AN ACCOUNT OF SPEECH DEVELOPMENT OF A THAI CHILD: FROM BABBLING TO SPEECH[1]

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This paper is part of a research report on "The phonetic and phonological development of a Thai baby: from early communicative interaction to speech" (Tuaycharoen, 1977). The study aims to present a picture of how the speech of a Thai child (aged 3 to 18 mths.) emerges from early vocalizations, and when and in what way language specific features appear. Thus, some answers are offered to questions which most investigators on babbling are asking, for instance:

- Do children produce an astonishing quantity and diversity of sounds, or do they produce a restricted range of sounds?
- Is babbling systematic or random?
- Is babbling a gradual continuous transition to speech or is it a discontinuous process?
- Are the patterns of babbling universal, and if so, when and how do language specific features emerge?

As Thai is a tone language where pitch is functionally contrastive at the lexical level, the question as to how 'tone' emerges from early vocalizations is also investigated. The following questions are also considered in this study:

- How does pitch come to be used functionally at the lexical level?
- What is the sequence of the acquisition of tones?

The description is centrally concerned with phonetic and phonological development. The psychological process and theories of language acquisition are not the main concern here. However, as a rationale, the writer has held the interactionist view of language acquisition, and the following assumptions are made. Firstly, language acquisition is closely related to cognitive development, and it takes place through the child's interaction with others in relation to the environment; secondly, the child creates a system of his own, and his system gradually changes as his cognitive development progresses.

The material in this study was collected in a natural home situation by tape-recording. During the period of 3-12 months, the recordings were made daily; from 12-18 months, the recordings were done twice a week. The time for each recording was not restricted, and varied between five

minutes and half an hour. There were a few gaps in recording, e.g. when the family went on a holiday, when the child was ill, or when the machine broke down.

All members of the family speak Bangkok Thai to each other and to the child. The child's parents speak only the standard Bangkok Thai of their generation. The child's grandmother speaks the Surathani dialect as well as Bangkok Thai. In her Bangkok Thai, there is some slight interference in some consonants from the Surathani dialect. However, the tones and vowel qualities are those of Bangkok Thai. In addition to the members of the family, there was a lady-cleaner who occasionally helped with the child. The cleaner speaks Bangkok Thai to the child and to the family, but with some interference from features of her dialect, the Lampang dialect. Thus, the only language the child was exposed to was Bangkok Thai, but with the addition of two other dialect accents.

The child's vocalizations were recorded by whichever member of the family was available, i.e. his parents and his grandmother. The adults always gave the date and time, and commented on the situation; sometimes the situations and contexts were clear from their conversation. During the period of 8-11 months, the writer stayed with the family and did the recording herself. Additional linguistic activities which took place when the recorder was not available was noted down in phonetic transcription. The writer also kept a detailed account of the child's general development during that period.

The data were transcribed by using the IPA symbols, as they are generally accessible to linguists. The transcription was intended to be as narrow as possible, so IPA diacritics were also used to give greater detail. In addition, a number of symbols and diacritics were made up to represent what cannot be symbolized within the IPA system. It has to be noted that the values of the symbols used in this analysis do not have precisely the same qualities as when used to represent the sounds of adult speech because of the child's vocalizations being unclear and imprecise and being produced from a much smaller vocal tract.

The vocalizations during the age of 3 to 18 months are divided into ten stages on the basis of phonetic changes, i.e. there is progress in the acquisition of phonetic features in each stage. The ten stages are described under the following headings: Early Babbling (Stages I and II), Later Babbling (Stages III and IV), the Proto-language (Stages V and VI), One-word Utterances (Stages VII, VIII, IX), Two and Three Word Utterances (Stage X).

