An Intonational Analysis of Deaf Speech: A Case Study

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ABSTRACT

The intonation of an English speaking congenitally deaf adult was analysed using the framework set out by Crystal (1969) for normal spoken English. The analysis revealed a deviant and deficient intonation system. The main features of this system included, firstly, an excessive use of tone units resulting in unintentionally emphatic sounding speech; secondly, inaccurate and inconsistent use of both the grammatical and accentual functions of tonicity; and thirdly, a deficient tone system with additional abnormal use of the tones which formed the subject's tonal repertoire. This paper highlights the need for both phonetic and phonological analyses in order to obtain a true indication of a speaker's performance.

OPSOMMING

Die intonasie van 'n kongenitaal dowe Engelssprekende volwassene is geanaliseer deur 'n raamwerk te gebruik wat deur Crystal (1969) vir standaard Engelse spreektaal opgestel is. Die analise het 'n afwykende en gebrekkige intonasiesisteem aan die lig gebring. Die belangrikste kenmerke van hierdie sisteem is eerstens, 'n oormatige gebruik van tooneenhede wat spraak wat onopsetlik beklemtoon klink tot gevolg het; tweedens, onakkurate en inkonsekwente gebruik van beide die grammatika- en aksentsfunksies van toon; en derdens, 'n gebrekkige toonstelsel met addisionele abnormale gebruik van die tone wat die proefpersoon se toonrepertoire gevorm het. Die noodsaaklikheid van beide fonetiese en fonologiese analises vir die vasstelling van 'n juiste aanduiding van 'n spreker se prestasie word deur hierdie ondersoek sterk na vore gebring.

INTRODUCTION

The congenital handicap of hearing impairment affects the normal development of intelligible speech (Ling, 1976). Intelligible speech is a function of both segmental and non-segmental aspects of phonology. In other words, in order to produce intelligible speech a person must have mastered the individual phonemes as well as the intonation system of his/her language. (In addition, intelligible speech requires the mastery of syntactic, semantic and pragmatic aspects of language, but discussion of these areas is beyond the scope of this paper.) Normal hearing children develop basic intonational contrasts before they acquire the finer phonemic distinctions which are to be fitted into the intonation 'envelope' or pattern (Bruner, 1975; Crystal, 1979).

Phonemic errors and segmental phonological systems of hearing-impaired speakers have been thoroughly investigated in the literature (Ling, 1976; Stark, 1979; Dodd, 1976). However, it is not only the phonemic problems which render the speech of the hearing-impaired largely unintelligible. Abnormal prosody also plays a large role in this process (John and Howarth, 1965; Phillips et al. 1968; Silverman and Calvert, 1978; King and Parker, 1980). Until recently the prosodic features of deaf speech were described in a rather impressionistic manner using labels such as 'monotonous voice' and 'laboured speech' without much formal analysis to justify these. It is only recently, with the advent of

visual display aids (eg. laryngoscope and visispeech as described by King, Parker, Spanner and Wright, 1982) that researchers have been able to analyse and describe the prosodic features of deaf speech in an objective manner, as well as compare them to the norm (Martony, 1968; Nickerson and Stevens, 1973; Nickerson et al. 1976; Phillips et al. 1968; King and Parker, 1980).

Stark (1979) summarises the typical prosodic features found in the speech of the deaf. These include:
- —errors in timing
- —excessive word and sentence duration
- —errors in rhythm
- —intonation problems such as too little pitch variation (monotonous voice) or excessive pitch variation.

However, there is no indication as to whether these features are used to mark meaning contrasts. In other words, are these features used on a phonological level as well as on a phonetic one? If one of the aims of deaf education is to teach effective verbal communication, it is imperative that deaf speakers be taught to make meaning contrasts both by phonemic and intonational means. In order to develop appropriate teaching goals and methods we need to establish not only the phonemic systems used by deaf speakers but also their intonational systems or lack of them.

Crystal (1969) has established a detailed and comprehensive account of normal prosodic systems and intonation in English. He defines prosodic features as those "vocal effects constituted by variations along the parameters of pitch, loudness, duration and silence" (Crystal, 1969: 128). The primary prosodic features include pitch, loudness and duration, while the secondary ones include rhythmicality and pause, which both involve combinations of the three primary features. These features allow the following prosodic systems to be distinguished.

