Uptalk: Towards a quantitative analysis

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The use of high-rise terminals, or uptalk, continues to be a point of contention in the study of intonation. Researchers continually produce conflicting descriptions of it in an effort to define it, including conflicting explanations of its connotation or significance in conversation. These difficulties suggest that ToBI, the most frequently used system of annotation for intonation, cannot adequately describe the contour. The definitions of uptalk produced using ToBI do not allow it to be distinguished from other contours, namely question intonation. This study tries to define the contour, not by describing it as ToBI does, but by measuring the pitch excursions that speakers produce in these contours in relation to the overall pitch range of the phrase in which it was produced. The results of the study show that the excursions produced in uptalk fall in the mid range of rises, steeper than those of other declarative statements, but not as steep as those produced in question intonation. This provides a potential set of criteria which can be used to precisely distinguish uptalk contours. The ability to identify contours based on the height of the pitch excursion exhibited also points to the possibility of the use of categorical perception of intonation contours by native speakers of English.

1. Introduction

The use of uptalk (Fletcher and Loakes, 2006), or high-rise terminals (HRTs) (Warren, 2005) is an increasingly studied feature of English intonation. Commonly associated with the speech of teenagers and specifically that of female teenagers, uptalk is characterized by the use of rising intonation at the end of declarative phrases resulting in a sound pattern in which “every sentence ends with an interrogative tone so that it sounds like a question even when it's a statement” (Seaton, 2001).

What makes this use of rising pitch so noteworthy is that rising intonation is a feature normally associated with yes/no questions. Researchers, linguists observers, and laypeople alike are startled to find the rising intonation cropping up at the end of declarative statements, which, according to traditional accounts of English intonation, should end in falling patterns (Hirschberg & Pierrehumbert, 1986). Recently, research has begun to try to characterize the uptalk contour using the Tone and Break Indices (ToBI) (Pierrehumbert, 1980), a theoretical framework and system of annotation used to describe and classify intonation patterns. While ToBI, described in greater detail below, has proven very useful in acting as a tool for describing most intonation patterns, its shortcomings become evident when trying to provide a representation and analysis of uptalk. The ToBI system is designed to characterize phonologic intonation patterns and is not necessarily
equipped to deal with the apparent phonetic variation that exists between particular intonation contours. ToBI’s strictly qualitative descriptions have resulted in multiple and conflicting definitions of uptalk by various researchers. This paper examines rising intonation and attempts to provide a narrower definition of the pattern beyond the ToBI labeling system, which does not allow for an annotation that uniquely identifies the uptalk pattern. It will use pitch excursion of the phrase boundary, the defining feature of uptalk, which distinguishes it from falling declarative phrases, in order to quantify the intonational rise. This will serve to align our perceptual understanding of uptalk in relation to other rising intonation patterns.

Conventionally, discussions of English intonation patterns include a description of declarative statements as ending in falling or descending pitch sequences. Alternatively, question intonation is characterized by a rising pitch sequence (Pierrehumbert & Hirschberg, 1990). The application of the question-like intonation pattern to declarative statements, named uptalk, carries implications for the English system of intonation. The extension of use of one contour onto the semantic meaning of another could indicate a shift in the use of the previously established system of intonation.

While often regarded as a new phenomenon, this linguistic trend has been observed in many English speaking countries including Canada (Shokeir, 2008), the United States (McLemore, 1991), Australia (Fletcher and Loakes, 2006) and New Zealand (Shokeir, 2008; Warren, 2005). While the origin of uptalk is still up for debate (Shokeir, 2008), its use is speculated to be on the rise. Its potential origin has been linked to everything from Californian surfer culture, Australian soap operas, to a residual effect of a politically correct culture in which the hesitant and non-committal effect of the tone is thought to protect people in a society “where people tiptoe around their beliefs by monitoring their language” (Seaton, 2001). Seaton (2001) even speculates that it may have roots in Irish dialects, which have, over generations, migrated all over the world. The use of this contour is thought by some to be a marker of uncertainty and lack of confidence (as cited in Shokeir, 2008, p. 1; Warren, 2005).

The use of variable descriptions of uptalk by researchers makes it difficult to assign a concrete and stable definition. However, this confusion opens the door to an alternative method of analysis. Because uptalk employs question intonation for declarative sentences, the uptalk intonation contour must fall somewhere in between, and employ elements of both declarative and question intonation contours, perhaps with little consistency. What is clear, however, is that uptalk phrases end with a particular pitch excursion in which the speaker’s pitch quickly rises from a moderate level pitch to some higher value, so that the boundaries of these statements end in a High tone, or raised pitch. Therefore, it may be a question of how high the final tone travels in comparison to a speaker’s declarative statement and question contours. It is possible that it is not the absolute value of the excursion, which we perceive, but instead the height of the excursion in proportion to the speaker’s overall pitch range. By calculating this ratio for each instance of rising intonation, this study hopes to uncover the underlying factors, which differentiate the three contours of plateau, uptalk, and question intonation, and provide a means of classification that will aid in the distinction of the controversial uptalk contour.

