

# **L+H\* vs. L\*+H**

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## **0. Introduction**

ToBI (for Tones and Break Indices) has been used extensively for the transcription of English intonation. The origin of this system can be traced back to Pierrehumbert (1980), after which it has been updated and revised repeatedly and given its current nomenclature, and at the time of writing this paper, the system explained in Beckman and Elam (1997) is the most updated version. The main supporters of ToBI used to be American phoneticians, but now many British phoneticians, who are strongly influenced by the tonetic stress-mark system, seem to use this system for the analysis of English intonation. At present, ToBI is not used only for English. It is also applied to other languages with slight modifications suited to them, including Japanese under the name of J-ToBI.

As will be explained in the next section, the tone tier in the ToBI system has three inventories: five pitch accents, two phrase accents/tones, and two boundary tones. In this paper, the focus is placed on two of the five pitch accents: L+H\* and L\*+H to find differences between them, as they are only bitonal tones in the newest version of ToBI. The only notational difference between the two pitch accents is the location of the starred tone.

## **1. Description of ToBI**

ToBI includes a recording of speech, an associated record of the f0 contour, and symbolic labels. The symbolic labels consist of four tiers: an orthographic tier, a tone tier, a break-index tier, and a miscellaneous tier. As the name of this system implies, the tone tier and the break-index tier are the core symbolic labels. The tone tier represents changes in the f0 contour in the prosodic unit, which has maximally three categories: pitch accents, phrase accents/tones, and boundary tones. The phrase accents/tones and the boundary tones are together called phrase tones and both of them have two distinctions: L and H. The phrase accents/tones are described as L- and H-, and the boundary tones are described as L% and H%. The pitch

accents have five distinctive inventories: L\*, H\*, L\*+H, L+H\*, and H+!H\*. Beckman and Elam (1997) explain the meaning of the five pitch accents as follows: L\* means an apparent tone target on the accented syllable which is in the lowest part of the speaker's pitch range. H\* means an apparent tone target on the accented syllable which is in the upper part of the speaker's pitch range. L\*+H means a low tone target on the accented syllable which is immediately followed by relatively sharp rise to a peak in the upper part of the speaker's pitch range. L+H\* means a high peak target on the accented syllable which is immediately preceded by relatively sharp rise in the lowest part of the speaker's pitch range. H+!H\* means a clear step down onto the accented syllable from a high pitch which itself cannot be accounted for by a H phrasal tone ending the preceding phrase or by a preceding H pitch accent in the same phrase. The number of the pitch accents are reduced in number from Pierrehumbert (1980), which admits seven pitch accents: L\*, H\*, L\*+H, L+H\*, H\*+L<sup>1</sup>, H+L\*, and H\*+H.

The break-index tier is used to represent the strength of the boundary (i.e., the degree of juncture) between the orthographic words. The number 0 represents no boundary with phonetic evidence of cliticisation, such as resyllabification of consonants, and the number 4 represents a full intonation phrase boundary, defined by the occurrence of a final boundary tone after the last phrase tone. The number 3 represents an intermediate intonation phrase boundary, defined by the occurrence of a phrase tone after the last pitch accent. The number 1 represents most phrase-medial word boundaries, and the number 2 represents either a strong disjuncture with pause but no tonal marks, or a disjuncture that is weaker than expected at a tonally-signalled full or intermediate intonation phrase boundary. A typical fluent utterance of 'Did you want an example?' is represented as 'Did<sub>0</sub> you<sub>1</sub> want<sub>0</sub> an<sub>1</sub> example<sub>4</sub>'.

The orthographic tier contains the orthographic words, which are marked at the right edge of the corresponding waveform. Filled pauses can also be represented. The miscellaneous tier is used for any comments or markings, such as silence, audible breaths, laughter and dysfluencies.

## 2. Data

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<sup>1</sup> It should be noted that H\*+L has no phonetic reality except for a downstep trigger. Since the downstep can now be explained by the presence of the symbol '!' on the following H tone, it has lost its status in the ToBI system.

