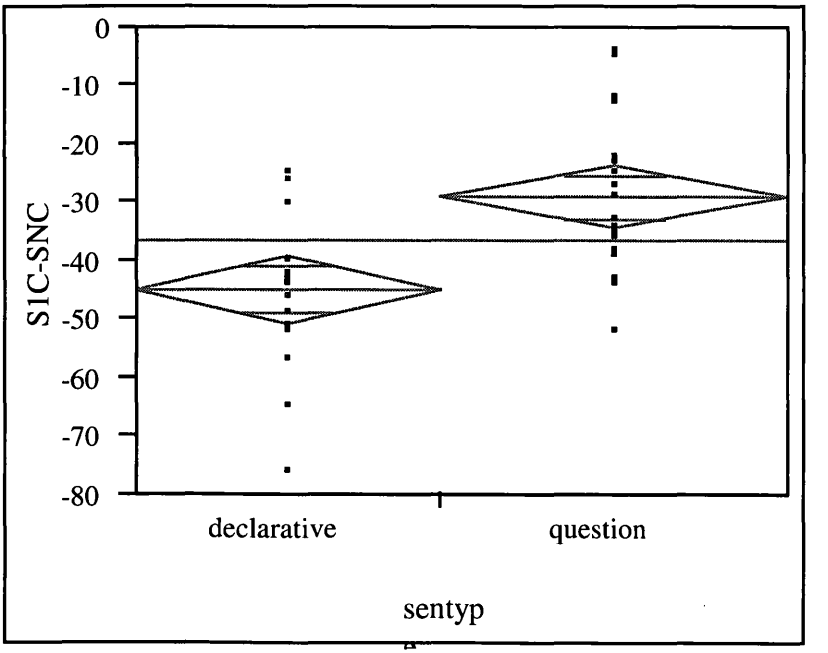


Table 5: Oneway Anova

Summary of Fit

Rsquare	0.29407
Adj Rsquare	0.276853
Root Mean Square Error	12.55607
Mean of Response	-36.814
Observations (or Sum Wgts)	43

Table 6: t-test

Declarative-question (Assuming equal variances)

Difference	-15.865	t Ratio	-4.13273
Std Err Dif	3.839	DF	41
Upper CL Dif	-8.112	Prob > |t|	0.0002
Lower CL Dif	-23.618	Prob > t	0.9999
Confidence	0.95	Prob < t	<.0001

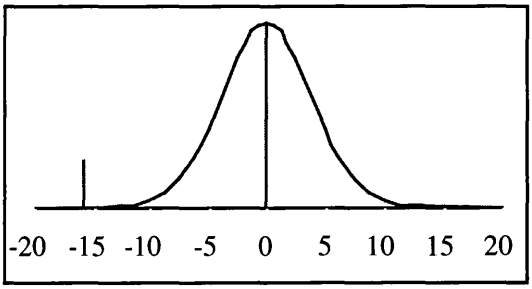


Table 7: Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Sentype	1	2692.6595	2692.66	17.0794	0.0002
Error	41	6463.8522	157.65		
C. Total	42	9156.5116			

Table 8: Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Declarative	20	-45.300	2.8076	-50.97	-39.63
Question	23	-29.435	2.6181	-34.72	-24.15

(Std Error uses a pooled estimate of error variance)