2. Modern Methods of Intonation Analysis

Intonation is described by Ladd as “the use of suprasegmental phonetic features to convey ‘postlexical’ or sentence-level pragmatic meanings in a linguistically structured way” (1996:6). It includes the analysis of F0 (pitch), intensity (loudness) and duration (Ladd, 1996). More broadly, it examines the pitch, rhythm, and tempo of speech (Baumann, 2006).

The phonetic study of intonation has changed dramatically over the past century and, with current advances in technology, has evolved to rely on the use of computer programs (e.g., Pitch
Works, PRAAT (Boersma & Weenink, 2006)) which are used to graphically represent sound. One screen can show pitch, intensity, duration, harmonics, etc. of a sound.

The ToBI annotation system, developed by Pierrehumbert (1980), allows for descriptive phonetic and phonological analyses of the intonational inventories of languages. This highly innovative system was unlike any other in use at its inception. Previously developed systems, which found their footholds in acoustic analysis, analyzed pitch in a very broad sense, focusing on local F0 movements which allowed for the assignment of a slope or contour which would approximate the complex movements of the intonation contained within the phrase (Ladd, 1988). Later, researchers developed a system based more in the theoretical underpinnings of linguistics. The crucial element in this system is that “no element is superimposed on any other” (Ladd, 1988:530). Instead, it uses targets to indicate the linguistic elements of the F0 contour, and denotes interpolations in the contour with a series of highs and lows. The establishment of this theory, now commonly referred to as ToBI, set the new standard for intonation analysis and has been influential in all intonational study thereafter.

3. ToBI Annotation Conventions

The most common way to transcribe intonation in the Autosegmental-Metrical (AM) model is with the Tone and Break Index (ToBI) system of annotation (Beckman & Hirschberg, n.d.; Pitrelli, Beckman, & Hirschberg, 1994). In addition to displaying the spectrogram, pitch, and intensity, this system has three main tiers: a tone tier, an orthographic tier, and a break-index tier. In the tone tier, phrasal and pitch accent tones are indicated using H, L, and a number of diacritics, such as ‘*’ (for example, H* or L*), indicates a pitch accent tone; ‘-’ (L-) indicates a phrase accent; ‘%’ (e.g., H% or L%) indicates a boundary tone.

In the orthographic tier, words are usually written syllable-by-syllable or phoneme-by-phoneme. The break index tier uses a numeric system (from 0, which represents no break between words, to 4, a major phrase boundary) to indicate the length of silence between words. Different versions of ToBI need to be developed for different languages (Beckman & Hirschberg, n.d.). A subset of ToBI labels, collectively referred to as E_ToBI, (Beckman & Hirschberg, n.d.) uses the H and L tones and accompanying diacritics in order to characterize the features of English intonation described in the following section.

3.1 Pitch accents

Pitch accents are used in English to display prominence and stress (Venditti, 2005). They are also used to denote an element of contrast or focus in the phrase within the context of discourse, with the most informative part of the utterance being the most intonationally prominent (von Heusinger, 1999). The pitch accent is realized as the alignment of a change in pitch with the stressed syllable, which is determined by the prominence pattern of the text. The nuclear accent is the phrase’s final pitch accent (von Heusinger, 1999).

Six types of pitch accents have been identified in English intonation: two simple accents (H* and L*), and 4 complex or bi-tone accents (L*+H, L+H*, H*+L, H+L*) (Pierrehumbert & Hirschberg, 1990).

Pairing the starred diacritic with the phrase’s accented syllable denotes the accented portion of the utterance, with the unstarred tone of the bi-tone accent either preceding or following the starred tone. It is important to note, however, that focused items in English become prominent due to the occurrence of an accent, and not the type of accent (Pierrehumbert & Hirschberg, 1990). A focused item does not necessarily receive an H* tone, nor would a focused item marked with an H* be more intonationally prominent than one marked with an L*. 
3.2 Pitch and Standard Intonational Contours

As a post-lexical feature of English, pitch does not contrast lexical items; instead, it contrasts intonational meanings (Beckman & Pierrehumbert, 1986). The readability of intonational contours is debatable, due to the many meanings a single contour can carry. The interpretation of intonational contours is dependant on hearer-speaker understanding and context. However, it is possible to identify contours which are frequently employed and assign them a generalized meaning (Pierrehumbert & Hirschberg, 1990), as in (1) through (7) below.

1. **H*H-H%**: high–rise question intonation
   This contour is used by the speaker to offer new information, while the H boundary tone searches for a confirmation of accuracy from the listener (Pierrehumbert & Hirschberg, 1990).

2. **L*H-H%**: Yes – No question contour
   This contour conveys to the listener that the speaker is very much in doubt of what response they will receive (Pierrehumbert & Hirschberg, 1990).
   The L*H-H% contour can also be used to convey incredulity (Liberman & Sag, 1974) or contradiction, that is, that the speaker is reconfirming something that the hearer should already know.

3. **H*H-L%**: Plateau contour
   The plateau contour is used in instances where the speaker wishes to add information to what has previously been said to provide additional detail so as to elaborate on earlier statements (Pierrehumbert & Hirschberg, 1990).

