INTONATION IN THE WH AND Y-N QUESTIONS OF MOTHERS OF HEARING IMPAIRED: INFLUENCE OF TYPE OF PARTNER IN COMMUNICATION

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Abstract

'Intonation' a prosodic feature of speech is characterized by the variation of fundamental frequency over time. The study attempted to analyze the variations in the use of intonation patterns of WH and Y-N questions in mothers following two approaches; Woodford Oral technique and non-specific technique, when they speak (a)to their children with hearing impairment and compare the same with their use of the same questions when it is addressed to (b)normal adults and (c)normal children. 30 mothers of children with hearing impairment served as participants and they were divided into 2 groups – one group followed Woodford Oral Technique and the other group followed non-specific technique. The participants were instructed to ask as many questions as possible to 3 different communication partners on a selected picture stimuli. A total of 14 WH and 5 Y-N questions spoken with a similar syntactic structure were analyzed for the intonation features that were expressed by majority of the mothers of the two groups. The intonation contours for each question across WH and Y-N questions, three conditions and two groups of mothers were extracted and plotted. Temporal measures included duration of the intonation contours and frequency measures included the analysis of onset and terminal F0 of the intonation contour, F0 range in the intonation contour, terminal contour of the intonation curve and declination gradient in the intonation contour. The results revealed a significant difference in the pattern of intonation contours especially in the frequency related parameters across the two groups of participants, across the conditions. Also, significant difference in the intonation contours were observed across the conditions for mothers following Non-Specific Technique suggesting that more natural intonation curves were used by mothers in Non-Specific Technique than the Woodford Oral Technique.

Key words: Hearing impaired, Intonation contours, Woodford Oral technique, Non specific technique

Supra-segmental features or 'Prosody' are considered as one of the most important but highly evasive properties of spoken language (Price, Ostendort, Shattuck-Hufmagel and Fong, 1991). According to Lehiste (1970) and Crystal (1986), prosody represents the linguistic use of vocal aspects of speech, such as variations in fundamental frequency (perceived as pitch), intensity (perceived as loudness) and duration (perceived as length) without consideration of the segmental aspects (speech sounds or phonemes). 'Intonation' is a prosodic feature of speech characterized by the variation of fundamental frequency over time (Collier, 1991), and it has many communicative roles: conveys attitudes (Crystal, 1986); old or new information, social status; grammatical functions; and information about discourse and speakers attitude (Brazil, Coulthard & Johns, 1980).

There are limited studies addressing the intonation features in Indian languages.Manjula (1979) and Nataraj (1981) found that in Kannada language, sentences are expressed with a final fall except for those with emotions like fear and anger, wherein a final-rise is noticed. Manjula (1997) studied the features of intonation and stress in question words (WH) and Yes – No (Y-N) interrogatives in standard dialect of Kannada and found that there is a general rise in the fundamental frequency (F0) for

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Y-N and fall in F0 for WH questions, and there are different patterns of declination and inclination in F0 observed for Y-N and WH questions.

Early communication in typically developing infants is extremely melodic in nature. Infants express using various intonation patterns which reflect their physiological and emotional needs (Lewis, 1951; Lennenberg, 1967). Amongst the suprasegmental features, the role of intonation in the acquisition of language has received relatively less attention. Crystal (1973) suggested that infants respond to supra-segmentals at an early age, possibly at the expense of other linguistic features. Infants master voice patterns that vary in pitch well before words are learned and this in turn facilitates acquisition of both speech perception and production skills (Smith and Goodenough, 1971).

Prosodic variations, including boundary phenomena, are especially prominent in the speech of adults directed to children or otherwise popularly known as "motherese" (Fernald & Simon, 1984; Albin & Echols, 1996). Child-directed speech or infant-directed talk , also referred to as baby talk or caretaker speech (and informally as "motherese", "parentese", or "mommy talk"), is a nonstandard form of speech used by adults while talking to toddlers and infants. It is usually delivered with a "cooing" pattern of intonation which is different from that of normal adult speech: high in pitch, with many glissando variations that are more pronounced than those of normal speech. Motherese is also characterized by the use of short and simple words. Swanson, Leonard & Gandour (1992) examined the vowel duration in mothers' speech with their typically developing children as compared to adult directed speech. They reported that the content words in the speech of mothers were often highlighted due to the lengthening of vowels in the content words rather than on function words. Ratner (1996) compared the child directed and adult directed speech of mothers in preverbal, holophrastic and combinatorial expressions and reported that vowels of content words were longer in phrase-final position in child directed speech when compared to adult directed speech.

Most of the specialists including the speech language pathologists recognize that mothers of hearing impaired children speak with their hearing impaired children in a very different prosodic form when compared to the mothers of typically developing children. The differences stand out in terms of exaggerated suprasegmental patterns in their speech which they probably do to facilitate increased auditory input to the child or slow down the rate of speech or improvise speech reading skills of the child and many other reasons. At times, a shift in the suprasegmental patterns of the mothers of hearing impaired children are seen with respect to the situation that they are placed in (For example, formal and informal contexts), persons that they are speaking to (For example, elders in the family, addressing a normal child etc), situation/context of the speech (For example, teaching the child versus holding small talk with the child etc). Overall, a noticeable change in the prosody of speech is observed in mothers of hearing impaired children when compared to mothers of children diagnosed as presenting other types of communication disorders such as mental retardation or cerebral palsy or learning disability etc. Although this impression is gained by most of the listeners who communicate with mothers of hearing impaired children, there is very little documented evidence available in the form of studies to understand this issue.

