



intonation of English.

## II. Data

To achieve the main purpose of this paper, examples with ToBI labelling and their recordings were used from Beckman and Ayers (1994a-f). There are 67 recorded files, some of which have more than one utterance. It would be ideal to report analyses of all these data in this paper, but it was not feasible for practical reasons. Two methods of selection were used to reduce the number. First, when examples had the same features in transcription, only one of them was selected. Second, when they were used to show problems with acoustic analysis and these problems were not identified in the software programme used by the author, they were not selected. Based on this screening, the following 25 examples were selected:

1. The pink carpeting.
2. Give him a hand with that.
3. Marianna made the marmalade. (x9)
4. Will you have marmalade, or jam?
5. 'I' means insert.
6. What's the difference among my long memory, your blond baby and the pink carpeting?
7. And set training and experience standards for airline inspectors and mechanics.
8. Don't hit it to Joey.
9. Who's it for? Mary's mother. It's for Mary's mother.
10. Is that Marianna's money? (x2) That's Marianna's money. (x2)
11. My name is Marianna.
12. Oh, don't nuzzle me, you marmalade-nose.
13. Where are you going, Willy? He won't be going, will he? (x2)
14. Ah Gloria. You're not ugly.
15. Bananas aren't poisonous.
16. You need a loan.
17. Only a millionaire.
18. There's a lovely one in Bloomingdale's.
19. Marianna.

20. It's lovely and yellowish, and it's an old one.
21. There are many intermediate levels.
22. Okay, now chop the onions. Now be careful.  
Okay, chop the onions, and put them into that bowl.
23. Anna married Lenny.
24. I'm simply trying to get you to understand.
25. What are the plane sizes for these flights and do they have - do are there any other flights that have s connections?

For acoustic analysis, PRAAT<sup>4</sup> was used.

## III. Analysis and Discussion

The selected 25 examples are acoustically and auditorily analysed and examined whether it is logically possible to convert them from ToBI to the tonetic stress transcription. The validity of transcription in ToBI is also explored.

1. The pink carpeting.  
H\* H\* L-L%

This utterance, which is a noun phrase, has two accented syllables and one full phrase boundary. The last accented syllable in an intonation unit<sup>5</sup> with a full phrase boundary can be regarded as the tonic syllable in the tonetic stress transcription. 'Carpeting' is spoken with H\*L-L%, which means a fall. In the tonetic stress transcription, 'pink' functions as the onset<sup>6</sup> and the stressed syllable of 'carpeting' works as the tonic syllable. This example is converted as follows:

The 'pink \carpeting.

2. Give him a hand with that.  
H\* L-L%

This utterance is an imperative sentence and has one accented syllable on 'hand'. It is spoken in the same tone as the one in the first example. Grammatical differences are not relevant in transcribing speech. Both phrases and sentences are treated in the same

way. This example is converted as follows:

Give him a hand with that.

3. Marianna made the marmalade.

- |    |      |        |     |      |
|----|------|--------|-----|------|
| 1) | H*   |        | H*  | L-L% |
| 2) | L+H* |        |     | L-L% |
| 3) | L+H* | L-H%L* | H*  | L-L% |
| 4) | L+H* |        | !H* | L-L% |
| 5) | H*   |        |     | L-L% |
| 6) | L*   |        | L*  | H-H% |
| 7) | L*   |        |     | H-H% |
| 8) | L*   | *?     | L*  | H-H% |
| 9) | L*   | H-     | L*  | H-H% |

The same sentence can be spoken in different ways, as this example shows. Nine different types in ToBI are displayed here. The overall feature in this example is that the first five utterances are spoken with H\*L-L%, which means a fall, and the remaining four are spoken with L\*H-H%, which means a rise.

The first utterance is one of the most natural types of statement, with there being more than one accented syllable and the last accented syllable functioning as the tonic syllable. The second utterance has tonicity different from the first, with the third syllable of 'Marianna' becoming the tonic syllable. The pitch level of the first and second unstressed syllables of 'Marianna' is different between the first utterance and the second: high in the first and low in the second. In ToBI, this low pitch is transcribed as L+, but there is no mark for a high pitch. In the tonic stress transcription, this difference can be marked with the use of different pitch levels of the pre-head. This high pitch in the first utterance can be marked in ( ), with the parentheses meaning optional. The third utterance has two full phrase boundaries (marked in %) at the end of both 'Marianna' and 'marmalade'. These correspond to two tone-unit boundaries in the tonetic stress transcription. The first intonation unit, marked in H\*L-H%, means that this unit is spoken with a falling-rising pitch. The L+ before H\* is not relevant in this judgement because it is not an accented syllable. The second

intonation unit is interpreted as being spoken with a fall. The fourth utterance has an exclamation mark in 'marmalade', which means that the stressed syllable of this word is a downstepped accented syllable. Since this downstep is a physiologically natural event, there is no logical reason to transcribe it in the tonetic stress transcription unless there is a special case, such as a pragmatic one to distinguish a downstepped syllable from an undownstepped syllable. The fifth utterance is different from the second in pitch level of the pre-head: low in the second and high in the fifth. As in the first utterance, this high pitch is optionally transcribed.