4. **L*+H-L-H%**: This contour is “used to convey uncertainty about a scale evoked in the discourse” (Pierrehumbert & Hirschberg, 1990:295), and more generally that the speaker is not fully committed to what they are saying.

5. **L+H*L-H%**: This contour is used to “mark a correction or contrast” (Pierrehumbert & Hirschberg, 1990:297); the accented item stands in contrast to some previously mentioned item.

6. **H*+L**: This accent suggests that the hearer must make a connection between the utterance and previous information or shared beliefs between the speaker and hearer. When it occurs with a H phrase accent, it is known as the calling contour in which the boundary tone is upstepped to produce a final mid-range tone (Pierrehumbert & Hirschberg, 1990).

7. **H+L***: This accent is used to imply that the hearer should already know the given information and be able to confirm the utterance (Pierrehumbert & Hirschberg, 1990).

The above contour-meaning associations, as outlined by Pierrehumbert and Hirschberg (1990) and Liberman and Sag (1974) have been developed in the context of the speaker attempting to modify the hearer’s existing knowledge of the situation, or rather in terms of the mutual beliefs held
by the speaker and the listener, therefore allowing for such generalizations to be made within that framework.

3.3 Phrasing

Although the attempt to divide utterances into smaller units or phrases is difficult and highly subjective, two levels of phrasing have been identified in English by Pierrehumbert and Hirschberg (1990): Intonational Phrases (IP) and Intermediate Phrases (ip). While certain guidelines for the placement of these divisions have been outlined, their definition still allows for much ambiguity, as they can be easily confused in instances of particularly fast or deliberate speech, and their identification is rarely consistent due especially to inter- and intra-speaker variability.

The ip is a level of prosodic structure smaller than an IP (Grice, Ladd, & Arvaniti, 2000). It consists minimally of one pitch accent and ends with either an H or L simple tone (Pierrehumbert & Hirschberg, 1990). Phrase boundaries (-) are indicated by (length of) pausing, final syllable lengthening, and H or L boundary tones, although the last criterion provides a somewhat circular reference for its identification. Following a phrase boundary, the speaker’s pitch range is normally reset at the beginning of the subsequent phrase (Beckman & Pierrehumbert, 1986). Within the E_ToBI system, the Intermediate phrase boundary is denoted with a ‘3’ on the break index tier.

The IP is made up of one or more complete intermediate phrases. An IP boundary (%) occurs where there is a deliberate pause, not to be confused with a hesitation pause, where a pause could be inserted without disrupting the pitch contour (Pierrehumbert, 1980) or where the final syllable is lengthened even in the absence of a pause.

von Heusinger (1990) cites these independent criteria for defining an IP, described in (8) below.

(8) a. **Timing**: An IP can be preceded and followed by a pause.
   b. **Metrical**: The metrical structure provides an additional clue, viz., the presence of a most prominent accent.
   c. **Tonal**: The boundary of an IP is sometimes a tonally marked boundary tone; pitch range adjustment plays a role, as well.
   d. **Junctural**: The boundary of an IP can block certain junctural phenomena (cf. Nespor & Vogel (1986)).
   e. **Semantic**: The material in the IP must constitute a sense unit.

In the E_ToBI system, the break after an Intonational Phrase is denoted with a ‘4’ on the break index tier.

3.4 Phrase Boundaries

Phrase accents occur after the pitch accent at the end of intermediate phrases, can be H or L, and occur in conjunction with the boundary tones at the end of an IP. Phrase accents are those pitch accent tones which occur in combination with the ip boundary diacritic ‘-’ (e.g., L-). The tone found at the end of an ip serves to convey the degree of relatedness of the phrase with the phrases that surround it: “where a phrase … has a H phrase accent, for example, it is more likely to be interpreted as a unit with a phrase that follows” (Pierrehumbert & Hirschberg, 1990:287).

Boundary tones occur at the end of an IP and are those pitch accent tones, which occur in combination with the IP boundary diacritic ‘%’ (e.g. L%). Due to the nature of the IP, that is, that it always contains at least one ip, the boundary tones always occur in sequence with the phrase accent.
4. Continuation Rise

Traditionally in the ToBI system, uptalk, also known as a continuation rise, occurs at an IP boundary and is characterized by an L phrase accent followed by an H boundary tone. Whereas a sentence ending with an L boundary tone is likely to be interpreted with regards to the previous statement, a phrase ending with an H boundary tone is likely to be interpreted in relation to the following utterance (Pierrehumbert & Hirschberg, 1990). An example of continuation rise is shown in Figure 1 below.

![Continuation rise](image)

Figure 1. A phrase containing two boundary tones, each phrase ending in a continuation rise or uptalk.

A serious point of contention in the uptalk debate concerns the method of characterizing this controversial contour. The ToBI system (Pierrehumbert, 1980) provides researchers with an analytic means of intonation contour annotation which is strictly qualitative however, even with the use of this system, the descriptions are often inconsistent, varying from researcher to researcher. Most generally, the uptalk phenomenon is characterized as the mapping of the Yes/No question contour, as described by Hirschberg & Pierrehumbert (1986), onto declarative sentences (Warren, 2005). In uptalk, speakers apply an intonation contour which ends in a H tone however, there exist multiple and conflicting interpretations of the contours.