In this paper, we choose four utterances from each of the L+H\* type and the L\*+H type, as the maximum number of the latter in Beckman and Elam (1997) is four. The examples<sup>2</sup> are

#### L+H\*

1. Marianna made the marmalade.  
L+H\*                      L-L%
2. Anna            married Lenny.  
H\* L-H%              L+H\* L-L%
3. Only a millionaire.  
H\*   L+H\* L-H%
4. There's a lovely one in Bloomingdale's.  
L+H\*              L+!H\*              L-L%

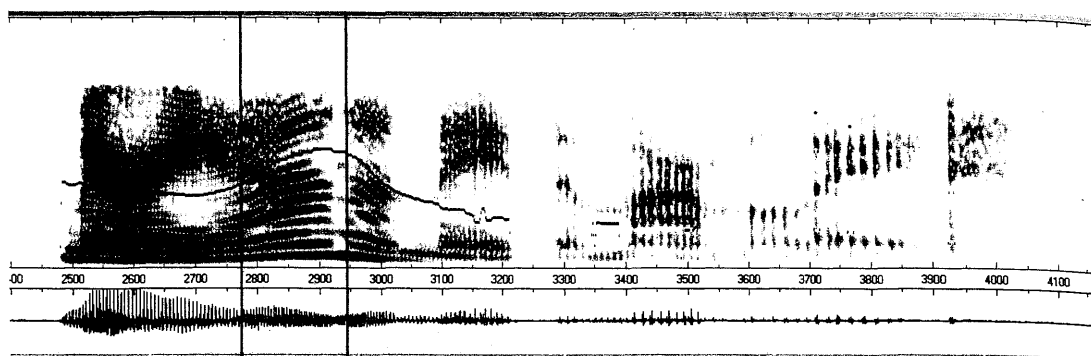
#### L\*+H

1. Only a millionaire.  
H\*      L\*+H L-H%
2. Stein's not a bad man.  
L\*+H              L-H%
3. Rigamarole is monomorphemic.  
L\*+H                      L-H%
4. There's a lovely one in Bloomingdale's.  
L\*+H              L\*+!H L-H%

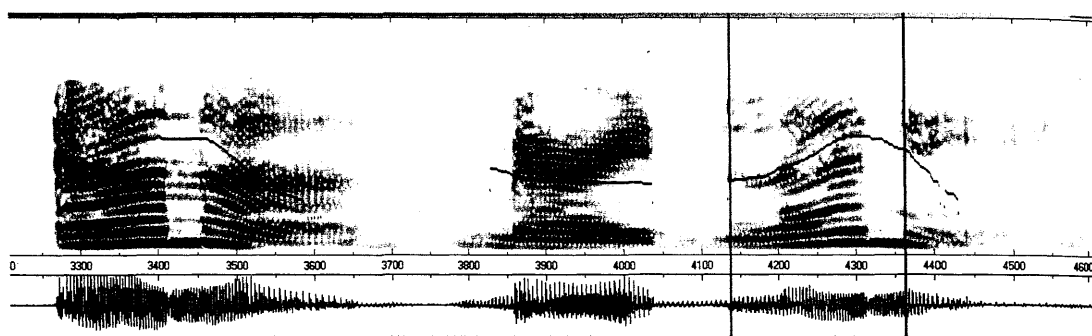
### 3. Data Analysis and Discussion

Let us start our analysis with the four utterances belonging to the L+H\* type. Their analysis results are shown in Figure 1.

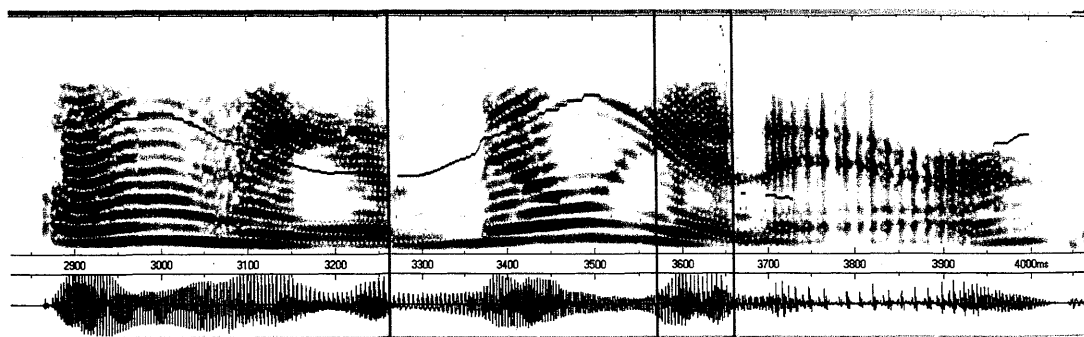
<sup>2</sup> Each example is named in Beckman and Elam (1997). The first four examples are named from above [made1], [anna], [millionaire] and [bloomingdales], and the last four are named [millionaire], [stein], [stein], and [bloomingdales]. Only the information of the tone tier is displayed.