The difference between the sixth and seventh utterances lies in tonicity: the first syllable of 'marmalade' in the sixth and the third syllable of 'Marianna' in the seventh. The eighth utterance has the \*? mark, which means that it is not certain whether this syllable is accented or not. Acoustic analysis indicates that there is no noticeable pitch movement there, so it is unlikely that this syllable is accented. A reasonable interpretation would be that it has a low head followed by a rise. The ninth utterance has an intermediate phrase boundary (marked in H-) and a full phrase boundary (marked in H%). The intermediate phrase boundary corresponds to levels 3 and 4 in the break index, and the full phrase boundary corresponds to level 4. Both 'Marianna' (marked in L\*H-) and 'marmalade' (marked in L\*H-H%) are spoken clearly with a rise. Therefore, the accented syllable in both words is the tonic syllable. In this utterance, the intermediate phrase boundary also signals a tone-unit boundary in the tonetic stress transcription. All the utterances in this example are converted as follows:

- 1) ( )Mari'anna made the \marmalade.
- 2) -Mari\anna made the marmalade.
- 3) -Mari\anna | made the \marmalade.
- 4) -Mari'anna made the \marmalade.
- 5) ( )Mari\anna made the marmalade.
- 6) Mari,anna made the /marmalade?
- 7) Mari/anna made the marmalade?
- 8) Mari,anna made the /marmalade?
- 9) Mari/anna | made the /marmalade?

4. Will you have marmalade, or jam?

L\* H- L\* H-H%

Both ‘marmalade’ and ‘jam’ are spoken clearly with a rise. As in the ninth utterance of the third example, which is marked in L\*H- L\*H-H%, the intermediate phrase boundary corresponds to a tone-unit boundary in the tonetic stress transcription. This utterance is converted as follows:

Will you have /marmalade, | or /jam?

5. ‘I’ means insert.

1) H\* H\* L-L%

2) H\* L- H\* L-L%

This first utterance is the typical type of statement spoken with a fall. This is exactly the same as the first utterance in the third example, which is marked in H\* H\*L-L%. The intermediate phrase boundary in the second utterance also corresponds to a tone-unit boundary in the tonetic stress transcription. Acoustic analysis indicates that the H\*L- shows a clear downward pitch movement. This example is converted as follows:

1) ‘I’ means in \sert.

2) \‘I’ | means in \sert.

6. What’s the difference among my long

H\* !H\* L-L% L+H\*

memory, your blond baby, and

!H\* H-H% L+H\* \*? !H\* L-H% L\*

the pink carpeting?

L\* H\* L-L%

This utterance has four full phrase boundaries. They correspond to tone-unit boundaries in the tonetic stress transcription. The first and fourth tone-units are spoken with a fall (H\*L-L%), and the second and third

are spoken with a rise (H\*H-H% and H\*L-H%). The difference between H- and L- can be understood from Figure 2:

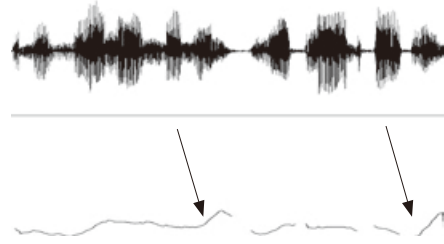


Figure 2 ‘among my long memory, your blond bab

The two arrows in Figure 2 show the beginning of the rising pitch. The left arrow corresponds to the final syllable of ‘memory’ and the right arrow corresponds to the final syllable of ‘baby’. So, the difference between H- and L- is based on the difference in pitch level before this rising pitch. However, this low pitch, especially when it is compared with the total pitch movement of this utterance, is not perceptually great enough to transcribe ‘your blond baby’ differently from ‘among my long memory’ in the tonetic stress transcription. Only linguistically significant features should be transcribed in this system.