Levis (1996:4) posits that “rising contours can be distinguished in the length of the final pitch rise, with one contour rising to a mid-level pitch and the other [question intonation] to a relatively high-level pitch”. He likewise concludes that listeners fail to make a distinction in meaning between H*L-H% and L*L-H%, which he proposes are the continuation rises, and similarly fail to distinguish H*H-H% and L*H-H% which are identified as question contours. Alternatively, Hirschberg and Ward (1995:6) identify the H*H-H% contour, not as a question intonation, but as being associated with “tentativeness, hesitation, and uncertainty” used by the speaker to “assert information while also inviting a response” – that is to say, uptalk.

Shokeir (2008) makes the observation that these definitions may very well be irrelevant due to the fact that, in English, pitch is also used to denote stress on a particular word or syllable (Liu & Xu, 2007). Taking this into account and considering the L*H-H% contour, and all possible contours ending in L-H%, which she identifies solely with the pitch accent and boundary tones, an instance of L-H% in which the last word is stressed will necessarily appear as an L*H-H% contour, confounding
the two and muddling their definitions. Of these she says, “It is not clear that these two rising contours have distinct features,” (Shokeir, 2008:44). Due to the fact that their structures are not sufficiently differentiated, she notes that “they also have overlapping interpretations” (Shokeir, 2008:44), which calls into question the ability of the ToBI system to accurately be able to identify the uptalk contour and distinguish it from any other rising contour that occurs in English intonation.

Analyses of the uptalk contour are further complicated by the fact that there exist great variations in the pitch used by individual speakers, which makes it difficult to conduct cross-speaker comparisons. Similarly, a person’s pitch varies from conversation to conversation, due to rate of speech, emotional excitement, or simply a change in topic (Hirschberg & Pierrehumbert, 1986). This unique quality of speech makes the comparison of absolute pitch excursions nearly impossible and almost entirely meaningless. For that reason, this study will use an alternate method of comparison.

It is clear that the three contours examined in the analysis presented in this paper, the plateau, uptalk, and question intonation patterns, involve a raise in pitch to some higher value as the speaker approaches an intonational phrase boundary. The measurement of pitch excursions and their comparison to the overall pitch range of the phrase seems a promising avenue of exploration and is, therefore, the motivation for this paper.

5. Method

The free-speech of five native speakers of Canadian English was recorded for comparison purposes for another study on intonation by Crook Jessop (2009). All of the speech samples are taken from unplanned conversations initiated through the use of discussion questions provided by the researcher. All of the samples used were free speech, except for the initial question asked by the researcher, which was read.

5.1 Participants

Participants were all native female speakers of Canadian English, from Ontario and British Columbia. They were university students attending Canadian universities. In addition to the five volunteer speakers, which were originally documented, voice samples of the interviewer were also heard in the free speech and were able to be collected and analyzed (labeled Speaker E6 in the Results). Having exhibited examples of free speech, her data was also included in the study.

The data of one participant was excluded because she did not exhibit any instances of uptalk in her speech. The data of another participant was also excluded due to the fact that her speech was thought to be characterized by a different overall intonational pattern as a result of her speaking a different dialectical variation of English. Only women were used in this study as the characteristically low pitch of male voices is very difficult to analyze in Praat, and appears quite often as creaky voice. The absence of creaky voice is necessary in order to ensure the continuous presence of F0 in order to be able to track pitch.

5.2 Materials

The speech samples were collected using a Blue Snowball dual-capsule USB condenser microphone, which recorded to Audacity 1.3.3-beta (Unicode) on a MacBook Pro computer. Each participant’s data were saved individually, and later separated into phrases. The pitch analyses and measurements were conducted using Praat acoustic analysis software (Boersma & Weenink, 2006).
5.3 Procedure

The samples collected from each speaker were divided into phrases for more efficient analysis. As the samples occurred in free speech, grammatical sentences could not be relied upon as a definitive marker of phrase termination. Phrases were deemed complete and subsequently divided when the speaker’s turn was terminated or an abnormally long pause was heard, that is, not a hesitation pause. Phrases were retained only if they included at least one instance of rising intonation, not necessarily at the end of the token. Those containing exclusively falling intonation, specifically any using neutral or declarative intonation, were eliminated, as those contours are not relevant to the current study.

Tokens were eliminated if they contained excessive background noise, overlapping at the phrase boundary, instances of creaky voice, or whisper — all of which impede Praat’s ability to provide an accurate representation of the pitch track of the phrase. It was necessary that each sample display an interpretable contour, specifically, one that was clear from the final pitch accent to the end of the phrase.