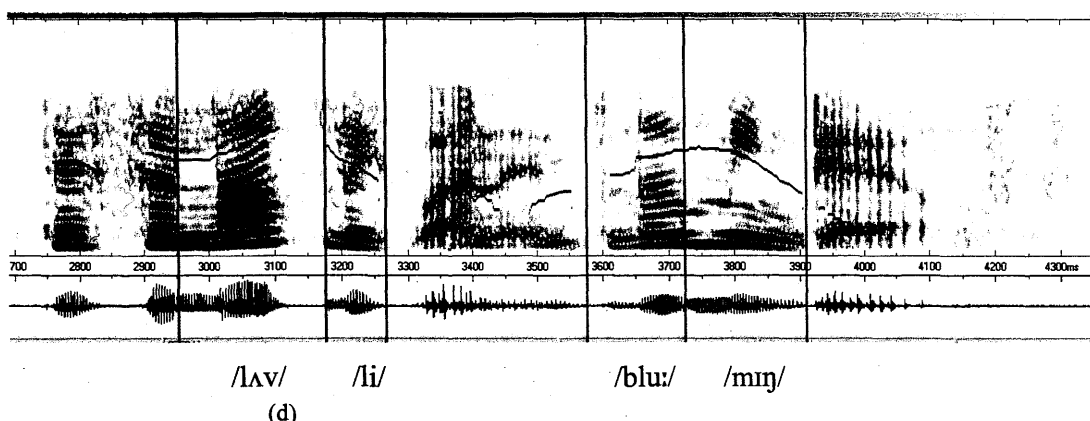
/æn/  
(a)



/len/  
(b)



/mɪl/      /jə/  
(c)



**Figure 1** Panel (a) is the analysis result of 'Marianna made the marmalade' (L+H\* L-L%). Panel (b) is the analysis result of 'Anna married Lenny' (H\* L-H% L+H\* L-L%). Panel (c) is the analysis result of 'Only a millionaire' (H\* L+H\* L-H%). Panel (d) is the analysis result of 'There's a lovely one in Bloomingdale's' (L+H\* L+!H\* L-L%). The vertical lines indicate syllable boundaries in question.

As this figure shows, the f0 peak coincides with the accented syllable (/æ/ for No.1, /len/ for No.2, /mɪ/ for No.3, and /læv/ for No.4), except for /blu:/ in No.4. This, however, has a similarity with the other four cases in that the maximum vertical value of the vowel in the accented syllable is higher than the one in the following syllable. In 'Bloomingdale's', the f0 peak is located on the /m/. In the other cases, the peak is located on the latter part of the syllable, not the initial part or the centre. It seems that the location of the peak on the initial part or the centre may not show a natural production of speech, probably because this may be interpreted as a very abrupt rise with a timbre of artificialness. The important point lies in the difference in the f0 contour between the accented syllable and the following syllable. In most cases, the maximum vertical value of the f0 contour is higher in the accented syllable than the following syllable. When this is not the case, the maximum vertical value tends to be seen in the onset of the following syllable. More importantly, all or most parts of the f0 contour for the syllable after the accented syllable descend. In Panel (d), the second peak is lower than the first, and this is represented in the transcription with the mark '!' to shown the downstep.<sup>3</sup>