Semantically, the focus is on the contrast between ‘my’ and ‘your’ and on the contrast between ‘memory’, ‘baby’ and ‘carpeting’. It is not possible to accent all these words equally without breaking each tone-unit further. One of the reasonably possible ways is to accent ‘my’ and ‘your’ on the one hand, and accent ‘baby’ and ‘carpeting’ on the other. However, two accented syllables cannot be the tonic syllables unless they constitute a split fall-rise. So, ‘baby’ becomes a stressed syllable in the tail, as realised here. ‘Blond’ is interpreted as unstressed because both ‘your’ and ‘baby’ have a rhythmic beat.<sup>7</sup> Stressed syllables in the tail are marked in the • symbol. As explained in Example 3, the downstep is not transcribed in the tonetic stress transcription. This example is converted as follows:

‘What’s the \difference | among /my long •memory, | /your blond •baby, | and the ‘pink \carpeting?’

## 7. And set training and experience

H\* H\* H- H\*

standards for airline inspectors and

H\* L-L% H\* H\* L-

mechanics.

H\* L-L%

There are two full phrase boundaries and two intermediate phrase boundaries<sup>8</sup> in this utterance. In the third, fourth and fifth examples, the intermediate phrase boundary is interpreted as a tone-unit boundary, but in this utterance, there is no noticeable pitch movement toward the end of both intermediate phrase boundaries. Figure 3 shows the case of ‘for airline inspectors’ together with ‘and mechanics’:

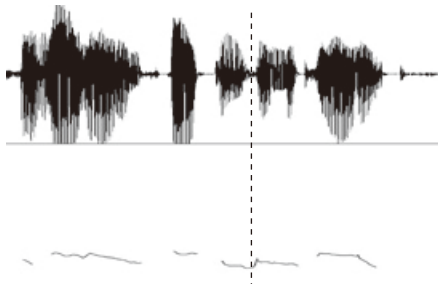


Figure 3 ‘for airline inspectors and mechanics’

As shown in Figure 3, the F0 contour of ‘for airline inspectors and mechanics’ is level throughout, except for the stressed syllable of ‘mechanics’, which is accented with a falling pitch. The vertical dotted line shows the boundary between ‘inspectors’ and ‘and’. Examining this acoustic analysis does not logically support the existence of an intonation boundary there: no noticeable change in the F0 contour and no noticeable time interval. A slight step up in the F0 contour in ‘for airline inspectors’ corresponds to the stressed syllable of ‘inspectors’, but this is a physiologically natural event. Also, no break is auditorily perceived after ‘inspectors’. The same thing can be said about what happens at the end of ‘training’. Therefore, this utterance has two tone-units in the tonetic stress transcription: ‘and set training and experience standards’ and ‘for airline inspectors

and mechanics’. What is linguistically important here is that the intermediate phrase boundary can be interpreted as a tone-unit boundary in one case (e.g. Examples 3, 4 and 5) and not in the other (e.g. Example 6).

There is a difference in phrase tone (H- and L-). It is true that there is an overall difference in pitch level between ‘And set training and experience standards’ and ‘for airline inspectors and mechanics’: higher in the former and the lower in the latter. To transcribe this difference in pitch level, the ! mark should be utilised in ToBI. In the tonetic stress transcription, all that is needed to do is to mark the accented syllable of ‘inspectors’ as a low-pitched accented syllable in the head. This example is converted as follows:

And 'set 'training and ex'perience \standards | for  
airline in,spectors and me\chanics.

## 8. Don't hit it to Joey.

H\* L\*+!H L-L%

The first accented syllable is located on ‘don’t’, and nothing is marked before ‘Joey’. As Figure 4 shows, however, this is not the case:

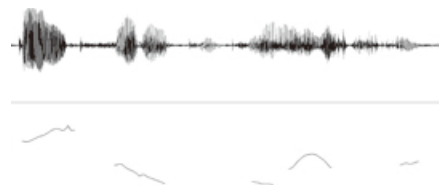


Figure 4 ‘Don’t hit it to Joey.’

It is true that ‘don’t’ is high-pitched, but there is a downward pitch movement from ‘hit’ to ‘it’. It is not understandable why this linguistically important pitch movement is not transcribed in ToBI. Because this utterance has a noticeable difference in pitch movement, there should be an intonation boundary after ‘it’. In the tonetic stress transcription, ‘don’t’ and ‘hit’ are treated as the onset and the tonic syllable, respectively. As for ‘Joey’, it ends with L%. In reality, however, it ends with a rising pitch, which means a rise-fall-rise, as Figure 4 shows. This should be





2) H\* H-L%

The transcription of the first utterance, marked in H\*H-H%, signals an overall high pitch movement, but it is not clear whether it means a high rise or a high level in the tonetic stress transcription. Acoustic analysis indicates that it is spoken with a high rise. The second utterance, marked in H\*H-L%, illogically intends to signal a level tone, as in the third utterance in Example 10. This example is converted as follows:

1) My name is Mari/anna.<sup>9</sup>

2) My name is Mari>anna.