One modification was made to the data set of one of the participants. The samples of speaker E4 were found to contain very high instances of voiceless strident consonants, (e.g., /s/). These instances cause Praat to display great pitch excursions, which do not actually exist and provide a false representation of the true pitch track. Using Audacity, a Low Pass Filter was applied to each of the phrases based on the highest observed frequency outside of those instances, allowing for a more accurate analysis of the observed pitch without the interference of the voiceless sounds.

Each of the phrases remaining in the data sets was analyzed using the ToBI intonation system in order to determine the breaks and tonal realizations. Prior to the analysis of the data set, both researchers participated in a one-week ToBI workshop at The Ohio State University under the instruction of Dr. Mary Beckman and others. Phrases that were ultimately included in the final analysis were those that demonstrated a rising boundary tone (H%) or a plateau (H-L%) boundary tone. Samples were auditorily classified as being an example of uptalk, plateau, or question intonation. This classification was done irrespective of the boundary tones assigned in the annotation phase. Phrases were categorized based on the semantic meaning they held within the context of the conversation. A phrase that demanded a response from the listener was deemed a question, whereas a phrase which offered new information and which might have been a question but did not request a response from the listener was classified as uptalk. Lastly, a phrase that offered new information, similar in function to declarative sentences, but did not end in falling intonation was classified as a plateau contour.

Using Praat, measurements of the speakers’ pitch within the phrases and variations of pitch, that is, how the pitch contour changes over the duration of the phrase, were taken. The use of Praat’s pitch calculation function allowed for an impartial calculation of pitch, eliminating the error that could occur with manual calculation. The measurements, made in Hertz, included the speaker’s mean pitch for the entire phrase, and the highest and lowest observed pitch for the phrase. The pitch excursion of the rising phrase boundary was also calculated, measured from the nucleus accent to the end of the phrase (see Figure 2 below) (del Giudice, Shosted, Davidsons, Salihie, & Arvantiti 2006).
The pitch excursion measurements were compared to the overall pitch range of the encompassing IP (Ladd, 1988). The pitch range of the surrounding IP was calculated by finding the difference between the phrase’s minimum and maximum pitch heights. The excursions were then displayed as a proportion or ratio of the speaker’s overall pitch for that phrase. The complete set of measurements for each speaker is listed in Appendix A.

6. Results

In all of the samples collected and analyzed (thirty-eight in total), only the following four phrase boundary contours were observed: (H*/L*)H-L%, L*H-H%, H*L-H%, and L*L-H%. No instances of H*H-H% were exhibited as was suggested by previous research (Hirschberg & Ward, 1995).

In order to provide a narrower quantitative description of the contour, within-speaker comparisons of the relative pitch excursions of uptalk tokens were compared to the relative pitch excursions of plateau and question phrases. The results of the mean relative pitch excursions for each speaker are summarized in Table 1 below. All values reflect a ratio of the pitch excursion measurements to the speaker’s total pitch range for the encompassing IP.

<table>
<thead>
<tr>
<th>SPEAKER</th>
<th>CONTOUR</th>
<th># OF TOKENS</th>
<th>MEAN</th>
<th>STANDARD DEVIATION</th>
<th>RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>Plateau</td>
<td>8</td>
<td>.22</td>
<td>.11</td>
<td>.31</td>
</tr>
<tr>
<td></td>
<td>Uptalk</td>
<td>7</td>
<td>.70</td>
<td>.22</td>
<td>.65</td>
</tr>
<tr>
<td>E3</td>
<td>Plateau</td>
<td>2</td>
<td>.14</td>
<td>.06</td>
<td>.09</td>
</tr>
<tr>
<td></td>
<td>Uptalk</td>
<td>5</td>
<td>.69</td>
<td>.21</td>
<td>.51</td>
</tr>
<tr>
<td></td>
<td>Question</td>
<td>3</td>
<td>.99</td>
<td>.01</td>
<td>.03</td>
</tr>
<tr>
<td>E4</td>
<td>Plateau</td>
<td>1</td>
<td>.019</td>
<td>-</td>
<td>.00</td>
</tr>
<tr>
<td></td>
<td>Uptalk</td>
<td>4</td>
<td>.65</td>
<td>.34</td>
<td>.74</td>
</tr>
<tr>
<td>E6</td>
<td>Uptalk</td>
<td>4</td>
<td>.91</td>
<td>.10</td>
<td>.19</td>
</tr>
<tr>
<td></td>
<td>Question</td>
<td>4</td>
<td>.87</td>
<td>.13</td>
<td>.28</td>
</tr>
</tbody>
</table>

*Note: All pitch measurements are in Hertz.*

Measurements of 10% of the data were taken by a second evaluator in order to ensure the reliability of the initial measurements performed. The measurements of the rises taken in the second
evaluation \((M=0.45)\) were not shown to be significantly different from the initial rise measurements \((M=0.47)\), therefore preserving the validity of the measurements taken and reducing the effect of experimenter bias on the overall results of the study.

The data from speaker E1 shows a noteworthy difference between the rises of the plateau \((M=0.22)\) and uptalk \((M=0.70)\) contours. The mean pitch excursion proportion for plateau phrases was notably lower than that of phrases ending in uptalk. Unfortunately, this speaker’s speech sample did not provide any instances of question intonation, making a three-way comparison impossible. This difference in means is shown in Figure 3 below.