— tone, which involves pitch movement
— pitch range, which involves relative pitch levels
— tempo, which involves relative speed
— loudness, which deals with changes along a soft/loud continuum relative to the preceding utterance
— rhythmicality, which allows for the description of speech along the rhythmic/arhythmic dimension
— pause, which deals with the use of pause within the stream of speech.

These systems function across both monosyllabic and polysyllabic stretches of speech (Crystal, 1969: 140).

Crystal (1969) distinguishes two functions of intonation. The first is the ability to impart attitudinal information, such as a puzzled or questioning attitude with rising intonation, a neutral attitude with falling intonation, and an ironic or sarcastic attitude with a flat intonation. The second function of intonation is grammatical, such as in the placement of the tonic or nuclear stress on the adjectives in "a BLUE pen, not a RED one" but on the nouns in "a blue CAR, not a blue PEN". In these two examples the second stress in the utterance has its placement determined by the placement of the first stress. All grammatical functions of intonation will also entail an expression of attitude, whereas an attitudinal function of intonation will not necessarily involve a grammatical function.

Intonation involves three aspects or components, namely tone units, tone and tonicity. These three aspects are described below.

a) *Tone units:* These are the most easily identified and defined. Crystal (1969) defines the tone unit as having one peak of prominence in the form of a nuclear pitch movement followed by a tone unit boundary which is indicated by two phonetic factors:

　i) there is a perceivable pitch change, the direction of which is determined by the nuclear tone,

and ii) there are junctural features at the end of every tone unit, normally in the form of a very slight pause, often accompanied by variations, such as in length and aspiration used in the production of the final phonemes.

Without a nucleus the tone unit is incomplete. On a semantic level the tone unit can be seen as corresponding to a 'sense group', on a syntactic level to a clause (usually), on a physiological level to a 'breath group' (Crystal, 1969: 205).

b) *Tone:* This component of intonation describes the direction of pitch movement of the nucleus or nuclear syllable of the tone unit. Three groups of tones are identified by Crystal (1969):

i) Simple tones include falling, rising and level tones which are undirectional.
ii) Complex tones include all nuclei "where there is a change in direction of pitch movement within a syllable" (Crystal 1969: 217). Complex tones include fall-rise, rise-fall, rise-fall-rise and fall-rise-fall, the first two being the more common. The syllable with the first element of the tone is more prominent phonetically than the syllable with the second or third element.
iii) Compound tones are "combinations of two kinetic elements of different major phonetic types acting as a single tonal unit (Crystal, 1969: 218). The two main types are fall + rise and rise

+ fall, where the "two elements of a complex tone have in effect been separated to allow a larger stretch of utterance to fall under the semantic range of the nucleus" (Crystal, 1969: 218). As for complex tones, the compound tones have one element which is more prominent phonetically than the other, this usually being the first.

When used together with the pitch range system one finds tones being produced with a narrow, wide or normal pitch range resulting in different meanings. In his data on normal intonation of English, Crystal (1969) found that simple falling tones were by far the most commonly occurring tone type.

c) *Tonicity:* This involves the placement of the nuclear tone within the tone unit. Tonicity has two functions: the accentual and grammatical functions. The accentual function is governed by non-linguistic situational factors and is unpredictable from the grammar. It serves to highlight the most relevant part of the sentence. The grammatical function is "largely or wholly predictable from the context immediately preceding the tonic word" (Crystal, 1969: 263), as in alternative contrasts such as for the utterance "Are you going by TRAIN or by CAR" where the tonic placement on any other words than TRAIN and CAR would, in most contexts, render the sentence ungrammatical. In English it is generally the case that the nucleus falls on the last lexical item in the tone unit.

The aim of this paper is to analyse, using the framework described above, the intonation of a congenitally deaf adult in order to establish whether she is using intonation in a systematic manner or not. The second aim, arising out of the first, is to establish the nature of this system, if there is one.

METHODOLOGY
1. The Subject (M):
a) Description
M is a 23 year old female whose mother-tongue is English. She has a profound, bilateral sensori-neural hearing loss of congenital origin with unknown cause. The pure tone average for the frequencies 500 Hz, 1000 Hz and 2000 Hz is 98 dB for both ears. M has worn bilateral hearing aids since the age of two and a half. M's parents and siblings are all hearing.

b) Education:
M attended schools advocating an oral approach. She has a Higher National Certificate in maths, statistics and computing and is employed as a computer programmer.

c) Speech Characteristics:
M's speech is mostly intelligible. She has some consistent segmental errors mainly involving consonants. These include:
— weak fricatives　　　　　— unreleased final plosives
— some nasalisation　　　　— intrusive schwa.