12. Oh, don't nuzzle me you

X\*? L- H\* !H\* L-

marmalade-nose.

L\* L-H%

There is an intermediate phrase boundary after 'Oh', but this word is marked as accented only (X\*?). Acoustic analysis indicates that there is a downward pitch movement in this word. So, it should be marked in H\*L-. In the tonetic stress transcription, it should be transcribed as a fall, and this intermediate phrase boundary should be regarded as a tone-unit boundary. The latter part of this utterance, which begins with 'don't', is spoken with a high pitch on 'don't' (H\*) and a falling-rising pitch on the rest (H\*L- L\* L-H%). This falling-rising pitch movement, which begins with the first syllable of 'nuzzle', is a major movement. So, this syllable is the tonic syllable. The intermediate phrase boundary on 'me' does not correspond to a tone-unit boundary because there is no noticeable pitch movement there. This also shows that the intermediate phrase boundary does not always correspond to a tone-unit boundary. This example is converted as follows:

\Oh, | 'don't \nuzzle •me you •marmalade-nose.

13.

1) Where are you going, Willy?

H\* L- L\* L-H%

2) He won't be going, will he?

H\* H\* L- L\* L-H%

3) He won't be going, will he?

H\* H\* L- H\* L-L%

There is a grammatical difference between the first utterance and the rest. 'Willy' in the first utterance is a vocative, and 'will he' in the second and third is a tag in tag questions. There is no noticeable difference in pronunciation between 'Willy' and 'will he' because /h/ in 'he' is usually deleted. This is the case in these two utterances. When a vocative comes after the main sentence, especially in a situation when it is clear whom the speaker is talking to, it is usually attached to the preceding tone-unit (Wells 2009: 153). Acoustic analysis indicates that the first utterance is an example of such a case. Tags in tag questions are almost regarded as separate tone-units. So, the intermediate phrase boundary is interpreted differently between the first utterance and the rest. This example is converted as follows:

1) Where are you \going, •Willy?

2) He 'won't be \going, | /will he?

3) He 'won't be \going, | \will he?

14. Ah Gloria. You're not ugly.

H\* L\* L-L% H\* L\* L-H%

The transcription of the second sentence 'you're not ugly' is easy to understand and logically correct. However, the transcription L\*L-L% in the first sentence is problematic because this signals a low-pitched level tone, but acoustic analysis shows that this is not the case. 'Gloria' is spoken with a falling pitch. So, this should be transcribed as H\*L-L%. This pitch movement is similar to the one in Example 8 'Don't hit it to Joey', where 'don't' is high-pitched and 'hit it' is spoken with a downward pitch movement.<sup>10</sup> This example is converted as follows:

'Ah \Gloria. | 'You're not /ugly.

## 15. Bananas aren't poisonous.

%H L\*            L\* L-H%

The % mark shows a high pitch before a low-pitched accented syllable. It should be noted that this mark is not used in transcribing the first and fifth utterances in Example 3 because the following accented syllable is high-pitched. This high pitch is transcribed as a high pre-head, as in the case of these utterances. The accented syllable of 'bananas' is transcribed as L\*, but acoustic analysis indicates that it is still high-pitched. So, %H H\* L\* L-H% is more accurate. Alternatively, since the following accented syllable is high-pitched (H\*), the %H symbol may be omitted, as in H\* L\* L-H%. Because of more prominence in 'bananas' than 'poisonous' in terms of pitch and intensity, it can be interpreted that the tonic syllable is located on the accented syllable of 'bananas', which is spoken with a fall-rise. This example is converted as follows:

-Ba\|nanas aren't \*poisonous.

## 16. You need a loan.

1)     H\*    H\* L-L%

2)     L\*    H\* L-L%

3) %H L\*    H\* L-L%

The difference between the first utterance and the second is the pitch level of the onset. The H\* in the first utterance is interpreted as the high head, and the L\* in the second is interpreted as the low head. The difference between the second utterance and the third is the pitch level of the pre-head: low in the second and high in the third. This example is converted as follows:

1) You 'need a \|loan.

2) You ,need a \|loan.

3) ` You ,need a \|loan.

## 17. Only a millionaire.

1) H\*    L\*+H L-H%

2) H\* L+H\*    L-H%

'Millionaire' in the first utterance is transcribed as L\*+H L-H%, which means that the pitch moves from low to high, and then becomes low and high again. L\*+H means that the tonic syllable, marked in L\*, is immediately followed by a high-pitched syllable. On the other hand, L+H\* means that the tonic syllable, marked in H\*, is preceded by a low-pitched syllable. The pitch movement after the tonic syllable is much more important than the one before it because the former is a part of the nuclear tone, but the latter is not. Overall, the first utterance displays a rise-fall-rise pitch movement. There is no additional comment on the second utterance. This example is converted as follows:

1) 'Only a /\|millionaire.