The role of intonation in the acquisition of language has received relatively less attention. The same is true for children with hearing impairment. A review of existing literature reveals a dearth of research regarding the nature of motherese in general and intonation patterns in specific, in mothers of children with hearing impairment. There are scanty reports that address this issue in western context and hardly any in the Indian context. One of the studies conducted in the western context by Szagun (1997) suggests that there is exaggerated intonation pattern used by mothers of hearing impaired.

Use of appropriate intonation patterns has a great impact on child's development of communication skills. Mothers of children with hearing impairment use different techniques to communicate with their children and to teach them how to communicate. This is often different from the natural or typical manner of speaking. For example, few mothers of hearing impaired children who follow 'Woodford oral technique' (used extensively as a teaching method at Balavidyalaya, Chennai, India,

which is a school for hearing impaired children that promotes aural verbal approach) give the impression of use of exaggerated prosody, especially in terms of intonation use. It is of scientific interest to verify how different the intonation pattern of this group of mothers is, and if it is different, what is the extent to which it is affected and are there any observable differences in the use of intonation patterns of these mothers as used with different groups of communication partners. Another point of interest that is well acknowledged is that the prosodic characteristics in general and intonation contours in particular, of different speakers is also influenced by the type of utterance. For example, a question would show an intonation contour that varies from that of a statement. Similarly, within questions, the category of questions [WH versus Yes-No (Y-N)] would also play an important role in deciding the intonation contour. Another influential parameter would be the communication pattern. Considering that the mothers of children with hearing impairment follow different methods of communication, it becomes extremely necessary to find answers to questions such as "Do mothers use the same intonation with children and adults who have hearing within normal limits?" Fetching answers to such questions will not only help us understand the extent to which their speech is same or different across different contexts, but also serves as benchmarks that help us evaluate the extent to which a method is influential.

Although one can find a decent review of literature on segmental features in children with hearing impairment, the same cannot be said of supra segmental features. Despite the widespread occurrence of prosodic problems in some communicatively impaired individuals, relatively few studies have examined the nature of prosodic impairment and how best to remediate prosodic problems (Shriberg & Kwisatkowski, 1985; Shriberg et al., 1986). An understanding of the mothers' prosody will enable us to understand the prosodic deficits seen in children with hearing impairment, because, mothers serve as models of communicative behaviour right from infancy through childhood to adulthood; their model of speech goes a long way in determining the type of deficits seen in communication of children. Knowing the deficits along with the cause will equip us to tackle them more effectively and establish appropriate patterns of communication.

This study is proposed to understand the differences in WH and Y-N questions of selected mothers of hearing impaired children, as spoken to their hearing impaired child, a normal child without hearing impairment and an adult, in a simulated experimental design. Comparison of stylistic use of intonation in these contexts by mothers of hearing impaired children will throw light on the flexibility of the intonation mechanism that a mother of hearing impaired uses across the said context. If the differences are evident, it will provide scope to introspect the reasons behind such shifts in intonation styles adopted by mothers of hearing impaired children.

Aims of the study

The study aims to compare the intonation patterns (in terms of F0 range, initial and terminal FO range and terminal intonation contours) for selected 'WH' and 'Yes-No (Y-N)' questions in Kannada language of mothers of children with hearing impairment as used with the following groups (three conditions):

- Hearing impaired children
- Normal adult
- Normal children

Method

Participants: For the experimental study, thirty Kannada speaking mothers of children with hearing impairment were included. All the mothers were in the age range of twenty five - forty years. The duration for which they were training their children ranged from one month to four years. The group included those mothers who were following the 'Woodford oral technique' (fifteen number) exclusively and those who did not follow any specific method of teaching (fifteen number).

Material: The stimulus material used to elicit utterances from the mothers in the three conditions of the experiment consisted of a non-emotional picture of kitchen items (enclosed as Appendix 1). This stimulus was selected on the basis of a pilot study that was carried out by the investigators prior to the experiment.

Pilot study: A pilot study was conducted in the first

phase of the experiment to ensure that the stimuli material used in the study could generate questions with similar syntactic structure across the speakers. Ten adult participants (mothers of typically developing children) in the age range of twenty five – forty years, who were not part of the actual experiment, were randomly assigned to two groups of five each to administer two tasks.

The task of one group of mothers was to rate for the familiarity and ambiguity of the pictures on a three point rating scale. Three pictures which provided scope for use of non emotional utterances were considered as stimuli for the pilot study. The three pictures depicted a city, a study room and items used in the kitchen. On the rating scale, a score of '2' indicated that the items/actions are familiar and non-ambiguous, '1' indicated that the items/actions are less familiar and somewhat ambiguous and '0' indicated that the items/actions are unfamiliar and ambiguous. If the ratings were '0' or '1' they were asked to explain the actual reason for the rating. Based on the pilot study, the picture of kitchen items which elicited a 5/5 response was selected for the experiment.