Stages in development

Early babbling	Stage I	0;3.0 - 0;3.22
	Stage II	o;3.23 - 0;4.19
Later babbling	Stage III	0;4.20 - 0;5.15
	Stage IV	0;5.16 - 0;7.20
Proto-language	Stage V	0;8.0 - 0;10.15
	Stage VI	0;10.16 - 0;11.12
One-word utterances	Stage VII	0;11.13 - 1;1.02
	Stage VIII	1;1.03 - 1;2.24
	Stage IX	1;2.25 - 1;3.23
Two-three word utterances	Stage X	1;3.24 - 1;6.0

The detailed description of each stage is as follows:

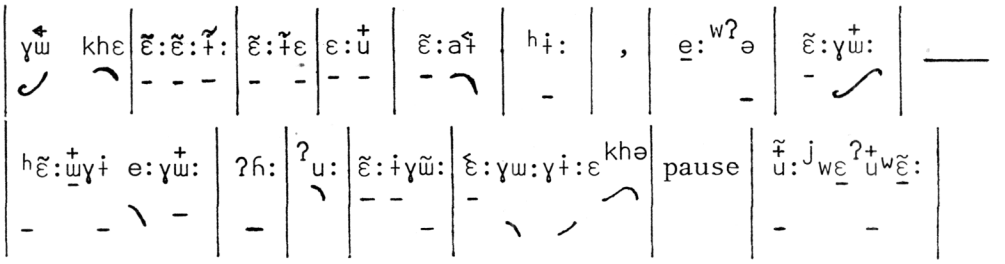
Stage I: (3 months to 3 months 22 days)

The child's vocalizations were 'fluid', consisting mostly of vowel-like sounds, and varied from open to close and from close to open. There was also variation from front to central and back. However, the vowel quality in the close front position as [i] did not occur. These vocalizations were sometimes interrupted by consonant-like sounds. The strictures for these consonant-like sounds were made at the labial, alveolar, palatal, velar, and glottal places, but they were articulated vaguely and imprecisely.

Pitch in this stage had a great variety of possibilities, i.e. mid, low, high, falling, rising, and rising-falling; the change of pitch direction was unpredictable. However, it was noticeable that at the end of almost every stretch of utterance, the pitch level appeared to be lowered or there was a change of pitch direction, e.g. falling or rising. Pitch plays an important role in this study, since the acquisition of pitch[2], or eventually tone[3] of the language is as important as consonantal and vocalic elements. An attempt to divide early babbling into syllables has been made on the basis of the changes of pitch and of pitch discontinuity for it is difficult to delimit syllables on the basis of consonantal and vocalic elements as is usually done in the adult system. This is because the early babbling is so 'fluid' and 'vague'.

Nasalization in the early babbling occurred randomly both in the happy state and the unhappy state, and also in vocal play.

Ex. 1



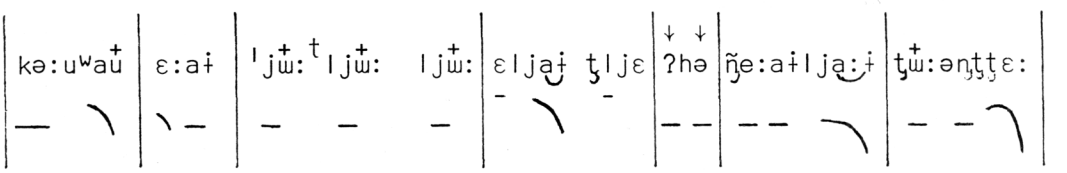
Stage II: (3 months 24 days to 4 months 19 days)

The vocalizations still varied in the range mentioned in Stage I, but there was an increase in the use of back rounded vowels, of complete closure at the alveolar place, and of homorganic articulation. In the vocal play, screeching vocalizations were often produced with a combination of normal pitch register and high pitch register. These screeching vocalizations continued in the stages that followed.

In sum, the early babbling is articulated vaguely and imprecisely. The vocalic elements are variable and tend to be centralized. The place features of consonantal elements range from labiality, alveolarity, palatality, velarity to glottality, but they are variously restricted in the manner features with which they combined, e.g.

w m b p bbb^{4} ppp^{4} bl^{4} are instances of labiality,
n l ɾ t d of alveolarity,
ʒ j of palatality,
ɣ x g k ŋ of velarity,
and ʔ h of glottality.