2) 'Only a \|millionaire.

## 18.

1) There's a lovely one in Bloomingdale's.

L\*+H            L\*+!H    L-H%

2) There's a lovely one in Bloomingdale's.

L+H\*            L+!H\*    L-L%

The two utterances have only one boundary tone, but they have two noticeable pitch movements. The first utterance has a rising-falling pitch movement and a rising-falling-rising pitch movement. These two noticeable movements should be used as the logical reason for the presence of the tonic syllable in each case, with the boundary after 'one'. The first unit is spoken with a rise-fall and the second is spoken with a rise-fall-rise. In the same way, the second utterance is spoken with a double fall, with the boundary after 'one'. In a case like this, there is a mismatch in the number of intonation units in ToBI and the number of tone-units in the tonetic stress transcription. This example is converted as follows:

1) There's a /\|lovely one | in /\|Bloomingdale's.

2) There's a \|lovely one | in \|Bloomingdale's.



19. Marianna.

L+H\* !H-L%

This is so-called calling intonation, which is spoken with a level tone. When the tonic syllable is preceded by unstressed syllables, they are spoken with a lower pitch. This is transcribed as L+ in ToBI. This can be transcribed as a low pre-head in the tonetic stress transcription, but it may not be necessary to do so because it is a physiologically natural event. Ordinarily, people start an utterance with a mid-pitch, which naturally becomes lower than the following accented syllable. As explained in Examples 10 (That's Marianna's money) and 11 (My name is Marianna), H\*H-L% does not make sense. In calling someone in this way, the latter part of his/her name becomes long. This is transcribed in the tonetic stress transcription with a hyphen. This example is converted as follows:

Mari>ann-a.

20. It's lovely and yellowish, and it's an

L+H\* L+!H\* L-

old one.

X\*? L-L%

The intermediate phrase boundary in this utterance is equated with a tone-unit boundary in the tonetic stress transcription because there is a noticeable difference in pitch movement after 'yellowish' and also because there is a syntactic boundary there. 'Lovely' is spoken with a falling pitch, but in ToBI it is not clear whether this word is spoken in such a way or there is a step down in pitch between 'lovely' and the following 'and'. On the other hand, the tonetic stress transcription has marks for both a high head (!) and a falling head (↘). The full phrase boundary is marked in L%, but this utterance ends with a slight rising pitch, as in Figure 6: As shown in Figure 6, there is a gap in the F0 contour in the latter part of 'old one'. This is because of the presence of the plosive /d/ and the influence of

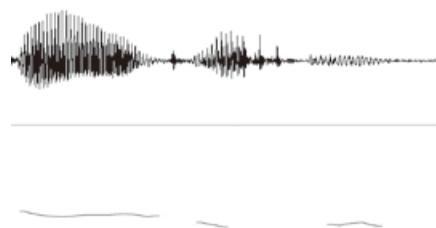


Figure 6 'old one'

creaky voice. However, by representing the missing F0 contour with a dotted line, it is understood that there is a falling-rising pitch movement there. This missing contour is perceptible auditorily. Acoustic analysis is scientific, but it is not perfect. It should be supplemented by auditory perception to make the transcription of intonation as accurate as possible. 'Old one' should be transcribed as H\* L-H%, which means a fall-rise in the tonetic stress transcription. This example is converted as follows:

It's ↘lovely and ↘yellowish, | and it's an ↘old one.

21. There are many intermediate levels.

L+H\* L+!H\* L+!H\* L-L%

As in Example 20 'It's lovely and yellowish', it is not clear from ToBI that the sequence of H\* L means a step down in pitch or a falling pitch movement, but both acoustic analysis and auditory perception indicate that there are two falling pitch movements in this utterance ('many' and 'intermediate') before the major falling pitch in the first syllable of 'levels', which is the tonic syllable. This example is converted as follows:

There are ↘many inter↘mediate ↘levels.

22.

1) Okay now chop the onions. Now be

H\*L- H\* H+!H\* H- L\*

careful.

L+H\* L-H%

- 2) Okay, chop the onions, and put  
 L+H\* L-L% H+!H\* H-

them into that bowl.

H\* H+!H\* L-L%

The first sentence in the first utterance has two intermediate phrase boundaries (no full phrase boundary), the first of which is located after 'Okay'. However, acoustic analysis indicates that 'Okay' and 'now' are spoken with a high pitch and with a rising pitch, respectively, which means that 'Okay' is the onset and 'now' is the tonic syllable and that there should be a tone-unit boundary after 'now'. There is no logical reason why there is an intermediate phrase boundary after 'okay'. It should be located after 'now'.