![Figure 3](image)

Figure 3. Speaker E1: Pitch excursions of plateau and uptalk contours as a proportion of speaker’s pitch range.

Speaker E3 also demonstrated an interesting pattern of rising. The plateau, uptalk, and question intonation patterns displayed visibly different pitch excursions in relation to the speaker’s pitch range, with plateau phrases exhibiting only very slight rises \((M=0.14)\), questions producing very steep rises \((M=0.99)\), and uptalk phrases falling in between the other two contours \((M=0.69)\). While there was a clear division between the plateau versus the uptalk and question contours, several tokens of this speaker’s uptalk exhibited pitch excursions similar in proportion to the speaker’s question contour excursions, resulting in a slight overlap of the two categories. The results of the analysis of speaker E3’s rising phrase boundaries are demonstrated in Figure 4 below.

![Figure 4](image)

Figure 4. Speaker E3: Pitch excursions of plateau, uptalk and question contours as a proportion of the speaker’s pitch range.
Due to the limited number of admissible tokens taken from speaker E4’s data set (only one plateau token and no instances of question intonation), the results of the analysis of this speaker’s phrase final rises make it difficult to draw any conclusions. While the ratio of plateau contour is relatively low in comparison to the uptalk contours and the results look promising, more tokens from this speaker would be required in order to draw any decisive conclusions. The results from speaker E4 are summarized in Figure 5 below.

![Figure 5. Speaker E4: Pitch excursions of plateau and uptalk contours as a proportion of the speaker's pitch range.](image)

While the differences in the pitch excursion ratios of each contour for participants E1, E3, and E4 provide some promising looking data, this clear division is absent from speaker E6’s data. There were no instances of plateau available in the data set. However, there is a significant overlap in the height of this speaker’s rise in uptalk statements ($M=0.91$) as compared to questions ($M=0.87$). In fact, not only do the measurements of the two contours overlap, and, whereas the other speakers’ question contours seemed consistently higher than the uptalk contours, speaker E6’s data includes question tokens which display proportional rises that are smaller than the speaker’s smallest uptalk rises. Conversely, it contains uptalk rises which are greater than those of the question contours. These results are demonstrated in Figure 6.

![Figure 6. Speaker E6: Pitch excursions of uptalk and question contours as a proportion of the speaker's pitch range.](image)
In order to make a comparison of the three contours, combining the results gathered from all four speakers examined in this study allows for some interesting observations. The results of this analysis are summarized in Table 2 below. All values reflect a ratio of the pitch excursion measurements to the speaker’s total pitch range for the encompassing IP.

Table 2: Combined results from all four participants.

<table>
<thead>
<tr>
<th>CONTOUR</th>
<th># OF TOKENS</th>
<th>MEAN</th>
<th>STANDARD DEVIATION</th>
<th>RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plateau</td>
<td>11</td>
<td>.19</td>
<td>.12</td>
<td>.34</td>
</tr>
<tr>
<td>Uptalk</td>
<td>20</td>
<td>.73</td>
<td>.23</td>
<td>.79</td>
</tr>
<tr>
<td>Question</td>
<td>7</td>
<td>.92</td>
<td>.11</td>
<td>.29</td>
</tr>
</tbody>
</table>

*Note: All pitch measurements are in Hertz.*

This overview of the combined data shows an interesting trend in the collected tokens, as is demonstrated in Figure 7. The dot in this graph represents an outlier in the data, a question contour with an uncharacteristically low rise. The outlier was produced by speaker E6, which is consistent with her wide variability of rises and may be the result of having frequently repeated questions used to elicit samples from the other speakers. There appears to be distinct variation in the ratios of the pitch excursions between the three contours. Plateau rises consistently have the lowest ratio, which typically do not exceed 0.5, followed by the uptalk contour which occupies the mid-range of contours. Interestingly, the majority of the uptalk tokens do not show a rise with a ratio less than 0.5 in relation to the pitch range of the phrase. Question intonation contours were found to exhibit the highest ratios.

![Pitch excursions of the plateau, uptalk, and question intonation contours of all speakers in relation to pitch range.](image)

7. Discussion

The findings of this study provide a few interesting observations with regard to the nature of the uptalk contour. Considered individually, the results show significant variation between speakers. However, while a certain degree of variation exists naturally between speakers of a language, the particular disparities shown here provide a promising analysis.

The findings from the data of speakers E1 and E3 show quite distinct divisions between the relative sizes of the pitch excursions of each of the contours, with little or no overlap. When taking
into consideration not only the mean value for the relative pitch excursions, but also the highest and lowest values for each of the contours, a pattern begins to emerge. The plateau contours seem to occupy the lowest range of values, while the majority of the uptalk contours appear to fall around the middle of the range, and the question intonation contours produce the highest relative excursions.

Unfortunately, the results from the data set of speaker E4 must be considered inconclusive, due to the limited number of tokens available. However, even in this limited set, the data hints at a similar pattern of findings. The plateau contour produces a very low relative rise, whereas the uptalk contours produce rises which are much higher.