The task of another group of mothers was to look into the possibilities of eliciting question sentences of WH and Y-N with similar syntactic structure using the pictures. This was required since the intention of the study was to compare the intonation contours of groups of mothers keeping the syntactic structure similar. Each mother was instructed to construct as many WH and Y-N questions as possible for each picture. The picture depicting kitchen items elicited the greatest number of similar questions. Thus, the picture depicting the kitchen items was considered as the final stimulus for the study.

Procedure: For the experiment, the speech samples of thirty mothers of hearing impaired children (fifteen mothers who followed Woodford oral technique and fifteen who followed non specific teaching methods) were collected individually in a sound treated room. The mothers were instructed to ask as many WH and Y-N questions under each of the three conditions. The three conditions included asking questions about the stimuli picture to:

(1) Their child with hearing impairment

(2) A normal child

(3) A normal adult.

The stimuli picture was placed in between the mother and the participant in such a way that the card was visible to both of them at a time. Looking at the picture, the mothers asked as many questions as possible to the participant. The mothers and their communicating partners were kept blind to the purpose of the study. They were not even sensitized as to the type of questions to be asked. The stimuli of kitchen picture was so constructed that it provided opportunities for the mother in framing WH and Y-N questions in a natural manner, more than any other type of questions. In order to maintain a true representation of the simulated condition of the experiment, the speech of communication partner was also recorded on a portable tape recorder, although the speech of the partner was not analyzed or included in the study design. When the mother asked the questions, she was instructed to do so as naturally as possible. The speech samples were recorded using a professional digital tape recorder with external microphone and the data was directly stored on a computer using line feed procedure. The speech recordings of mothers across the three conditions were randomized to counterbalance and to control order effect if any. The syntactic structure of WH question forms 'where' & 'what' were not the same across the mothers & hence these were not included in the final analysis.

Analysis: From the recorded samples, questions which were framed using similar syntactic structure across the thirty mothers & across all the three conditions in both WH and Y-N question categories were selected. This process yielded a total of nineteen questions (fourteen WH and five Y-N questions) (see Appendix 2). These questions were transferred through line feed to PRAAT software (Boersma & Weenink, 2001) to analyze the intonation contours of WH and Y-N questions, using 'F0 analysis' module in the Speech analysis section of the software. The speech signal was digitized at a sampling rate of 16000 Hz. The basic unit of analysis included the WH or Y-N question, within which the temporal and F0 measurements were carried out. For the purpose of pitch analysis, F0 range was set between 100 to 350 Hz and the window frame length of analysis was 25 ms. The pitch contours were

extracted using pitch extracting algorithm of PRAAT software. The F0 contours of WH and Y-N questions analyzed were stored as separate files. In order to obtain accurate duration measurements and facilitate discernible boundaries of syllables and intonation units, the utterances were displayed on a wide-band spectrogram. The spectrographic display was obtained between 0-80% Nyquist frequency and was analyzed in Blackman window weighting. The pre-emphasis level was set at 0.80. The acoustic measurements were carried out by the investigators of the study. To check for reliability of measurements of temporal and F0 parameters, approximately 10% of the speech sample was measured independently by another investigator, and these were found to be reliable as the contour to contour agreement was greater than 90 %.

The acoustic measurements of duration and F0 were obtained for the following parameters:

Temporal measures:

- Duration of the intonation contour for question as a whole

Fundmental frequency (F0) measures:

- Onset and terminal F0 of the intonation contour
- F0 range in the intonation contour
- Terminal contour of the intonation curve, with respect to rise, fall, level and the combinations of these.
- Declination gradient in the intonation contour.

Graphic representation of intonation contours: To facilitate comparison of the WH and Y-N intonation contours of the mothers, the intonation contours of each question as expressed by mothers were superimposed on each other for graphic representation and further analysis. This was carried out by copying the contours extracted through PRAAT analysis on to Microsoft PowerPoint office and placing them on the temporal and F0 scale using Microsoft paint office. The contour of each mother's utterance was represented in specific colour as codes to facilitate identification of the mother and for further analysis and comparison. The contours for each question asked by mothers across three conditions were thus depicted graphically.

Results & discussion

The selected features of intonation contours were analyzed for WH and Y-N questions of mothers for the three conditions separately. The results are presented in two sections for Y-N and WH questions respectively.

The phonetic transcription to represent questions is based on Schiffman (1979) for Kannada language (Appendix 3). Graph 1 and 2 presented in Appendix 4 shows an example of the superimposed intonation contours for one out of five Y-N questions and one out of fourteen WH questions.