The verb phrase 'chop the onions' appears in two places: one in the first utterance (now in the second tone-unit) and the other in the second. Both are transcribed as H+!H\* H-, but acoustic analysis and auditory perception indicate that there is a slight falling-rising pitch movement, not a downstep. This part should be transcribed as H\* L-H%, and there should be a tone-unit boundary after 'chop the onions' in the second utterance. By correcting these errors in transcription, this example is converted as follows:

O'kay /now | chop the \uonions. | Now be \u<sup>c</sup>areful.  
 O\kay, | chop the \uonions, | and put them 'into that  
 \u<sup>b</sup>owl.

23. Anna married Lenny.

- 1) H\* L-L%  
 2) H\* !H\* !H\* L-L%

The first utterance has a high-pitched accented syllable on the first syllable of 'Anna' (i.e. the tonic syllable). This shows that it is spoken with a fall. This utterance is easy to transcribe. However, the second utterance is difficult to interpret because it has three syllables marked in H\*, with the second and third being downstepped. It is difficult to judge whether the second and third H\*s are really accented or deaccented. In this

case, other acoustic elements should be used.

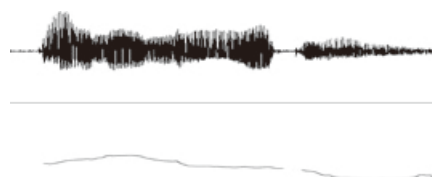


Figure 7 'Anna married Lenny' (second)

Figure 7 shows that there is a noticeable difference in intensity between 'Anna married' and 'Lenny' and the change in pitch movement in 'Lenny' is minimal, which means that the first syllable of 'Lenny' is not the tonic syllable. In addition, 'Anna' is higher pitched than 'married'. By putting all these facts together, the logical conclusion is that the first syllable of 'Anna' is the tonic syllable and is spoken with a level tone, and that the gradual stepping down of pitch is interpreted as a physiologically natural event. So, neither accent nor stress is assigned in 'married' and 'Lenny', as in the first utterance. This example is converted as follows:

- 1) \u<sup>A</sup>Anna married Lenny.  
 2) >\u<sup>A</sup>Anna married Lenny.

24. I'm simply trying to get you to

H\* L\* H- L\* H- L\* H-

understand.

L\* H\* L-L%

This utterance has three intermediate phrase boundaries and one full phrase boundary. There is no noticeable pause after each of the intermediate phrase boundaries. This is spoken quickly, and it is a typical intonation to show the speaker's irritation. In the tonetic stress transcription, this utterance is interpreted as having one tone-unit. It is important to take grammatical, semantic, and pragmatic factors into consideration in transcribing utterances. The mark to show a successive rising pitch movement in the head can be used in the tonetic stress transcription. This example is converted as follows:

I'm ↗ simply ↗ trying to ↗ get you to understand.

25. What are the plane sizes for these

H\* L\* H-H% H\*

flights and do they have do are there

H\* H-L% %r

any other flights that have s connections?

H\* !H\* %r H\* L-L%

This example has three full phrase boundaries. The noun phrase 'the plane sizes' is marked in L\*H-H%, which shows a rising pitch. Acoustic analysis agrees with this. The prepositional phrase 'for these flights' is marked in H\* H-L%, but there is no downward pitch movement there. Instead, a high level pitch is used, like the one in Example 19 'Marianna', where the calling intonation is used. There is a drop in pitch in the following word 'and', but this change in pitch should have nothing to do with L% because the boundary is marked after 'flights'.

In addition, there is no mark in the first 'have', but acoustic analysis indicates that this word is spoken with a level pitch with a relatively long duration of 400 ms. So, this word can be interpreted as accented, which is the tonic syllable in the tonetic stress interpretation, and the tone-unit boundary should be drawn after this word. The %r mark shows some disfluency, which is common in natural spontaneous speech, in order to repair the utterance. This information can be added with the use of three dots in the text in the tonetic stress transcription. This example is converted as follows:

'What are the /plane sizes | for 'these >flights | and do they >have | do... are there 'any other 'flights that have s... co\underline>nnections?'

#### IV. Conclusion

This paper explored how well the conversion is made from ToBI to the tonetic stress transcription by using selected examples from Beckman and Ayers

(1994a-f), and it was found that this is totally possible. In one example, nine different intonation patterns were transcribed in ToBI, and all of them were able to be transcribed accurately in the tonetic stress transcription, without any overlap.