When considered in this way, the data seems to form a sort of spectrum of rises, analyzable in context by the listener with relation to the speaker’s overall pitch range during the course of the conversation. This kind of real-time analysis by a listener would allow her to compare the perceived excursion with respect to the immediately surrounding Intonational phrases, that is, with the speaker’s overall pitch range between two pauses or breaks. If this were the case, a perceptual analysis of this sort on behalf of the listener would suggest a sort of categorical perception of intonation patterns.

Lastly the data from speaker E6, which at first glance might appear to contradict the findings of the other three speakers, may add the most interesting piece to this discussion. This speaker’s data showed considerable overlap in the relative pitch excursions of their uptalk and question intonation rises. In fact, the uptalk phrases produced a range that included rises which were both smaller and larger than the question rises. Firstly, it must be taken into consideration that most of the questions admitted into the data were part of a script that was used to initiate the free speech conversations. While they were not read, the questions had been repeated several times by the speaker, and may have exhibited qualities similar to those of read speech, inhibiting what would have naturally been produced by the speaker had they been completely unplanned questions.

Despite the effect that the planned questions may have had on the boundary tone rises of the phrases, the range of rises exhibited in the uptalk phrases is still remarkable. This overlap of the ranges shown in the data appears problematic for the analytic purposes of the study, and it also provided an extra challenge during the categorization phase of the study. While the phrase endings of the other speakers were, for the most part, easy to identify as being an example of a plateau, uptalk, or question contour, speaker E6’s phrases were more often than not decidedly difficult to characterize. Making a distinction between phrases which were uptalk and those which were questions was rarely easy, making it necessary to rely on the context of the conversation as a means of deciding which category the phrases belonged to. A similar difficulty arose with a couple of the phrase endings of other speakers, specifically when the rise was of a proportional height which was more characteristic of another category of the person’s speech. For example, a rise that had a height that was 0.85 proportional to the surrounding IP could not easily be categorized as uptalk or a question. This problem arises due to the fact that, even taking into consideration the context of the phrase, the contour could pass as either a question or uptalk.

These kinds of observations may provide an explanation for the controversial status of uptalk. The perception of uptalk as a growing phenomenon among younger people (Seaton, 2001; Warren, 2005) seems to be susceptible to great variation among speakers and listeners. If, in fact, a contour can be characterized in terms of its relative pitch excursion, this would suggest an analysis of categorical perception of intonation and specifically of rising contours. Much like native speakers’ perception of phonemes of their native language and its effect on their perception of accents and foreign phonemes, perhaps some writers and researchers find uptalk to be such a jarring trend because it defies their perceptual boundaries of acceptable and unacceptable contours for statements versus questions in their native language. In contrast, teenagers or younger adults would fail to identify the contour as extraordinary, and categorically perceive the rise as being within some acceptable range for that contour.
This possibility makes the analysis of speaker E6’s speech so significant. Speakers E1, E3, and E4, all of whom are females in their early 20’s, seem to produce a categorical representation of these intonation contours. They seem to possess a kind of categorical representation of the contours which is reflected in their speech. This means that when producing a question, the rise in the final pitch excursion at the boundary of the phrase is very steep in comparison to the pitch range of the phrase, spanning very nearly the entirety of the range. Conversely, instances of plateau produce very shallow rises. Uptalk, however, is characterized by rises which are much steeper than plateau rises, but still less steep than those produced for questions. Speaker E6, however, is approximately twenty years older than the other three speakers, and thus may not hold the same categorical representation of the three contours. It is possible that, while being able to recognize uptalk and employ a rise where traditional accounts of intonation allow for only a falling pattern, she does not possess the same categorical representation of the rises. This might explain the similarity between this speaker’s uptalk and question intonation patterns.

The findings of this study are far too preliminary to be able to draw any conclusive results; however, they point to the need for further investigation of the topic. Further research in this area might look at perception of the three rising patterns, as opposed to production, to see if in fact the younger subjects do hold a categorical representation of rising intonation which includes three, as opposed to two, categories. Furthermore, future studies should attempt to collect greater amounts of data so that a larger number of tokens can be compared, and the results can be generalized to a greater degree.

Previous analyses of this highly controversial intonation pattern, and the subsequent attempts to characterize it with the ToBI annotation system, have resulted in many conflicting interpretations of not only what the meaning of the contour is, but of what it looks like and how it can be characterized. Quite evidently, there exists a large amount of variation in its appearance, and there must, therefore, be an alternate means of classification. The findings of the current study suggest that in addition to the ToBI labeling system, a more accurate means of identifying and classifying the uptalk pattern should involve an analysis of the speaker’s rise in pitch from the nuclear pitch accent to the boundary tone in relation to the speaker’s overall pitch range for the surrounding intonational phrase, as it is this ratio which may provide a means of differentiation between the three rising contours found in Canadian English.