Table 1a shows the duration of the intonation contours for the yes-no questions. The duration of the Y-N questions along with mean and SD for the two groups of mothers namely, the group that followed Woodford Oral technique (Group 2) for the three conditions – adults (C1), typically developing child (C2) and their hearing impaired child (C3) was lesser compared to the group that followed non-specific technique. In general, the mean duration was higher in mothers who followed non-specific technique than that of mothers who followed Woodford Oral Technique. This was probably because of lesser number of syntactically similar questions in mothers following Woodford Oral Technique compared to mothers who used non specific technique. The mean non specific technique was higher for C1, C2 conditions and C3 was greater in Woodford Oral Technique group. Thus, the two groups of mothers revealed differences in the duration of whole sentence across conditions. However, the differences must be examined in the light of absence of syntactically similar questions in quite a few cases in Group 2 which may have resulted in lesser values. Although the data is limited to five, it can probably be inferred that there was a difference in terms of duration of intonation contours between the Woodford Oral Technique and non specific technique group.

The duration of the WH questions along with mean and SD for the two groups of mothers namely, the group that followed Woodford Oral Technique (Group 2) for the three conditions – adult with hearing sensitivity within normal limits (C1), typically developing child (C2) and their hearing impaired child (C3) are shown in Table 1b. In general, the mean duration was almost similar in mothers who followed

1. Duration of the intonation contour for Y-N and WH questions in three conditions

Questions	Mothers: Non-specific approach			Mothers: Woodford technique		
	C1	C2	C3	C1	C2	C3
Q1	1.7	1.5	1.8	-	1.3	-
Q2	1.5	1.6	1.9	1.5	1.4	1.9
Q3	1.2	1.3	1.4	0.9	-	-
Q4	1.5	1.5	1.4	1.4	-	-
Q5	1.4	2.6	1.4	0.9	-	-
Total	7.3	8.5	7.9	4.7	2.7	1.9
Mean	1.46	1.7	1.58	1.17	1.35	1.9
S.D.	0.24	0.9	0.32	0.32	0.05	0

Table 1a: Duration of the intonation contour for Yes - No questions in sec (C1 = Adult, C2 = N Child and C3 = HI child, '-' indicates that syntactically similar questions were not available for comparison)

Question Number	Mothers : Non-specific approach			Mothers: Woodford technique		
	C1	C2	C3	C1	C2	C3
Q1	-	1.5	-	1.6	1.7	1.6
Q2	1.6	1.6	1.5	1.7	1.5	1.6
Q3	1.3	1.5	1.6	1.5	1.6	1.5
Q4	1.3	1.5	1.6	1.5	1.5	1.7
Q5	-	1.5	-	1.0	1.8	1.6
Q6	1.2	1.5	1.6	1.9	1.9	1.3
Q7	1.5	1.6	1.8	1.7	1.5	-
Q8	1.5	1.3	1.5	1.3	1.6	1.6
Q9	-	1.5	1.5	1.4	1.3	2.0
Q10	1.6	1.5	1.5	1.5	1.5	1.6
Q11	1.9	1.6	1.7	1.5	1.7	1.9
Q12	1.4	1.5	1.9	1.6	1.5	1.6
Q13	1.6	2	2.5	1.5	2.0	1.7
Q14	1.4	1.4	1.4	1.0	1.4	1.6
Total	16.3	21.5	20.1	20.7	22.5	21.3
Mean	1.35	1.53	1.67	1.47	1.60	1.63
S.D.	0.25	0.07	0.83	0.43	0.4	0.37

Table 1b: Duration of the intonation contours in sec for the WH questions (C1 = Adult, C2 = N Child and C3 = HI child, "-" indicates that syntactically similar questions were not available for comparison)

non-specific technique and mothers who followed Woodford Oral Technique, with very minor differences across the conditions in both the groups. Thus the two groups of mothers revealed no differences in the duration of the whole sentence across conditions. This is reflected in the changes seen in the intonation contour. One can see that there are almost similar modulations in the intonation contour in both the conditions.

Table 2a shows the difference in range of onset and terminal F0 in Hz for yes-no questions for both groups of mothers. Table 2b shows the difference in range of onset and terminal F0 in Hz for WH-questions for both groups of mothers. The difference was calculated as the value of the final /end point of the contour minus the initial / onset of the contour. A positive value indicates an upward inclination in the contour and a negative value indicates a downward declination in the contour. In Y-N and WH questions, mothers who followed Woodford Oral Technique showed lesser standard deviations in all three conditions as compared to those mothers who followed a non specific technique, who showed greater variability in onset and terminal F0 range. In WH questions, the greatest variability in terms of the range was found for C2 condition in both groups. The least variability was found for the C3 condition in both groups.

The groups showed similar inter-condition changes within their respective groups. The results point to the possible explanation that the type of communication partner did not have a significant effect on the onset and terminal F0 in mothers who follow Wood ford Oral Technique. It seems like the mothers who follow Woodford Oral Technique tend to generalize the method across communication

partners and tend to show more of flat pitch than mothers who follow the non-specific method. Table 3a shows the F0 range of Y-N intonation contours of both the groups of mothers for yes-no questions along with the total, mean and standard deviation. Table 3b shows the F0 range of WH intonation contours of both the groups of mothers for WH questions along with the total, mean and standard deviation. For both the question types, mothers who followed the non specific technique exhibited wider range of F0 with a higher mean F0.