Ex. 2

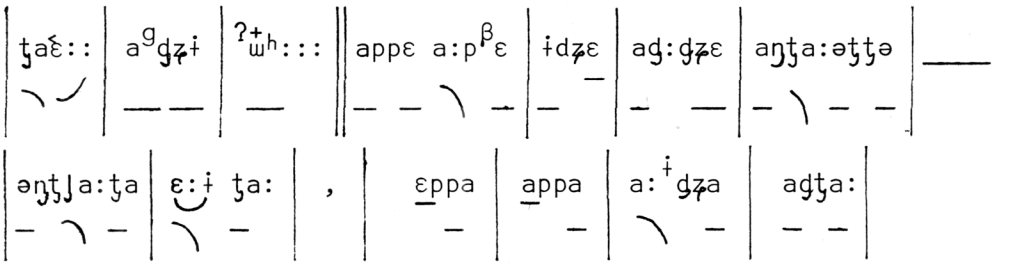


Stage III: (4 months 20 days to 5 months 15 days)

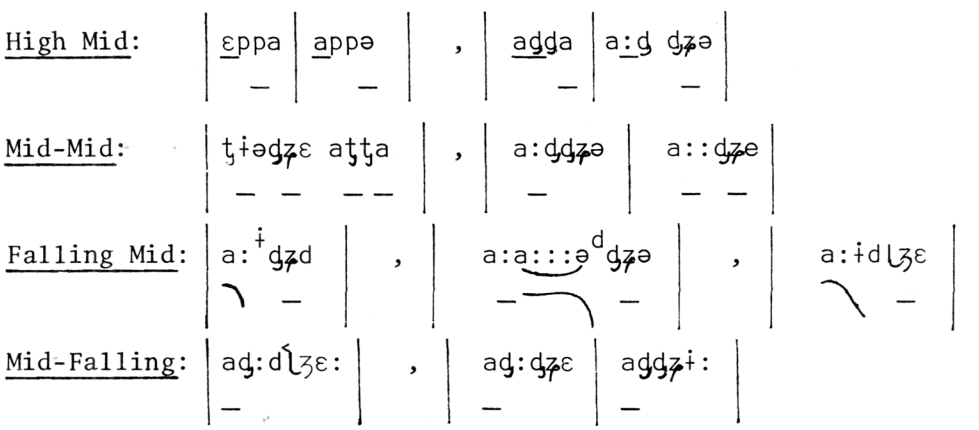
In this stage the vocalizations became more strongly articulated and accented. They became more rhythmic and more patterned. It could be said that now there were two types of vocalizations: checked and non-checked. (The 'checked' were vocalizations interrupted by stricture of complete closure, the 'non-checked' by strictures of close approximation and open approximation). All these were produced in monosyllabic and disyllabic patterns, but in this stage the disyllables outnumbered the

monosyllables. The monosyllables were produced with any one of five different pitches: low, mid, high, rising, and falling; the disyllables were produced with restricted pitch patterns, e.g. high-mid, mid-mid, falling-mid, and mid-falling. Nasalization did not appear randomly at this stage. It was produced mainly with the non-checked vocalizations and was absent in the checked vocalizations.

Ex. 3



Vocalization with fixed patterns of pitch



Stage IV: (5 months 16 days to 7 months 20 days)

The fixed patterns of syllable and pitch as in Stage III were still in use, but now monosyllables predominated over disyllables. The combination of high pitch and normal pitch registers which occurred in screeching vocalizations now appeared as 'singing tunes' in the child's vocal play. In other words, the child now began to play with pitch.

As the vocalizations became regularly patterned it was found useful to set up a basic system and a peripheral system in the analysis.

The basic system is defined as a system of sounds, pitch, and syllable patterns which occurred frequently in the child's vocalizations, and which were subsequently found to continue to appear in the later stages,

and were eventually incorporated into the system of the Thai language.

The peripheral system is defined as a system of sounds, pitch, and syllable patterns which occurred less frequently, or occurred only in conjunction with a restricted number of phonetic features and situations, e.g. falling pitch was used in connection with loudness and long length of vowel; velar sounds were produced to show pleasure; a series of fricatives and trills was produced in vocal play. Some of the sounds, pitch, and syllable patterns in the peripheral system in time became incorporated into the basic system. Others which do not occur in the language of the environment dropped out of the system. The basic and peripheral systems are given below:

1. Syllable Patterns

   Basic: V, CV, VCV, VCCV structures

   Peripheral: $V^{c,\epsilon}$ and $CV^{c,\epsilon}$ structures ($^{c,\epsilon}$ represent stricture of complete closure, and stricture of close approximation respectively.).