It was decided to choose a subject who had reasonably good segmental ability so that the intonational factors could be more easily isolated.

2. Data Collection and Analysis:
About 20 minutes of informal conversation between M and the writer was recorded on a cassette recorder. The tape was then transcribed orthographically. Only M's utterances were analysed in terms of prosodic features. The following features were marked:
— tone unit boundaries　　— stress
— tonicity　　　　　　　　— pitch range
— nuclear tones　　　　　　— pauses and rhythm.

Appendix A gives a list of the symbols used in the transcription. Counts were made of the occurrence of the various features and percentages were calculated from these.

RESULTS AND DISCUSSION

Once the data had been analysed it became apparent that M was using a consistent intonation system which involved a number of idiosyncratic combinations of features. This is illustrated in detail below.

The Intonation System used by M:
1. Tone Units:
Table 1 summarises M's use of tone units. M used a total of 567 complete, intelligible tone units, and 10 incomplete ones. The average length of the tone units was 3,7 words, and 81,1% of the tone units were between one and five words in length. Crystal (1969) found that the average number of words per tone unit was five and that 80% of all tone units had lengths between one word and seven words. Therefore, M used shorter tone units on the whole, although the significance of the difference has not been established statistically.

Table 1: The use of tone units by M

Number of complete intelligible tone units	567
Total number of words	2157
Average number of words per tone unit	3,7
Percentage of tone units which ranged from 1 to 5 words	81,1%
Percentage of tone units which ranged from 6 to 10 words	18,9%
Number of minor sentence tone units	43
Number of minor sentence tone units expressed as a percentage of the total	7,5%
Number of incomplete tone units	10

It would seem that M was in fact using too many tone units and as a result too many nuclear tones were marked. This overuse of nuclear tones, in turn, results in the loss of the functions of tonicity, namely to highlight new information and mark grammatical contrasts. The following are some examples of the excessive use of tone units.

M: but we stàyed in /
    a very s̆imple /
    accommodàtion /

M: it ùsed to be /
    a stàble /
    for hòrses /

M: ꜛ"I've been toꜛ Dàrtmoor /
    ¹once befòr̆e /

M: ¹it's . fièlds /
    and coùntry / —
    ¹ all aroun̆d /

All the above examples would have been single tone units rather than separate ones in the speech of a hearing speaker with only the last item stressed or highlighted. M is clearly not using tone units to delimit sense-groups. Rather, she has segmented the sense groups inappropriately into phrases. A phonetic variation on the excessive use of tone units was the use of glissando which involves

glides and also causes accentuation. For example:
'gliss' M: I ¹use it "mainly for ¹going' to wo̊rk̊ /
'gliss' M: say "twenty-¹five de¹grees'ꜛ ceǹtigrade /
In the above examples M used glissando rather than separate tone units with a similar result.

One way of overcoming the loss of functions of tonicity would be to devise an alternative means of marking these. In other words, it is possible that M is using an idiosyncratic or abnormal way of marking the limits of sense-groups. In fact, the data suggest that M used the tone system, rather than tone units, to serve this function. This hypothesis will be discussed in detail in the section on tone.

Another effect of M's excessive use of tone units is the fact that some tone units sound complete on an intonational level, but on a syntactic and semantic level they are incomplete. For example, in

     M: and the èlms /
     T: and that's what . . .
'gliss' M: a "lot of èlms / . ¹get ̈it /

M's first utterance seems incomplete in all respects except for the presence of a tonic on "elms".

The literature on the speech of the deaf makes reference to sentences being broken up into unusual breath-groups (Hudgins and Numbers, 1942, cited in Stark, 1979), and to the presence of inappropriate pauses between words in mid-phrase (Stark, 1979). A large amount of breath is used for each phrase thereby reducing the number of words or length of phrase per breath (Nickerson and Stevens, 1973). Therefore it would seem that the use of too many tone units, (or to put it in another way, the use of tone units which are shorter than normal) seems to be a recognised feature of deaf speech. The explanation for this could be due to what Ling (1976: 12) describes as "a lack of coordination between the articulators and the breath-voice system".

2. Tonicity:
Tonic placement can be either final or non-final in the tone unit. Out of a total of 395 tonic markings, 293 were final and 102 non-final. This represents 74% and 26% of the total respectively. Tonic placement was only counted for those tone units which were larger than one word, and furthermore, it was decided to look at sense-groups rather than solely the tone units. This was felt to be justified as the excessive use of nuclear tones, not necessarily marking tonicity, would have yielded confusing results. As mentioned above, it seems that M uses an idiosyncratic system for marking prominence (see below for further discussion).