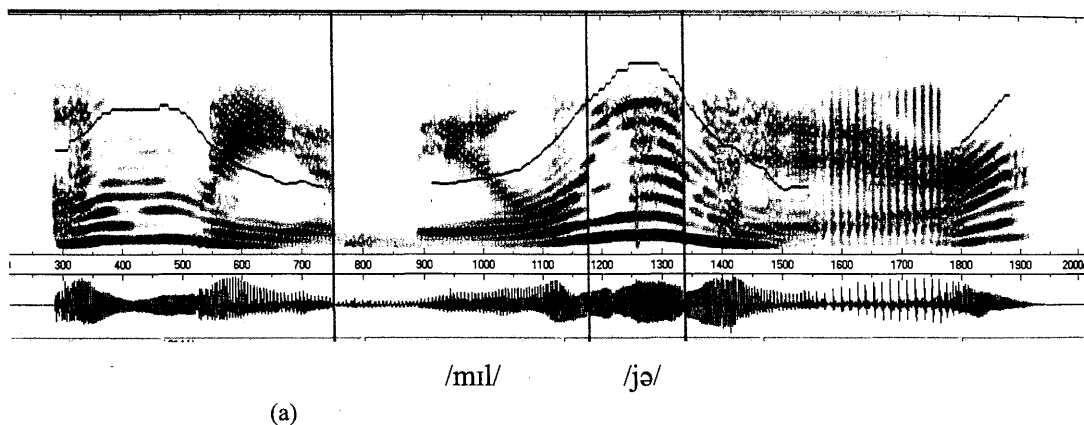
Judging from the f0 contours in Figure 1, it is considered in the British tradition that these accented syllables are spoken in the fall, except for No.3, which, due to the terminal rise, is spoken in the fall-rise, and these four utterances can be transcribed as

<sup>3</sup> The downstep, to use the definition by Beckman and Elam (1997), means 'a categorical compression of the pitch range that reduces the f0 targets for any H tones'.

1. Mari\anna made the • marmalade.
2. \Anna | ,married \Lenny.
3. 'Only a \million/aire.<sup>4</sup>
4. There's a \lovely one | in \Blooming • dale's.

The underlined syllable indicates the accented syllable.<sup>5</sup> Since only one tonic syllable is acceptable in a tone-unit in the British School, No.4 is divided into two tone-units. The symbol '|' indicates a tone-unit boundary. It may also be possible to transcribe No.4 as 'There's a 'lovely one in \Blooming • dale's', because the changes in the f0 contour for 'lovely' are not very great and this syllable can be interpreted both as a tonic syllable or a head. To make comparison of this with its L\*+H version easier, however, we have decided to divide this utterance into two tone-units.<sup>6</sup>

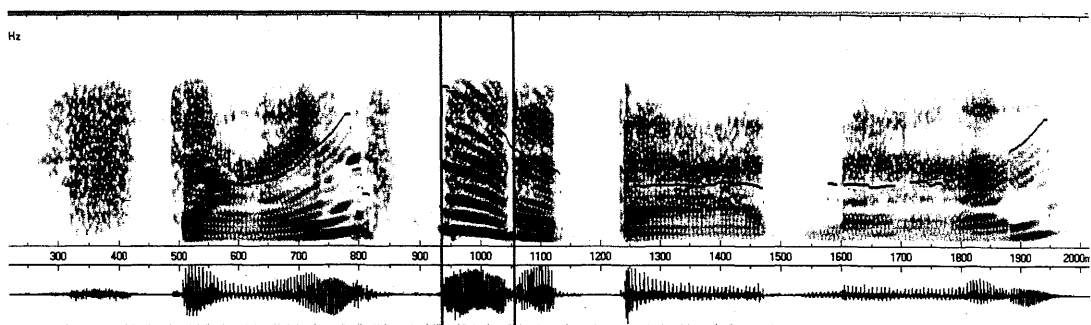
Let us examine the f0 contour of the L\*+H type. The analysis results of the four utterances belonging to this type are shown in Figure 2.



<sup>4</sup> This may be transcribed as 'Only a \million • aire'.

<sup>5</sup> The underline is drawn from a phonological viewpoint, not an orthographical one.