They demonstrated significant intra-group variability and hence a higher standard deviation was noticed. Also, across conditions, they demonstrated

2. Difference between onset and terminal F0 of the Y-N and WH intonation contours

Question Number	Mothers: Non-specific approach			Mothers : Woodford technique		
	C1	C2	C3	C1	C2	C3
Q1	110	140	50		-10	-
Q2	-50	210	-20	110	30	-50
Q3	70	50	-50	60	-	-
Q4	-20	-30	-30	-10	-	-
Q5	-50	-50	-20	50	-	-
Total	60	320	-70	210	20	-50
Mean	12	64	-14	42	4	-10
S.D.	98	146	36	68	26	40

Table 2a: Difference between onset and terminal F0 (in Hertz) of the intonation contour (C1 = Adult, C2 = N Child and C3 = HI child, '-' indicates that syntactically similar questions were not available for comparison)

Question Number	Mothers: Non- specific approach			Mothers: Woodford technique		
	C1	C2	C3	C1	C2	C3
Q1	-	10	-	20	70	-60
Q2	-10	160	0	0	0	0
Q3	-20	-40	10	100	30	20
Q4	-10	10	10	0	0	0
Q5	-	-20	-	-10	0	-20
Q6	10	60	30	0	0	20
Q7	-30	-50	-20	-20	-20	-
Q8	20	30	50	70	140	-70
Q9	-	110	90	90	90	-10
Q10	-10	-100	100	-20	-20	-10
Q11	0	-100	30	50	-10	0
Q12	-10	-80	100	-20	-10	-20
Q13	100	-30	50	-20	40	-20
Q14	-10	-20	-30	-50	20	-20
Total	30	-60	420	190	330	-190
Mean	2.72	-4.28	35	13.57	23.57	-14.61
S.D.	97.27	155.71	65	86.42	116.42	45.38

Table 2b: Onset and terminal F0 in Hertz of the intonation contour for WH questions (C1 = Adult, C2 = N Child and C3 = HI child, '-' indicates that syntactically similar questions were not available for comparison)

3. F0 range in the Y-N and WH intonation contours

Question Number	Mothers: Non- specific approach			Mothers: Woodford technique		
	C1	C2	C3	C1	C2	C3
Q1	110	160	40	-	-	-
Q2	50	70	80	60	10	-
Q3	120	70	60	-	-	-
Q4	70	40	50	-	-	-
Q5	60	100	50	-	-	-
Total	410	440	280	60	10	-
Mean	82	88	56	60	10	-
S.D.	38	72	24	0	0	-

Table 3a: F0 range in Hertz in the intonation contour for yes-no questions (C1 = Adult, C2 = N Child and C3 = HI child, '-' indicates that syntactically similar questions were not available for comparison)

Question Number	Mothers: Non- specific approach			Mothers: Woodford technique		
	C1	C2	C3	C1	C2	C3
Q1	-	10	-	20	70	-60
Q2	-10	160	0	0	0	0
Q3	-20	-40	10	100	30	20
Q4	-10	10	10	0	0	0
Q5	-	-20	-	-10	0	-20
Q6	10	60	30	0	0	20
Q7	-30	-50	-20	-20	-20	-
Q8	20	30	50	70	140	-70
Q9	-	110	90	90	90	-10
Q10	-10	-100	100	-20	-20	-10
Q11	0	-100	30	50	-10	0
Q12	-10	-80	100	-20	-10	-20
Q13	100	-30	50	-20	40	-20
Q14	-10	-20	-30	-50	20	-20
Total	30	-60	420	190	330	-190
Mean	2.72	-4.28	35	13.57	23.57	-14.61
S.D.	97.27	155.71	65	86.42	116.42	45.38

Table 3b: F0 range in Hz in the intonation contour for WH questions (C1 = Adult, C2 = N Child and C3 = HI child, '-' indicates that syntactically similar questions were not available for comparison)

variability in their F0. Highest values of F0 were obtained for C2 followed by C1 and C3. This implies that F0 variations were highest with typically developing children and adults as against children with hearing impairment. On the other hand, the total F0 range of mothers who followed Woodford Oral Technique was significantly lesser than the F0 range of mothers who followed the non specific technique and also showed lesser intra-group variability. All the F0 values obtained under each condition were the same.

This shows that mothers who follow Woodford Oral Technique use lesser variations in F0 and show little intra-group variability as compared to the other group. The F0 range was higher for C1 than C2 indicating that the mothers who follow Woodford Oral Technique use a higher range of F0 with adults than typically developing children. However, no syntactically similar questions were obtained for C3 and hence the condition was not analyzed.