As the above percentages indicate, M used mostly final tonic placement. Crystal (1969) suggests that the normal pattern is about 90% final and 10% non-final placement. Therefore it would seem that M followed the normal trend except that she tended to use non-final placements more than might have been expected. The following examples illustrate firstly, final and secondly, non-final tonic placement.

1. 'gliss' M: we ¹went up on the "thursday¹ after'nòon /
   'gliss' M: — it was "really a con¹verted' <u>stable</u> /
   'gliss' M: ¹never came "back the same' <u>way</u> /

2. M: we | "climbed . to the tòp hill / —
   M: ¹they have the "highest <u>Welsh</u> ¹mountains /
   M: there are h̆igher ones ¹<u>there</u> /

M did not use correct tonic placement in all cases. Of the final placements, 76% were correct and 24% incorrect. Some examples of incorrect final placement are given below.
3. 'gliss' M: — — and "three ¹<u>people</u>' . | <u>slept</u> /
   on the |¹ two màttresses /
4. M: ¹we went for | this ¹Easter <u>weekènd</u> /

The underlined syllables indicate the tonic placement in question. In example 3 the tonic placement should have been on "three" and "two" to indicate the meaning contrast. There is no contrast meant between "slept" and "mattressess". In example 4 a more natural accent would have been to put the tonic placement on "this". Example 3 demonstrates the grammatical function of tonicity where the placement of the tonic is determined by the preceding grammatical context. Example 4 demonstrates the accentual function of tonicity which is independent of grammatical context. However, M's placement of the tonic does not show correct use of these functions. It seems therefore that M has some but not full control of the rules governing tonic placement.

Of the non-final tonic placements, 81% were correct, 7% should have been final placements, and 12% were used correctly in that they were non-final but were placed on the wrong non-final item in the tone unit.

M: I 'went up to the 'North↑ Yorkshire Dales / —

In the above example "Yorkshire" is made prominent when it need not be as no contrast is being made between "Yorkshire Dales" as opposed to some other "Dales". The tonic placement would have been more appropriate on "Dales" making it a final placement.

An example where the use of non-final placement was correct but the non-final item chosen was incorrect, is the following:

M: which is /
  |"right up / —
  the 'north 'west part of 'Yorkshire /

In this utterance, if the non-final tonic placement is to be used, it would be more appropriate on "west" rather than "part", as the important information is the fact that it is the "north-west" and not the "north-east" part.

A further example is

M: you↑ 'don't . 'see anybody /
'gliss' we "hardly see any people /

where the tonic should have been placed on "any" rather than "see" in the second utterance.

M's use of tonicity mostly on lexical items rather than grammatical ones follows the normal pattern, in that 98% of tonic placements were on lexical items and 2% on grammatical ones. In Crystal's (1969) data, 93% of tonics were placed on lexical items and 7% on grammatical ones. Most of the placements of tonics on grammatical items in the data for this project occurred in final position, and were generally correct, as the following examples show.

'gliss' M: we 'went up on the "thursday 'after'noòn / — —
    we 'drove ùp /
    in↑cars / — — erm —
'gliss' it "took all 'afternoon' to get↑ ùp there /

The tonic placement on the second "up" is quite appropriate in the context. The first "up" should not have a tonic and should be part of the same tone unit as "in cars".

'gliss' M: "where we' slèpt /
'gliss' 'was — "sectioned' òff / —

In the above example, the placement of the tonic on "off" seems to fit correctly in the context.

Therefore, with regard to tonicity, the data indicate that M is not fully in control of tonic placement. There is little literature concerning the placement of tonics by deaf speakers. Stark (1979: 239) in her summary of the features of deaf speech, mentions that 'word accents are misplaced and normally unaccented syllables are accented'. This statement refers to word stress rather than

sentence stress, the concern of tonicity. There were very few instances of incorrect word stress in the present data. Two notable examples were the placement of the stress on the first rather than the second syllable of "cèrtificate" and on the second syllable of "anywày" rather than the first. A later instance of "ànyway" was produced with the correct stress. The lack of reference to tonicity in the literature on deaf speech reflects the fact that research has concentrated on the phonetic level and has not looked at the phonological use of these features.