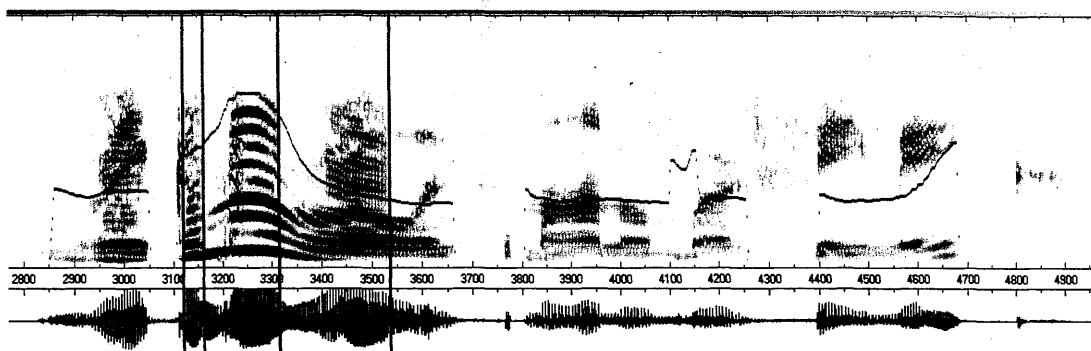
<sup>6</sup> No.2 also has two tone-units, but this corresponds to its ToBI transcription.



/stainz/

/nat/

(b)



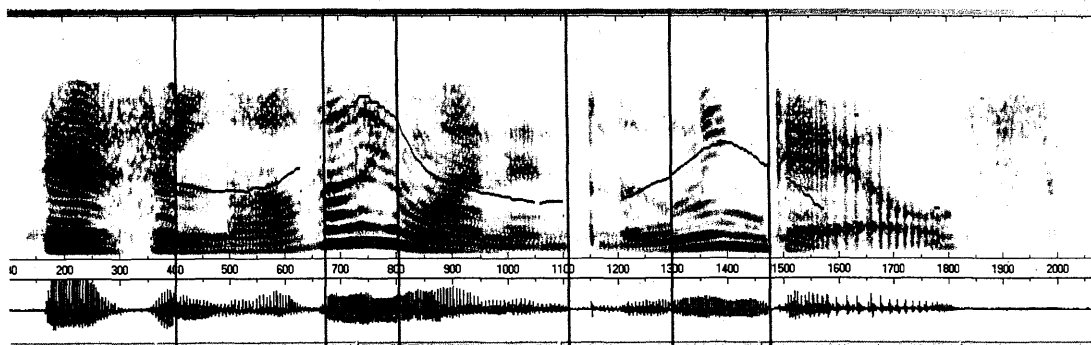
/rig/

/ə/

/mə/

/roul/

(c)



/ΛΔv/

/li/

/blu:/

/mɪŋ/

(d)

**Figure 2** Panel (a) is the analysis result of 'Only a millionaire' ( $H^* L^* + H L - H\%$ ). Panel (b) is the analysis result of 'Stein's not a bad man' ( $L^* + H L - H\%$ ). Panel (c) is the analysis result of 'Rigamarole is monomorphemic' ( $L^* + H L - H\%$ ). Panel (d) is the analysis result of 'There's a lovely one in Bloomingdale's' ( $L^* + H L^* + !H L - H\%$ ). The vertical lines indicate syllable boundaries in question.

As this figure shows, the  $f_0$  peak coincides with one syllable after the accented syllable (/jə/ for No.1, /nat/ for No.2, and /li/ and /ɪŋ/ for No.4) or with the second syllable after the accented syllable (/ə/ for No.3). It is noticed that the  $f_0$  contour for the syllable with the peak has a mountainous shape, except for No.2. This is probably because a pause after ‘Stein’s’, which prohibits the continuation of the  $f_0$  contour from the accented syllable to the following syllable. In this way, the  $f_0$  contour is heavily influenced by the segments.