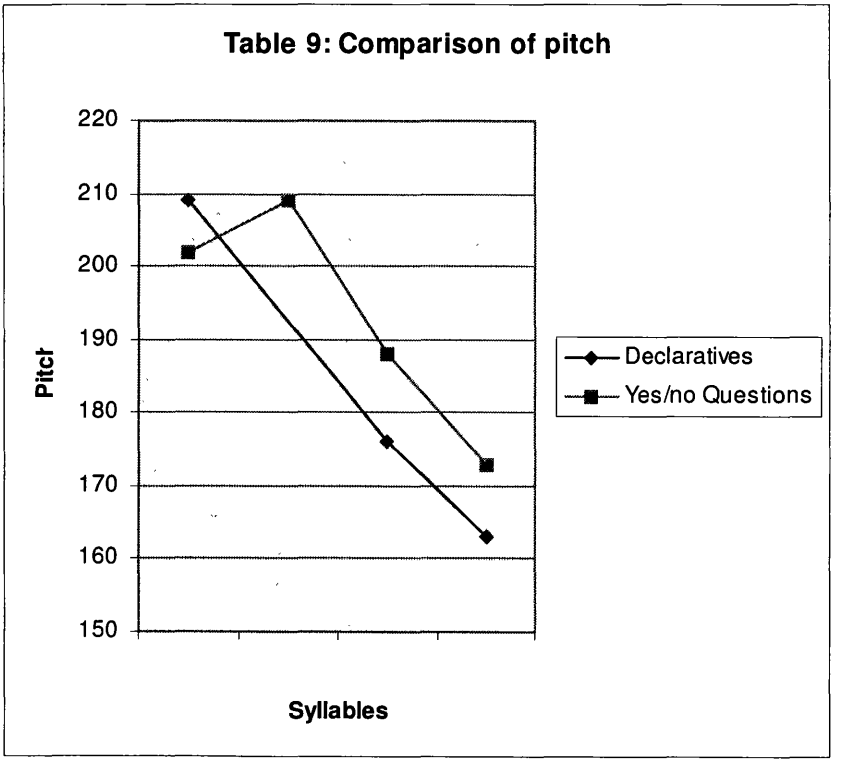
These statistics are designed to test to see if there is an overall pitch rise for the yes/no question as compared to the declarative sentence. The pitch

readings that are used are from the mid-point of the initial syllable of the clause to the mid-point of the final syllable of clause.

The pitch readings indicate that there is an overall declination for both sentence types. The yes/no question, although it still has an overall declination like the declarative, on average ends at 15.865 Hz higher than the declarative sentence. The p-value ($p < 0.0001$) indicates that this difference in declination is statistically significant.

In the following graph I have plotted the average pitch for the syllables with a line graph. For the yes/no questions I have marked four syllables, and for the declaratives I have marked three syllables. The initial syllable of the declarative is at the beginning of the chart, but the second and third syllables are aligned with the final two syllables of the yes/no question. This gives a comparison of the pitch values of the predicate.

Table 9: Comparison of pitch



4.4.3 Rise on individual syllable

Table 10: t-test for rising intonation on individual syllable on yes/no question.

	Clitics				Predicate			
	First Syllable		Second Syllable		Penultimate Syllable		Final Syllable	
	Initial to mid	Mid to final	Initial to mid	Mid to final	Initial to mid	Mid to final	Initial to mid	Mid to final
Pitch	209-202	209-192	230-209	209-190	209-188	188-177	179-173	173-168
t-test	0.0473	0.0060	0.0001	0.0004	0.0008	0.0282	0.0496	0.0528

The t-test was done for the first and second syllables of the clitic phrase, and for only the final and penultimate syllables of the predicate. There were not enough tokens to do any statistically significant tests for the antepenultimate syllable. This set of tests was done to check if there is a rise in pitch on any one syllable in the yes/no question.

For all the syllables in this study there is consistently a drop in pitch over the course of each individual syllable, regardless of where the syllable is in the sentence. The t-tests indicate that this is statistically significant for all syllables except for the final syllable. The final syllable is the only one that does not have a statistically significant drop in pitch over the course of the whole syllable. The t-test value for the first part of the syllable shows that the drop from 173-164 is not significant (t-test: 0.19), and the drop on the last half of the syllable is not statistically significant either (t-test: 0.0528).

4.4 Test for high tone

Table 11: t-test for high tone

	pitch values	t-test values
i) DC-1b to QC-1b (initial syllable)	209 > 202	0.0165
ii) DP-2b to QP-2b (penultimate syllable)	176 < 188	0.0205
iii) DP-1b to QP-1b (final syllable)	163 < 173	0.0053

For these tests I used the mid-point reading of the respective syllable for comparison.

For the initial syllable, the declarative sentence has a significantly higher pitch than the yes/no question. The t-test value of 0.0165 ($p < 0.05$) indicates that this is a significant difference in pitch.