3. Tone:

Tonal aspects on intonation deal with the direction of pitch movement which occurs on the nucleus or tonic. Crystal (1969) indicates that falling tones are the most commonly used, with rising tones being second in frequency of use. Table 2 shows the distribution of tone types in M's speech.

Table 2: Tone Types in M's Speech

Type	Number	Percentage of total
Falling \ Full nuclear 82% Sub-nuclear 18%	388	73%
Rising / Full nuclear 81% Sub-nuclear 19%	16	3%
Fall-rise \/ Full nuclear 94% Sub-nuclear 6%	86	16%
Fall + Rise \+/ Full nuclear 92% Sub-nuclear 8%	42	8%

In the above discussion it was suggested that M had devised an idiosyncratic system to mark the limits of sense-groups. This was necessary because she used an excessive number of nuclear tones and thereby lost the ability to delimit sense-groups using tone unit boundaries. In analysing the placement of tonics in the data, the tone units were grouped into sense-groups, and the tonic for the sense-group, rather than for the individual tone units, was then determined. Therefore the tones used by M were classified as full nuclear when they were considered to be the nuclear tone of the sense-group, and sub-nuclear when they were not.

Crystal (1969) suggests that falling tones occur on about 51% of nuclei, and rising tones on about 20%. The other tone types seem to occur in relatively similar proportions. In the data for this subject falling tones were used far more and rising tones far less than expected. This could be a function of the sample type (i.e. informal conversation) as, for example, reading produces many more rising tones.

Falling tones are considered to be the most basic of the tones and are the first to be used by normal hearing children learning their mother tongue (Crystal, 1979). It is also the falling tone which carries the least attitudinal information in English, being the neutral, unmarked form (Crystal, 1969). Therefore, if, due to the handicap of deafness, M has not developed a full, normal intonation system, it is not surprising that the falling tone is far more common in the present data than expected. The following are some examples of full nuclear falling tones:

'gliss' M: — 'cause there's a "lot of 'other' tràffic /
    — of the hòliday 'traffic /
M: erm — — it's 'so quiet /
M: — the 'whole building /
'gliss' M: a'bout — as "big as 'this' ròom /
    M: I 'haven't . 'got a 'very good sleèping bag /
    I'm going to 'buy a↑ bètter one /
    làter /

The following examples show the use of falling tones in sub-nuclear positions:
M: it was 'just 'like — you 'could 'imàgine it /
    being a stàble /
    M: the doòr /
    was . divided /
    in twò /

In the examples given below it will be noticed that the full nuclear tonic is in fact a falling tone produced with a narrow pitch range.
M: ↑'that is about /
'gliss' "three and a half 'thousand feet' hĩgh /
'gliss' M: but we "'get ᵒ' very 'wrapped' . 'warmly 'wrapped↑ùp /

For reasons that will be discussed below, it is assumed that the narrowed falling tone is a variant of the falling tone, and that the narrowing could be seen as merely a phonetic realisation of the falling tone, just as one finds intra-person variations in phonemic productions. Furthermore, narrowing can be related to a common observation in the literature that the speech of deaf speakers has a tendency to be monotonous (Stark, 1979). If one did an analysis of the semantic contexts associated with the use of either variant, then it is possible that the falling and narrow falling tones might be used in different contexts. However, that is not within the scope of this paper.

The tone types which occurred with most frequency after the falling tone were the fall-rise complex tone and fall + rise compound tone. Both these tones were produced with a narrow pitch range on the rising component, not an entirely abnormal feature as Crystal (1969) describes these tones as having a more prominent first component. The complex tone occurred about twice as often as the compound tone. A further look at the data indicates that comparison of M's use of these two tones with normal usage is not really valid as they seem to be used for different purposes.

It was observed that
i) the compound tone (\+/) tended to occur predominantly as a nuclear tone in non-final position,
ii) the complex tone (\ /) tended to occur as a nuclear tone in final position, and
iii) the use of the complex tone was much more frequent than the use of the compound tone (i.e. final tonic placement occurred more frequently than non-final placement).

Therefore, the distribution of these tones was analysed in more detail. The results show that, of the complex tones, 94% occurred as a full final nuclear tone, while only 6% occurred as sub-nuclear tones. Furthermore, the tones which occurred in sub-nuclear position also marked final tonic placement within their tone units. The following examples show the use of this tone.