2. Pitch System

   Basic: monosyllables: mid and/or low
   disyllables: high-mid, falling-mid, mid-falling, and mid-mid

   Peripheral: high, falling, rising

3. Vowel System

   Basic: e ɛ a
   ɨ ə

   Peripheral: œ y
   u ɯ ɔ o ɤ

4. Consonantal System:

	Basic					Peripheral						
Labial	p	b	m	w		Labial	p͡p	b͡b	β	b͡l	m͡l	
Alveolar	t	d	n			Alveolar	l	r	ɾ			
Palatal	tɕ	dʑ				Palatal	j	ɲ	ʑ			
Glottal	ʔ					Velar	k^h	k	g	ŋ	ɣ	x
						Glottal	h					

In this stage regular patterns of pitch occurred more frequently and appeared to be used to convey 'meanings', e.g. the use [ɤ ɛ] and [ɛ ɤ] patterns to show pleasure or satisfaction.

Ex. 4

Beginning of functional use of sounds and pitch

Father	Baby	
ʔɤi ʔɤi | tɕaʔe	ʔɛ̃:ʰɛ̃:	(laughs)
"peek-a-boo"	ɤ̃:ɛ̃:	
repeats	ɤ̃:ɛ:	
repeats	ɤ̃:ɛ̃:	

Continuous babbling while investigating a toy

laughter | ze:ʔɤ: | ʔɛ̃:ʔɤ: | ɛ̃:ʔɤ·· | ɛ̃:ʔɤ:: | ɛ̃:ʔɤ:: | ɛ̃::ʔɤ:: | etc.

Stage V: (8 months to 10 months 15 days)[5]

What appeared in Stages III and IV continued in use, but greater complexity was evident in the use of a closed syllable pattern in vocal play and in vocalizations of the hungry state. Further, an example of complexity may be seen in the use of rising and high pitches in the singing tune. At this time also, final glottal constriction began to be produced.

In this stage the use of a proto-language--to use Halliday's term--appeared consistently. The proto-language used by the child under study was in the vowel form varying in quality from front to central, i.e. [a ɛ e ə ɨ]. These sounds were used with different pitches, sometimes with nasalization and glottal constriction, to imply certain functions. The functions are as follows:

1. Inquisitive, i.e. asking
2. Instrumental, i.e. demanding or requesting
3. Informative, i.e. indicating something 'usual' and something 'unusual'.
4. Affirmative, i.e. acknowledging

The first two functions, Inquisitive and Instrumental, were conveyed by the use of high or high with slight rising pitch; the third function, i.e. Informative, with either high and high-rise or mid and lower-mid depending on the context. In the 'usual' context, i.e. when the child wanted to indicate the persons or objects he knew, mid or lower-mid pitch was used, but if he wanted to inform about something 'unusual', e.g. strangers to him, or things in his environment that had gone wrong (the cuckoo-clock did not go back into the clock after striking the hour), high or high-rise pitch was used. The last function, Affirmative, was conveyed by the mid or lower-mid pitch.

Ex. 5

The use of proto-language in 'dialogue'

Situation: Before going to sleep, with his grandmother in her bedroom, the child initiated this 'dialogue'

Grandmother	Child	
	ʔɛ̃ː ʔɛ̃	(Pointing to grandmother's blouse)
nan swə khun jaːi		
'That's grandma's blouse.'		
	ɛ̃ː ɛ̃ː	(Pointing to (maternal) grandfather's photograph on the wall)
nan ruːp khun taː		
'That's grandpa's photograph.'		
sawatdi khun taː lɛu jaŋ ə luk	ʔɛːʔ	
'Has baby said "Hello" to grandpa?'		
	ʔɛ	(Pointing to his great-grandfather's photograph)
nan ruːp khun thuət	ʔeʔ	
'That's great-grandpa's photograph.'		

Grandmother	Child	
khap khun ta: thuət 'Yes, great-grandpa.'	ʔɛ:ʔ	
	ʔɛ̃	(Pointing to the electric fan)
nan phat lom 'That's an electric fan.'		
	ʔɛ ʔɛ̃:a ʔa:	(Pointing to the electric fan (again)
nan phat lom 'That's an electric fan.'	ʔã::	
	ʔɛ̃:	(Pointing to the sewing machine)
nan tɕak 'That's a sewing machine.'	ʔɛ:::	

Stage VI: (10 months 16 days to 11 months 12 days)

The proto-language was still in use in interaction with adults. Imitation of words in response to the adult models increased. Back rounded vowels began to appear more frequently. Long series of babbling were still regularly produced as vocal play.