As mentioned above, only No.3 has the  $f_0$  peak on the third syllable, not on the second. Judging from our previous experience of examining many such examples, we think that this is a very rare case of  $L^*+H$ . To take an instance, all the recorded examples in O’Connor and Arnold (1973) for this tone<sup>7</sup> have the  $f_0$  peak on the second syllable. This special location of the  $f_0$  peak in No.3 may be related to the word ‘rigamarole’. The second syllable consists only of the schwa with no onset or coda, which means that this syllable is qualitatively very weak. It is much shorter than the third syllable /mə/. The weakness in this second syllable is also manifested by another spelling of this word: ‘rigmarole’, in which the abovementioned schwa is left out, making it a three-syllable word from a four-syllable word. Beckman and Elam (1997) states that ‘the timing of the peak  $f_0$  relative to the segment is not controlled’, but we think that the timing is predictable if we have a close look at syllable structures. In most cases, the  $f_0$  peak is located on the syllable after the accented syllable. The exceptional case would be found when the syllable after the accented syllable is very weak, but even if this environment is achieved, this special case does not seem to happen all the time. We once encountered an utterance ‘Anyone would be’, which is transcribed as

Anyone would be

$L^*+H$      $L-L\%$

One speaker out of six speakers located the  $f_0$  peak on the third syllable /wʌn/, but all the other five speakers located it on the weak second syllable /i/.

In Panel (d), the terminal rise at ‘Bloomingdale’s’ is not shown even though this part is spoken with a rise at the end. This may be because the signal level is low at this place, or

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<sup>7</sup> They refer to this tone as the ‘jackknife’.

because the algorithm for the extraction of the  $f_0$  in the speech analysis programme we are using now needs more modification.<sup>8</sup>

In the British tradition, it is considered that these accented syllables are spoken in the rise-fall followed by a terminal rise,<sup>9</sup> except for the first tone-unit in No.4, which does not have a terminal rise, and these four utterances can be transcribed as

1. 'Only a  $\wedge$ million/aire.
2.  $\wedge$ Stein's not a bad /man.
3.  $\wedge$ Rigama • role is • monomor/phemic.
4. There's a  $\wedge$ lovely one | in  $\wedge$ Blooming/dale's.

In order to learn the difference of the two tone types in more detail, let us compare No.3 in L+H\* with No.1 in L\*+H and No.4 in L+H\* with No.4 in L\*+H, as they have the same sequence of words. Since the location of the  $f_0$  peak is discussed above, the present focus is placed on the  $f_0$  contour for the accented syllable or the tonic syllable. When the accented syllable in 'millionaire' in 'Only a millionaire' is spoken in L+H\*, the rise in the  $f_0$  contour already begins at the onset /m/, and the  $f_0$  contour for the coda /l/ has both a rise and a fall. On the other hand, when it is spoken in L\*+H, the rise in the  $f_0$  contour begins at the coda /l/, and the onset /m/ and the nucleus /t/ remain low and level. It seems that besides the different location of the  $f_0$  peak, the presence or lack of the low and level  $f_0$  contour at the earlier part of the accented syllable is one of the main differences between L+H\* and L\*+H.

When the accented syllable in 'lovely' and 'Bloomingdale's' in 'There's a lovely one in Bloomingdale's' are spoken in L+H\*, the rise in the  $f_0$  contour also starts early: at the nucleus / $\wedge$ / in 'lovely' and at the /l/, part of the onset in the first syllable of 'Bloomingdale's'. In contrast, when these two words are spoken in L\*+H, the rise starts late: at the latter part of the nucleus / $\wedge$ / in 'lovely' and at the nucleus /u:/ in 'Bloomingdale's'. The predictability of the  $f_0$

<sup>8</sup> As this example shows, we should not be dependent on the acoustic analysis too much. We need a double check by perception.

<sup>9</sup> This type of transcription is also used in Knowles, Williams and Taylor (1996), where the spoken data are transcribed in the British tradition using the tonetic stress-marks. If we admit the rise-fall-rise, No.1, No.2, No.3 and No.4 are transcribed as 'Only a  $\wedge$ million • aire', ' $\wedge$ Stein's not a bad • man', ' $\wedge$ Rigama • role is • monomor • phemic' and 'There's a  $\wedge$ lovely one | in  $\wedge$ Blooming • dale's'.

peak is no problem, unlike the abovementioned statement by Beckman and Elam (1997) in that the syllable following the accented syllable holds the  $f_0$  peak in the two  $L^*+H$  types.