The terminal contours of the Y-N and WH intonation contour were examined and were categorized as rise, fall, level and combinations of these. The result of the general pattern that emerged for Y-N questions is shown in table 4a and that of WH questions is shown in table 4b.The number of syntactically similar questions elicited for mothers who follow the Woodford Oral Technique was lesser and hence the pattern of the terminal contour of mothers who followed Woodford Oral technique was found to be mixed consisting of both rise and fall. In both the question types, the pattern of terminal contours of mothers who followed non specific technique was mainly of falling types with not much inter-condition variability within the group. Thus, more consistency in terms of the terminal contour pattern was found in mothers who followed the non-specific approach. The pattern of the terminal contour of

***4.* Terminal contour of the Y-N and WH intonation curve, with respect to rise, fall, level and the combinations of these.**

Question Number	Mothers: Non- specific approach			Mothers : Woodford technique		
	C1	C2	C3	C1	C2	C3
Q1	Fall	fall	Fall	-	Rise	-
Q2	Fall	fall	Fall	Rise	Fall	Fall
Q3	Rise	fall	Fall	Rise	-	-
Q4	Fall	fall	Fall	fall	-	-
Q5	Fall	fall	Fall	Rise	-	-

Table 4a: Terminal contour of the Y-N intonation curve, with respect to rise, fall, level and the combinations of these for yes-no questions (C1 = Adult, C2 = N Child and C3 = HI child, '-' indicates that syntactically similar questions were not available for comparison)

WH Questions	
1.	bindige yaake beeku?
2.	gyaas sTov yaake beeku?
3.	bakeT yaake beeku?
4.	baaNaLe yaake beeku?
5.	mora yaake beeku?
6.	paip yaake beeku?
7.	sink yaake beeku?
8.	chaaku yaake beeku?
9.	porke yaake beeku?
10.	Tuut braS yaake beeku?
11.	iiLigemaNe yaake beeku?
12.	miksi yaake beeku?
13.	haalinkaanu yaake beeku?
14.	friDj yaake beeku?
Y-N Questions	
1.	aDige maaDabahuda?
2.	anna maaDabahuda?
3.	hallu ujjabahuda?
4.	kasa guDisabahuda?
5.	snaana maaDabahuda?

Table 4b: Terminal contour of the intonation curve, with respect to rise, fall, level and the combinations of these for WH- questions (C1 = Adult, C2 = N Child and C3 = HI child, '-' indicates that syntactically similar questions were not available for comparison)

mothers who followed Woodford Oral technique was found to be mixed consisting of both rise and fall with majority of them showing rise pattern.

The intonation contours were analyzed in terms of inclination or declination pattern. The declination and inclination gradients are tabulated in table 5a and 5b and compared across the two groups of mothers for yes – no and WH questions respectively. For both the question types, in mothers who follow the non specific technique method, significant inter and intra-group variability was found across the three conditions with C1 and C2 showing declination for few questions and inclination for few. However, there was not much variability in C3 with most of the mothers showing a declination pattern. In mothers who follow the Woodford Oral Technique, no fixed pattern was noticed.

In Y-N questions, the number of syntactically similar questions elicited was very less for C2 and C3. Hence a declination gradient could not be calculated. The two groups of mothers demonstrated significant difference in the declination gradient. In WH questions, not much of inter-condition variability emerged and a careful analysis reveals similar patterns across the three communication partners for each question. This indicates that the mothers who follow the Woodford Oral Technique tend to generalize the intonation pattern across different communication partners.

The present study is the first of its kind to be carried out in the Indian context. Despite the widespread occurrence of prosodic problems in some communicatively impaired individuals, relatively few studies have examined the nature of prosodic impairment and how best to remediate prosodic problems (Shriberg & Kwisatkowski, 1985; Shriberg et al., 1986). One of the studies in the western context conducted by Szagun (1997) suggests that there is exaggerated intonation pattern in mothers of hearing impaired. However, the exact nature of prosody in mothers of children with hearing impairment and how it is influenced by the method followed is not highlighted.

This study highlights the difference in WH and

5. Declination gradient in the Y-N and WH intonation contour.

Question Number	Mothers: Non- specific approach			Mothers: Woodford technique		
	C1	C2	C3	C1	C2	C3
Q1	inclination	inclination	inclination	-	declination	-
Q2	declination	inclination	declination	inclination	inclination	declination
Q3	inclination	inclination	declination	inclination	-	-
Q4	declination	declination	declination	declination	-	-
Q5	declination	declination	declination	inclination	-	-

Table 5a: Declination/ Inclination gradient in the intonation contour for yes-no questions. (C1 = Adult, C2 = N Child and C3 = HI child)

Question Number	Mothers: Non- specific approach			Mothers :Woodford technique		
	C1	C2	C3	C1	C2	C3
Q1	-	inclination	-I	inclination	inclination	declination
Q2	declination	inclination	No change	No change	No change	No change
Q3	declination	declination	inclination	inclination	inclination	inclination
Q4	declination	Inclination	inclination	No change	No change	No change
Q5	-	declination	-	declination	No change	declination
Q6	inclination	inclination	inclination	No change	No change	inclination
Q7	declination	declination	declination	declination	declination	-
Q8	inclination	inclination	inclination	inclination	inclination	declination
Q9	-	inclination	inclination	inclination	inclination	declination
Q10	declination	declination	inclination	declination	declination	declination
Q11	No change	declination	inclination	inclination	declination	No change
Q12	declination	declination	inclination	declination	declination	declination
Q13	inclination	declination	inclination	declination	Inclination	declination
Q14	declination	declination	declination	declination	inclination	declination

Table 5b: Declination gradient in the intonation contour for WH questions. (C1 = Adult, C2 = N Child and C3 = HI child, "-" indicates that syntactically similar questions were not available for comparison)

Y-N intonation contours across two groups of mothers following two different techniques across different communication partners namely typical adult, typically developing child and child with hearing impairment. The results indicate that there is not much of inter-condition variability in mothers who follow the Woodford Oral Technique as compared to mothers who follow the non specific technique. This suggests that mothers who follow Woodford Oral Technique exhibited similar exaggerated intonation and stereotypic patterns irrespective of the age and diagnosis of the communication partner. On the other hand, mothers who follow the non specific technique showed more variability across the conditions suggesting a more natural way of communication and that which is similar to the typical communication patterns.