M: we↑ wórk for people /
'gliss' like the "National Trùst /
'gliss' or — a "local' couñcil /
'gliss' or a "nature' . couñcil /
'gliss' M: a "lot of 'dead' elms /
    M:↑'what we dõ̀ /
    is vòluntary /

The first two examples show full nuclear tones and the third a sub-nuclear tone. (It should be noted that, in giving these examples, the correctness or incorrectness of the tonic placement is not at issue).

Similar results were observed with the occurrence of the compound tone, namely that 92% occurred as non-final full nuclear tones, while only 8% occurred as non-final sub-nuclear tones. The examples presented below demonstrate the use of the compound tone, the first two being non-final full nuclear tones and the last being a non-final sub-nuclear tone.
M: 'there's no tràffic 'warden /
    on Satũrdays / — —
M: but I's 'very unlùcky that afternóon / —
M: it 'would've 'cost . 'about seven 'seventy peñce /
    for the thrèe hours I was . awãy /
M: well I've pàrked my bik̃e /
    thère /

M's purpose in using these tones seems to be to mark the end of sense-groups which normally would be marked by the use of tone unit boundaries. Furthermore, M uses the complex and compound tones for the same phonological function, thereby giving them the status of allophonic variations of the same tone in complementary distribution.

However, M does not only use the complex and compound tones to delimit sense-groups. She also uses the simple falling and narrow falling tones to fullfil this function. In the data, falling and narrow falling tones tended to be used for shorter sense-groups than the other tones, but this was not an important trend.

Finally, as Table 2 indicates, M used few instances of rising tones and no instances of complex and compound tones other than the fall-rise and fall + rise discussed above.

Therefore the use of tone types by M has proved to be quite systematic in nature. However, it is not a normal system, in that M seems to be using the three main tones of her system more as variations of one tone than as separate tones phonologically. This would indicate that M has a very small range of tone types with which to mark meaning contrasts in terms of attitude. However, this assumption would need to be checked by analysing the semantic use of these tones; in other words, is M marking different attitudes with these tones? It seems unlikely that she is, as her tone system functions to delimit sense-groups rather than to mark attitude contrasts.

In summary, the most important characteristics of M's intonation system are the following:
1. an excessive number of tone units which do not correspond to the notion of tone units delimiting sense-groups;
2. an inconsistent ability to mark grammatical contrasts and to highlight new information by means of varying tonic placement within the tone unit;
3. a very small tonal system which seems to be undertaking the function of delimiting sense-groups rather than marking attitude contrasts.

The prediction is that, on a semantic level, M will have a reduced ability to mark or express meaning contrasts usually indicated, in part, by variations in number of tone units, tonicity and tone. For example, Crystal (1969) suggests that a haughty attitude is partly expressed by the use of non-simple tones, a puzzled attitude by a relatively high number of tone units and extremely stable tonicity and an amused one by a low number of simple falls. Therefore it would be interesting to investigate the ability of deaf speakers to express these attitudes and the means by which they express them.

CONCLUSION

The intonation system which has emerged from the analysis of M's speech is deviant and deficient in nature. Although M has a number of normal features on a phonetic level, she does not use them in the normal manner to mark phonological contrasts. In that sense her system is deviant. The tone system used by M includes basically one tone type with a number of phonetic variants, and in that way it is deficient. Therapeutic intervention would aim at remediating both of these factors, using for example, visual display aids to teach different tone types and correct placement of the tonic.

The aims of this paper have been achieved, and in addition, the hypothesis that was put forward has been shown to be correct for the speech of one congenitally hearing-impaired adult. One cannot generalise from one case, but it is not unlikely that other hearing-impaired speakers will use intonation systematically with a deviant and deficient system, although their individual systems might not have the same characteristics of M's system.

An important factor arising from the analysis is the need to analyse the use of intonation not only in terms of the phonetic features but also in terms of how those features are used phonologically. In other words, assessment aimed at establishing therapeutic goals necessitates both a phonetic and phonological description of speech. This was highlighted by the fact that on a phonetic level, M used at least three different tone types, but on a phonological level they functioned as a single tone.

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Appendix A: Symbols used for the transcription

Symbol	
\	= falling tone
/	= rising tone
\/	= fall-rise tone
\+/	= fall + rise tone
n	= narrow pitch range
.	= short pause
—	= longer pause
' or ''	= stress (extra loudness as opposed to pitch movement)
↑	= raise in pitch
'gliss' '' ''	= glissando
/ /	= tone unit boundary
syll	= tonic syllable referred to in examples