Although we mentioned that the presence of the low and level  $f_0$  contour at the earlier part of the accented syllable is important for  $L^*+H$ , there is no such contour in /blu:/. It seems that this low and level  $f_0$  contour is not always an indispensable factor for the production and the perception of  $L^*+H$ . What is most important is that the  $f_0$  peak is located on the first syllable (or very occasionally on the second syllable) after the accented syllable. Another interesting feature about  $L^*+H$  pointed out by Beckman and Elam (1997) is that 'American speakers do not always make  $L^*+H$  rise as late as most RP British speakers do', but from our experience of examining many British English examples of this kind, we do not see any difference in the  $f_0$  contour between American English and British English.

#### 4. Concluding Remarks

In this paper, we have examined the  $f_0$  contour of  $L+H^*$  and  $L^*+H$  using four examples each. The major difference between these two pitch accents is detected in the location of the  $f_0$  peak. In  $L+H^*$ , it is almost always on the accented syllable. The exceptional case is found in 'Bloomingdale's', where the peak is located on the first syllable after the accented syllable. The important point, however, is that the peak is not on the vowel, but on the onset. In  $L^*+H$ , the  $f_0$  peak is almost always located on the first syllable after the accented syllable. It is located on the second syllable after the accented syllable on rare occasions. In this type of tone, the initial part of the  $f_0$  contour for the accented syllable usually remains low and flat, and this is also a very important key to realising this tone in most cases. In the examples used in this paper,  $L^*+H$  is always followed by a terminal rise at the end of the utterance, but it seems that such a rise is much less frequently used in British English. We wonder if the terminal rise is common among  $L^*+H$  examples in American English. Due to lack of data, however, we cannot make any conclusions about this now.

The  $L^*+H$  was reported as the 'scooped accent' in Gunter (1972). It seems that before that, this pitch accent was not discussed among researchers in America. In Britain, however, this was already recognised at least in Palmer (1922) as a distinctive tone. Since in the UK, many researchers follow the configuration approach, the  $f_0$  contour spoken in  $L^*+H$  was not known as a pitch accent, but as a tone termed as the rise-fall. In other words, the title of this paper

'L+H\*' vs. L\*+H' corresponds to 'The Fall vs. The Rise-fall', but not vice versa, because the fall can also be transcribed in H\* and L\*, besides L+H\*. To be exact, however, the phrase accent/tone L- and the boundary tone L% are necessary to achieve this correspondence.

Beckman and Elam (1997) classifies the L+H\* as the rising peak accent. This may indicate that they pay more attention to the initial part of the f0 contour rather than the latter part, which shows a descent. This is because it is transcribed by a phrase accent/tone and a boundary tone. In the British approach, this descent is more focused in the classification of tones.

In the configuration approach, many researchers have discussed whether the rise-fall is a distinctive tone or an allotone of the fall, mainly because this tone is very rarely used both in American English and in British English and for this reason, some of them have doubts about this categorical status. Judging from the ToBI system, however, where the L\*+H is clearly distinguished as one of the five pitch accents, we think that the categorical status of the rise-fall may be strengthened.

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本論文では、英語における L+H\* と L\*+H のイントネーションの違いを基本周波数から論じた。この2つの表記の差はアスタリスクの位置であるが、基本周波数では頂点の位置の相違を具現化していることが実例から分かる。L+H\* では基本的にアクセントのある音節に頂点が見られるが、L\*+H ではアクセントのある音節の直後または時として2音節後に見られる。両者の違いは頂点の位置だけではなく、多くの場合、頂点に至る基本周波数の形状にもある。基本周波数の形状から、L+H\* と L\*+H は、L-L%を後に従えば、イギリスの伝統的分析では、それぞれ下降調と上昇下降調に相当すると考えられる。イントネーションを捉える視点は2つの理論で異なるが、次第に整理され簡潔になっている最新の ToBI でさえも、L\*+H を認めていることは、裏を返せば、下降調の下位範疇と考えられやすい上昇下降調の存在意義を明確にすることになると考える。

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