For the penultimate syllable, though, the average pitch of the yes/no question is significantly higher than the declarative clause. The t-test value of 0.0205 indicates that this is a significant difference in pitch.

The final syllable also has significantly higher pitch for the yes/no question when compared to the declarative clause. The t-test value of 0.0053 indicates that this difference in pitch is significant.

Overall we have significantly higher pitch on the initial syllable of the declarative sentence, but higher pitch on the final two syllables of the yes/no question.

5 Discussion

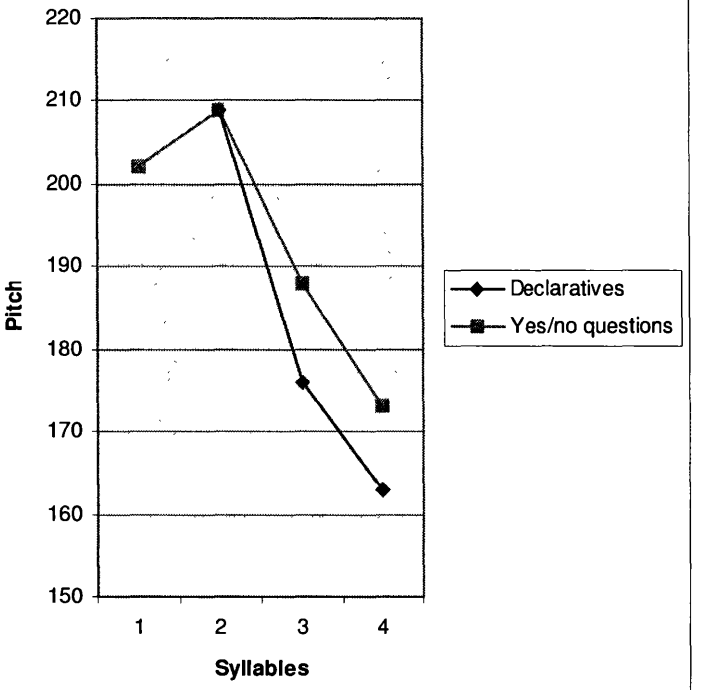
In Sḵwx̱wu7mesh I have found that there is no rise in pitch for the last two syllables. Neither is there an overall sentence rise in pitch in the yes/no question. Furthermore, there is no rise in pitch on any individual syllable in the yes/no question. This finding is significant since it has been claimed that pitch rising is a near universal for questions (Ladd 1996).

While there is a consistent declination in pitch for both sentence types, the yes/no question begins on a lower pitch and ends on a higher pitch than declaratives. Said another way, the declaratives start on a higher pitch than yes/no questions and end on a lower pitch. This was shown graphically in Table 9 above.

The difference for the initial syllable may have to do with the nature of the actual segments in these initial syllables. The initial clitic in the declaratives was /chen/ which has an aspirated affricate as the initial segment followed by schwa. While the initial clitic in the yes/no question was /nu/ which has a nasal as the initial segment followed by a full vowel. The nature of the relative pitch of vowels in Sḵwx̱wu7mesh was examined by Watt et al. (2000). They examined the quality of full vowels (a, i, u) in Sḵwx̱wu7mesh, but they did not examine and compare the vowel quality of schwa.

After constructing Table 9, though, I noticed that the average pitch on the subject clitic in both sentence types is exactly the same. If the pitch of these clitics is matched up in a line graph, it appears that it is only the difference in pitch on the predicate that differentiates these two sentence types. Possibly the somewhat lower pitch on the initial clitic collocation for the yes/no question (n-u) has to do with the interaction of the pitch of clitics, and not because of sentence types. Compare this graph in Table 12 with Table 9.

Table 12: Comparison of pitch



From a phonological viewpoint, the consistent drop in pitch from the penultimate to the final syllable in both clause types is consistent with the presence of a downstep edge tone (to use the terminology of the Auto-segmental approach to intonation) (Ladd 1996). In order to have this low tone perceptible there must be higher pitch on the preceding syllable, and thus the penultimate syllable would have a high tone.