References


Hirschberg, J., & Ward, G. 1995. The interpretation of the high-rise question contour in English. Journal of
Pragmatics, 24, 407–412.
Appendix 1: Complete set of pitch measurements made for all speakers

| Phrase                | Orthography | Classification | H|H-H (%) (Hz) | L|L-H (%) (Hz) | H|H-L (%) (Hz) | L|L-H (%) (Hz) | (H-H-L) (%) (Hz) | Min pitch (Hz) | Max pitch (Hz) | Mean pitch of phrase (Hz) | Ratio | Low Pass Cutoff (Hz) |
|-----------------------|-------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------------------------|-------|----------------------|
| S1 wine shoes         | Uptalk      |                | 116.2          |                  |                |                |                |                |                |                         |       |                      |
| S2 living there       | Uptalk      |                | 117.57         |                  |                |                |                |                |                |                         |       |                      |
| S3 to Toronto         | Uptalk      |                | 144.16         |                  |                |                |                |                |                |                         |       |                      |
| S4 aunt and uncles    | Plateau     |                | 173.76         |                  |                |                |                |                |                |                         |       |                      |
| S5 and now            | Plateau     |                | 94.47          |                  |                |                |                |                |                |                         |       |                      |
| S6 swing dances there | Uptalk      |                | 12.99          |                  |                |                |                |                |                |                         |       |                      |
| S7 rain dance         | Plateau     |                | 95.62          |                  |                |                |                |                |                |                         |       |                      |
| S10 for swing         | Uptalk      |                | 110.1          |                  |                |                |                |                |                |                         |       |                      |
| S11 ridiculous you    | Uptalk      |                | 64.17          |                  |                |                |                |                |                |                         |       |                      |
| S12 you look          | Uptalk      |                | 58.83          |                  |                |                |                |                |                |                         |       |                      |
| S13 that frame        | Plateau     |                | 97.83          |                  |                |                |                |                |                |                         |       |                      |
| S14 your partner      | Plateau     |                | 132.71         |                  |                |                |                |                |                |                         |       |                      |
| S15 silly, so         | Plateau     |                | 80.17          |                  |                |                |                |                |                |                         |       |                      |
| S16 Queen's Swing Club| Plateau     |                | 146.65         |                  |                |                |                |                |                |                         |       |                      |
| S17 psychology        | Uptalk      |                | 209.65         |                  |                |                |                |                |                |                         |       |                      |
| S18 linguistics       | Uptalk      |                | 153.45         |                  |                |                |                |                |                |                         |       |                      |
| S19 favourite city     | Plateau     |                | 22.91          |                  |                |                |                |                |                |                         |       |                      |
| S20 from Vancouver    | Uptalk      |                | 120.07         |                  |                |                |                |                |                |                         |       |                      |
| S21 do really?        | Question    |                | 228.54         |                  |                |                |                |                |                |                         |       |                      |
| S22 like travel       | Plateau     |                | 194.5          |                  |                |                |                |                |                |                         |       |                      |
| S23 Expo hit          | Uptalk      |                | 186.19         |                  |                |                |                |                |                |                         |       |                      |
| S24 Yaletown          | Question    |                | 235.49         |                  |                |                |                |                |                |                         |       |                      |
| S25 right down there  | Question    |                | 140.97         |                  |                |                |                |                |                |                         |       |                      |
| S26 the place         | Uptalk      |                | 189.94         |                  |                |                |                |                |                |                         |       |                      |
| S27 city and place    | Uptalk      |                | 49.12          |                  |                |                |                |                |                |                         |       |                      |
| S28 living there with | Plateau     |                | 48.98          |                  |                |                |                |                |                |                         |       |                      |
| S29 known places      | Uptalk      |                | 40.08          |                  |                |                |                |                |                |                         |       |                      |
| S30 Tour de France     | Uptalk      |                | 101.79         |                  |                |                |                |                |                |                         |       |                      |
| E11 Live part 2       | Uptalk      |                | 193.42         |                  |                |                |                |                |                |                         |       |                      |
| E12 psychology        | Uptalk      |                | 153.45         |                  |                |                |                |                |                |                         |       |                      |
| E13 linguistics       | Uptalk      |                | 153.45         |                  |                |                |                |                |                |                         |       |                      |
| E14 the place         | Uptalk      |                | 189.94         |                  |                |                |                |                |                |                         |       |                      |
| E15 city and place    | Uptalk      |                | 49.12          |                  |                |                |                |                |                |                         |       |                      |
| E16 living there with | Plateau     |                | 48.98          |                  |                |                |                |                |                |                         |       |                      |
| E17 known places      | Uptalk      |                | 101.79         |                  |                |                |                |                |                |                         |       |                      |
| Q1 interest you?      | Question    |                | 105.66         |                  |                |                |                |                |                |                         |       |                      |
| Q2 interesting you, or | Question    |                | 105.66         |                  |                |                |                |                |                |                         |       |                      |
| Q3 do really think?   | Question    |                | 185.79         |                  |                |                |                |                |                |                         |       |                      |
| Q4 do really think?   | Question    |                | 185.79         |                  |                |                |                |                |                |                         |       |                      |
| Q5 second reading     | Question    |                | 185.79         |                  |                |                |                |                |                |                         |       |                      |