The differences in the intonation contours for WH and Y-N questions within the groups across participants are not very different. This suggests that a similar pattern is maintained for the type of questions by subjects using one method. There are however, significant differences across the two groups (Woodford Oral Technique and non specific technique) especially in terms of the F0 range, terminal contours, declination gradient and range of F0 onset and termination values. The durational measures are however, not significantly different across the two groups suggesting that temporal parameters are not greatly affected by the method adopted whereas frequency measures, which are core features of intonation are highly dependent on the method followed for both the Y-N and WH questions.

Conclusion

The present study was conducted to compare the intonation contours of Y-N and WH questions across the two groups who follow the Woodford oral technique and the Non specific technique. Comparisons were also made across three conditions (with communication partners including typically developing children, normal adults and children with hearing impairment) in which the mothers uttered the Y-N and WH questions in simulated experimental conditions. The results reveal a significant difference in the pattern of intonation contours especially in the frequency related parameters across the two groups of participants, across the conditions. Also, significant difference in the intonation contours were observed across the conditions for mothers following non specific technique suggesting that more natural intonation curves were used by mothers in non specific technique than the Woodford Oral Technique.

Implications

The study compared the intonation patterns of WH and Y-N questions of two groups of mothers who used two different teaching methods to teach and stimulate their children with hearing impairment. Results suggest that the mothers of the Woodford Oral Technique go on to generalize the same with

other communication partners irrespective of their age and hearing status. This gives rise to unnatural use of intonation by such mothers. It also implies that they are less flexible and rather rigid in the stylistic use of intonation in different communication contexts.

On the other hand, mothers who follow the non specific technique who do not actually abide by any specific technique of teaching intonation seem to be more flexible in terms of their intonation use especially so as reflected in the use of WH and Y-N questions. Extrapolating this finding to the modeling of language by adult to child, one can attribute the prosodic deficits seen in the children to the method adopted by the mother. That is, the parameters of 'motherese' is reflected not only in terms of segmental variations but also in terms of intonation variations and this may in turn have an effect on the production of intonation in children's speech.

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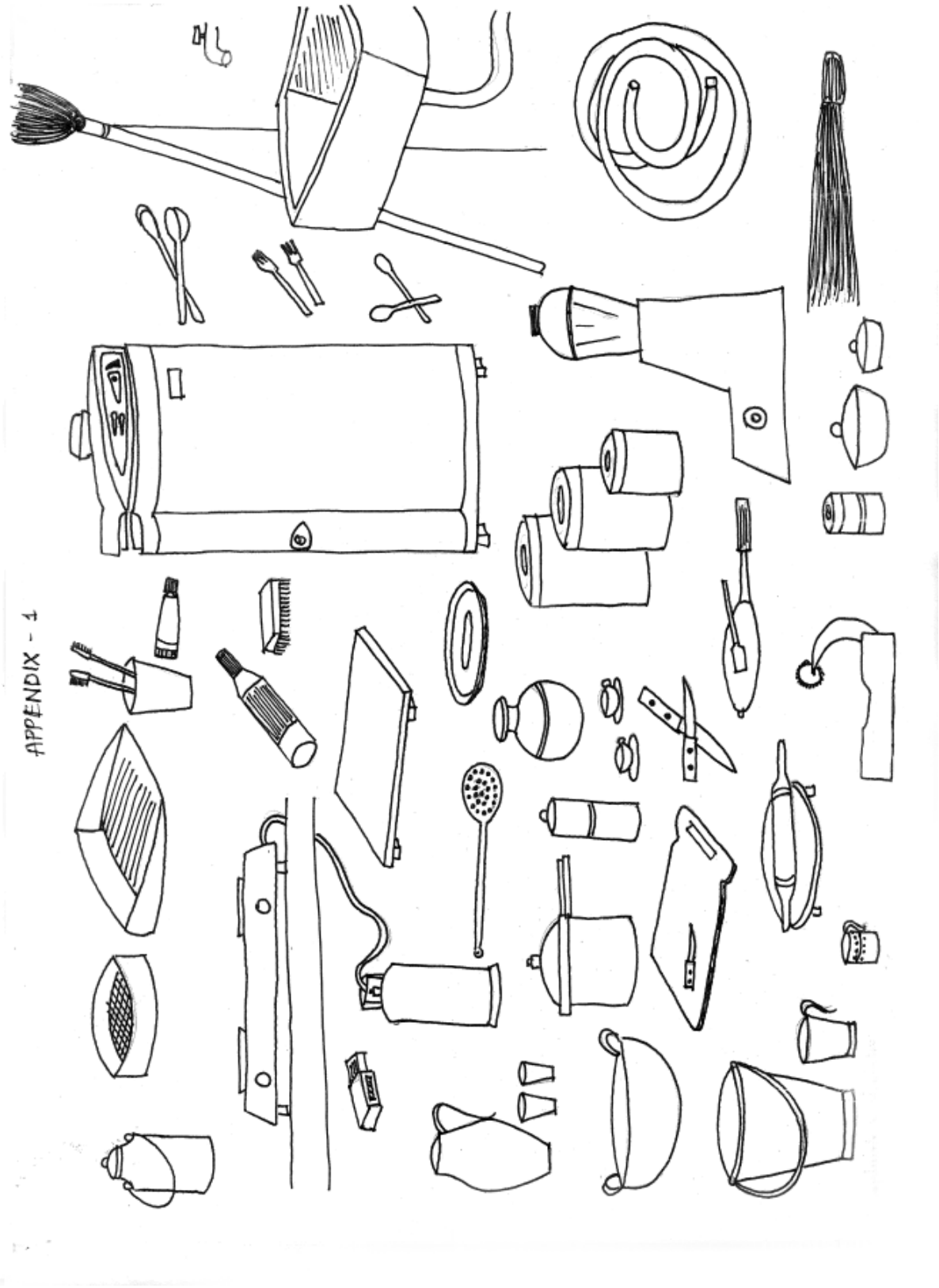
Appendix 1 – Picture stimuli