Some preliminary evidence that this putative downstep may be part of the intonational phonology of both sentence types comes from the one sentence where the predicate is bisyllabic with final stress. Even though the stressed syllable is the final syllable in the clause, this syllable is still realized with lower pitch than the preceding syllable. Normally one of the correlates of stress in Sḵwx̱wu7mesh is higher pitch. In this case, then another correlate of stress in Sḵwx̱wu7mesh - vowel length - is all that distinguishes this stressed syllable from the previous unstressed syllable. The stressed syllable is still 1.5 times longer than the unstressed syllable (Kuipers 1967).

A further avenue to pursue in understanding pitch in Sḵwx̱wu7mesh as it relates to yes/no questions is to try and tease apart the interaction of pitch on the

predicate and the overall declination pattern for both sentence types, since in this study the predicate coincides with the end of the sentence. A further test that could confirm that there is a pattern of higher pitch associated with the predicate separate from the end of the sentence of the yes/no question is to test them in the future tense. In the future tense, the predicate is initial in both the yes/no question and in the declarative sentences. For example:

a) lhích'-it u chen?
cut-tr pq 1sub
"should I cut it?"

b) lhích'-it chen ek'
cut-tr 1sub fut
"I will cut it."

This test would help to determine if the higher sentence final pitch for the yes/no questions is due to a distinct sentence declination pattern to distinguish them from declaratives, or if this higher pitch is due to higher pitch being associated primarily with the predicate, wherever that happens to be in the sentence. By further adding a determiner phrase or temporal phrase we could control for a sentence final downstep. If the sentence final pitch is always higher for the yes/no question, this difference should still be available with the same phrase.

c) lhích'-it u chen ta sts'úkwi7?
cut-tr pq 1sub det fish
"should I cut the fish?"

d) lhích'-it chen ek' ta sts'úkwi7
cut-tr 1sub fut det fish
"I will cut the fish"

e) lhích'-it u chen k kwayl-es
cut-tr pq 1sub sbj next.day-3conj
"Should I cut it tomorrow?"

f) lhích'-it chen ek' kwayl-es
cut-tr 1sub fut next.day-3conj
"I will cut it tomorrow."

Timá tkwetsi tin snichim
(This is all I have to say)

Appendix 1

An interesting interaction between stress and pitch came out of this study for the one word with final stress - the predicate **ts'its'áp'** *to work* . The pitch on this stressed syllable is lower than the pitch on the unstressed, initial syllable. Although comprehensive comparison of vowel duration is beyond the scope of this study, initial findings seem to indicate that the duration of the stressed syllable is about 1.5 times as long as the unstressed syllable, in this one word at least. This finding is consistent with Kuipers (1967) description of the difference between stressed and unstressed vowels. He describes stressed, full vowels as 1.5 times as long as unstressed full vowels. This is also the finding of Watt (2000).

Interestingly in this study, though, is that this difference in duration is still evident even when the pitch level is lower on the stressed vowel than the preceding unstressed vowel. One hypothesis about why the pitch is lower in this instance is that it may have to do with presence of a L%, a low edge tone, which is overriding the high pitch correlate with stress. Nevertheless, the durational correlate with stress is maintained. A comparison with this same sentence with a temporal DP following the predicate **ts'its'áp'** might show whether this hypothesis holds. The final syllable of the temporal DP should take the low tone of the edge tone. This would leave the stressed vowel of the predicate to be realized with high pitch also, and not just with length.

Appendix 2 Sḵwx̱wu7mesh – IPA equivalents

a	a	m'	m'
aa	a:	n	n
ch	tʃ	n'	n'
ch'	t'ʃ	p	p
e	ə	p'	p'
h	h	s	s
i	e	sh	ʃ
ii	e:	t	t
k	k	t'	t'
k'	k'	tl'	t'ɬ
kw	k^w	ts	ts
kw'	k'^w	ts'	t's
ḵ	q	u	o
ḵ'	q'	uu	o:
ḵw	q^w	w	w
ḵw'	q'^w	w'	w'
l	l	xw	x^w
l'	l'	x̱	X
lh	ɬ	x̱w	X^w
m	m	7	ʔ

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