During the analysis and discussion of these examples, some theoretically negative points were found in ToBI. Among them, three major points are mentioned here. First, ToBI depends heavily on the F0 contour and transcribes even what may some consider to be linguistically unimportant, such as physiologically natural events. A clear distinction should be made between what is phonologically significant and what is not in the transcription of intonation. Too much dependence on the F0 contour may hinder practically useful analysis of intonation, especially from the viewpoint of human perception. This approach also works inversely. Quite often, parts of the F0 contour are lost because of features that segments hold inherently, effects of speech quality, and the level of the pitch tracking algorithm. When this missing information is unimportant, it is not problematic, but it may also be important pragmatically. For example, a fall and a non-fall can convey totally different impressions to a hearer in terms of politeness. In such cases, auditory perception and the context as well as careful examination of the contour should be utilised to retrieve missing information and grasp the speaker's intention correctly. Second, the role of the intermediate phrase boundary is not theoretically clear. Sometimes it corresponds to a tone-unit boundary and other times it does not. The tone-unit is a basic and important unit in analysing intonation in the tonetic stress transcription. The idea of tonality should be the same in any transcription system in analysing intonation. Third, ToBI cannot transcribe important pitch movements accurately. One case is a level tone. It is transcribed as H\*H-L%, but this does not make sense. This may show a theoretical limit that this transcription system originally entails – the use of binary symbols (H and L). Duality may be theoretically useful, especially in processing data in computers, but may oversimplify to the point that

reality is not reflected well enough. Other cases are (1) the difference between rising/falling pitch and step up/step down, (2) the difference between rising head and low head, and (3) the difference between high rise and high level. In the tonetic stress transcription, all of them can be transcribed accurately.

Some errors in transcription were found, which were derived from the pitch tracking algorithm used in Beckman and Ayers (1994a-f). Measuring the F0 contour accurately is not an easy task, but the programme that the author used in writing this paper seems to be better than the one that Beckman and Ayers used because the problems they identified in their audio files were not detected in the author's analysis. Errors of this type should decrease in number year by year with the development of algorithms. The PRAAT programme is updated almost every month.

It is not easy to decide how disfluency in utterances should be treated in transcription. In ToBI, it is added as a part of transcription, but it may be simply added in the text with the use of dots, as in the tonetic stress transcription.

Both ToBI and the tonetic transcription system have their unique features with different symbols and users should have adequate knowledge to utilise them properly. It is difficult to transcribe intonation of speech accurately, especially that of naturally spontaneous speech, because there are many factors that need to be considered: where the boundary exists, whether a particular syllable is accented, stressed or even unstressed, whether it is high pitched or low pitched, where the syllable carrying a specific tone is, and what pitch pattern is used. Not only acoustic analysis but also auditory perception should be utilised for accurate transcription.

Visual information should be easy to understand. In transcribing pitch movement, ToBI utilises points, which need to be mentally reconstructed as lines, while the tonetic stress transcription uses lines extensively, which makes it much easier to understand what intonation is used. Marks for the tonetic stress transcription are simply added to texts – no extra lines are required to transcribe intonation, while

ToBI requires other lines (tiers), which makes it more difficult to understand how the given utterance is spoken.

It was mentioned above that the conversion from ToBI to the tonetic stress transcription is totally possible, but it is still not possible to do so automatically. This is mainly because there are some cases in which ToBI cannot transcribe utterances accurately. ToBI may be developed further, but care must be taken not to make overly complicated changes because this keeps many users away. However, if targeted for computer processing, any complication could be acceptable and even recommendable.

Intonation of human speech is complicated, and no transcription system can transcribe it perfectly. However, what is important in devising a transcription system for human use, especially in education, is that it should be simple and easy to understand, and that it should be capable of transcribing as many utterances as possible in a linguistically accurate manner.

<sup>1</sup> This is taken from Beckman and Ayers (1994c). (Accessed on 2 May 2020).

<sup>2</sup> Each tone can be subdivided. For example, a fall can be divided into a low fall and a high fall, but this paper does not go into such details, except for special cases.

<sup>3</sup> This is taken from Roach (2012).

<sup>4</sup> This programme was made by Paul Boersma and David Weenink. The version used in this paper is 6.1.15 (64-bit edition), released on 20 May 2020.

<sup>5</sup> This paper uses the term 'intonation unit' to show a unit which ends with a full phrase boundary in ToBI in order to distinguish it from a tone-unit used in the tonetic stress transcription.

<sup>6</sup> The onset means the first accented syllable in the head.

<sup>7</sup> Refer to the rule of three (Wells: 2006: 229) for theoretical reasoning for this argument.

<sup>8</sup> When the intermediate phrase boundary is followed by the full phrase boundary, as in 'standards' H\*H-H%, this paper does not include this H- in the number of the intermediate phrase boundaries.