Appendix 2

Questions of participants with common syntactic patterns which were analyzed for intonation contours

[Notations used from Schiffman (1979)]

WH Questions	
1.	bindige yaake beeku?
2.	gyaas sTov yaake beeku?
3.	bakeT yaake beeku?
4.	baaNaLe yaake beeku?
5.	mora yaake beeku?
6.	paip yaake beeku?
7.	sink yaake beeku?
8.	chaaku yaake beeku?
9.	porke yaake beeku?
10.	Tuut braS yaake beeku?
11.	iiLigemaNe yaake beeku?
12.	miksi yaake beeku?
13.	haalinkaanu yaake beeku?
14.	friDj yaake beeku?
Y-N Questions	
1.	aDige maaDabahuda?
2.	anna maaDabahuda?
3.	hallu ujjabahuda?
4.	kasa guDisabahuda?
5.	snaana maaDabahuda?

Appendix 3

Transcription of sounds in Kannada language using *Schiffman's (1979) transcription procedure*

Vowel Sounds

		Frontal	Central	Back
High	Short	i		u
	Long	ii		uu
Mid	Short	e		o
	Long	ee*(ae)		oo
Low	Short		a	
	Long		aa	

Diphthongs

"ai" and "au"

Consonant Sounds

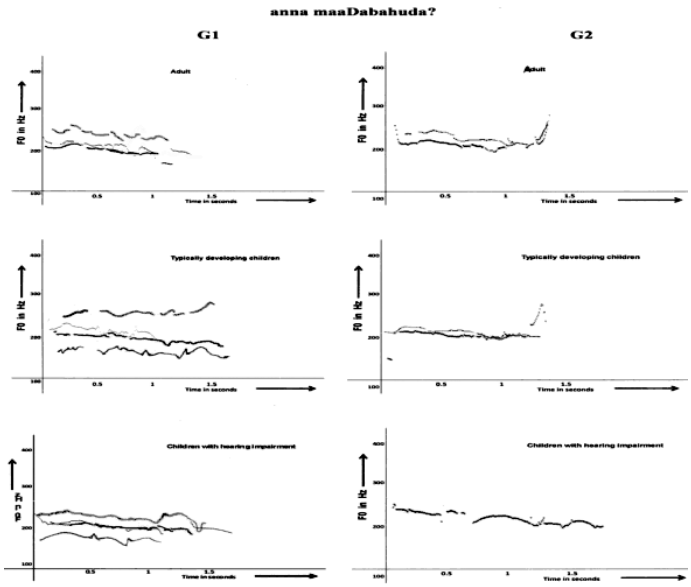
	Unaspirated	Aspirated	Unaspirated	Aspirated	Nasals
Velar	k	kh	g	gh	
Palatal	c	ch	j	jh	
Retroflex	T	Th	D	Dh	N
Dental	t	th	d	dh	n
Lateral	p	ph	b	bh	m

	Glides		Sibilants		Fricatives		Laterals		Continuant	
	V	UV	V	UV	V	UV	V	UV	V	UV
Pharyngeal						h				
Retroflex		S					L			
Apicopalatal	Y	sh								
Alveolar		s	z				l			
Labiodental	V		f							

V= voiced and UV= unvoiced or voiceless

Appendix 4:

Graph 1: A sample of superimposed Yes – No (Y-N) intonation contours of mothers in the two groups (G1= Mothers using non specific approach and G2 = Mothers using Woodford's technique)



Graph 2: Intonation contour of a WH question of mothers in the two groups (G1= Mothers using non specific approach and G2 = Mothers using Woodford's technique) across 2 groups and 3 conditions