<sup>9</sup> To transcribe a high rise clearly, the superscript / mark (i.e. Mari'anna) may be used in 1) instead: My name is Mari'anna.

<sup>10</sup> 'Gloria' is not as high-pitched as 'hit'. In the tonetic stress transcription, the mark for a low fall can be used for more accurate transcription, as in 'Ah Gloria.

## References

- Ashby, Michael, and Maidment, John. (2005). *Introducing Phonetic Science*. Cambridge: Cambridge University Press.
- Barry, Angela. (2008). *The Form, Function and Distribution of High Rising Intonation: A Comparative Study of HRT in Southern Californian and Southern British English*. Saarbrücken: VDM Verlag Dr. Müller.
- Beckman, Mary E. and Ayers, Gayle M. (1994a) 'Guidelines for ToBI Labelling: Preface' <http://www.speech.cs.cmu.edu/tobi/ToBI.0.html> (Accessed on 2 May 2020).
- Beckman, Mary E. and Ayers, Gayle M. (1994b) 'Guidelines for ToBI Labelling: Overview' <http://www.speech.cs.cmu.edu/tobi/ToBI.1.html> (Accessed on 2 May 2020).
- Beckman, Mary E. and Ayers, Gayle M. (1994c) 'Guidelines for ToBI Labelling: More on the Tone Tier' <http://www.speech.cs.cmu.edu/tobi/ToBI.2.html> (Accessed on 2 May 2020).
- Beckman, Mary E. and Ayers, Gayle M. (1994d) 'Guidelines for ToBI Labelling: More on the Break Index' <http://www.speech.cs.cmu.edu/tobi/ToBI.3.html> (Accessed on 2 May 2020).
- Beckman, Mary E. and Ayers, Gayle M. (1994e) 'Guidelines for ToBI Labelling: The Miscellaneous Tier' <http://www.speech.cs.cmu.edu/tobi/ToBI.4.html> (Accessed on 2 May 2020).
- Beckman, Mary E. and Ayers, Gayle M. (1994f) 'Guidelines for ToBI labelling: the ToBI Annotation Conventions' <http://www.speech.cs.cmu.edu/tobi/ToBI.6.html> (Accessed on 2 May 2020).
- Beckman, Mary E. and Venditti, Jennifer, J. (2010). 'Tone and Intonation' in Hardcastle, William J., Laver, John and Gibbon, Fiona E. (eds.) *The Handbook of Phonetic Sciences*. Second edition, pp. 603-652, West Sussex: Wiley-Blackwell.
- Cruttenden, Alan. (2016). *Gimson's Pronunciation of English*, Eighth Edition. Abingdon: Routledge.
- Guessenhoven, Carlos. (2004). *The Phonology of Tone and Intonation*. Cambridge: Cambridge University Press.
- Jun, Sun-Ah. (2005). *Prosodic Typology: The Phonology of Intonation and Phrasing*. Oxford: Oxford University Press.
- Roach, Peter. (2012). *English Phonetics and Phonology: A Practical Course*. Fourth Edition. Cambridge: Cambridge University Press.
- Rogerson-Revell, Pamela. (2011). *English Phonology and Pronunciation Teaching*. London: Continuum.
- Warren, Paul. (2016). *Uptalk: The Phenomenon of Rising Intonation*. Cambridge: Cambridge University Press.
- Wells, J. C. (2006). *English Intonation: An Introduction*. Cambridge: Cambridge University Press.

## ToBI から音調強勢表記への変換

湯 澤 伸 夫

英語の主たるイントネーションの表記には、ToBIと音調強勢表記がある。前者は、アクセントのある音節に注目し、HとLの2要素を基本概念として、基本周波数の変動に重点を置き、4つの層により重層的に表記する。本論文では音調層に注目する。点的発想のToBIに対し、音調強勢表記ではイントネーションを線として捉え、ピッチ、強度、持続時間などを総合的に判断し、発話を音調単位にまず分割し、各音調単位の中で音調核音節の位置と形状、および、その周りのピッチを決定して表記する。本論文では、Beckman and Ayers (1994)をデータとして、点と線という発想が異なるこの2つの表記の変換の可能性を論じた。結果として、ToBIで表されている表記は、音声データも分析しながら、完全に音調強勢表記で表すことができた。また、ToBIの特徴を分析する中で、基本周波数の過度の重視、中間句境界の曖昧な概念、論理的に矛盾する表記など、ToBIの問題点が浮き彫りになった。イントネーションの表記を考案するには、多くの発話を言語学的に正確に表記できなければならない。

(2020年6月1日受理)