Pitch levels used in his proto-language were the same as those mentioned in the previous stage. The pitch used in response to the adult models was restricted mainly to low and mid, irrespective of the pitch levels in the adult models. However, occasionally falling, rising, and high pitches were produced, but these were accompanied by loudness and length of vowel.

In continuous vocal play, screeching vocalizations and the singing tune were now seldom produced. The pitch of the babbling in general varied among low, mid, high, rising and falling. Sometimes one level of pitch was produced continuously before changing to another.

In this stage the palatal semi-vowel [j] which previously was in his peripheral system appeared to be used more regularly than before, and was produced with glottal onset. The glottal onset of [j] is a characteristic feature of the conventional language (cf. Henderson, 1964). Thus [j] had now become a sound in his basic system.

Stage VII: (11 months 13 days to 13 months 2 days)

At this stage, the general picture of the child's vocalizations was similar to that of the previous stage. However, in this stage progress in some features of the conventional language was remarkable. It was the starting point of first words; aspiration, which appeared sporadically in the previous stage, began to be produced in imitation in the forms of friction and breathiness; rising pitch appeared more frequently in the vocal play; the use of back rounded vowels with both 'non-checked' and 'checked' vocalizations increased; and final glottal constriction occurred consistently with low pitch.

The first words were of CV and CVC structures, but the CVC structure was simple in that there was no contrast in place and manner of articulation of onset and ending, e.g. [_mam] 'to eat', [_ʔɔʔ] 'to go out'. The first words were also used to replace some functions conveyed earlier by the proto-language. The basic tones used with all first words were mid and low.

Ex. 6

First words

P's forms	Meanings	Adult forms
[_mam]	'to eat'	[_mam]
[_ʔɔʔ]	'to go out'	[_ʔɔ:k]
[_dua]	'peanut'	[_thuə]
[¯wua]	'cow' (picture book)	[-wuə]

Stage VIII (13 months 3 days to 14 months 24 days)

It was pointed out in the previous stage that the child had started using words of the conventional language. In the present stage, he appeared to produce one-word utterances more frequently, and developed from being merely 'vocally active' to more 'verbally active'. Speech was now used to replace some more of the uses of the proto-language. The proto-language was less frequently produced. Rising pitch and back vowels were practised experimentally in syllables already acquired, and later used with words. Therefore, rising pitch became a rising tone. Thus, three tones: low, mid, rising, had been acquired.

His verbal-vocal play repetitively and continuously produced syllables with CV, VCV, and CVC structures. The onset and ending of utterances of the CVC structure were homorganic in articulation, but there was also the possibility of ending with a glottal stop. Moreover, in this stage greater complexity in the babbling was evident in that stops, fricatives, and nasals were also possible at the onset and ending of CVC syllables. The place of stops and fricatives remained labial, e.g. [_pap] [_pɔp] [_faf], but for nasals, a contrast was possible, e.g. [¯ɲɛn].

Stage IX: (14 months 25 days to 15 months 23 days)

In this stage, the features which were practised and used in the previous stage were still in the process of being acquired. Verbal-vocal play appeared consistently and the gradual reduction in the use of the proto-language continued. In the present stage, there was further progress in that frontness and close quality of vowel, i.e. [i], was acquired, and long utterances were attempted.

Long utterances appeared in repeated form. For example, in response to the word [¯wi_tɕhai] 'name of a neighbour', the child first produced [¯cʃe ¯cʃe ¯cʃe] or [¯cʃɨ ¯cʃɨ ¯cʃɨ]; a few days later he produced it as [¯tʃɤi ¯tʃɤi] and eventually as [¯tʃai ¯tʃai], which was a reduplicated form of the second syllable of the model. The example of long utterances in a spontaneous situation can be seen in Ex.7.

Ex. 7

Situation: Grandmother and the child are talking about what the child did in the morning.

Grandmother	Child
wan ni: pai ba:n luŋ witchai luk hen arai	pa::::?
'What did Baby see today at Uncle Wichai's house?'	'Fish'
ɔ: hen pla:	
'Oh yes, saw a fish.'	
pla: nai tsa? bua tɕhai mai luk	tʃa?
'Was the fish in the lotus pond, Baby?'	'Pond'

Grandmother	Child
	(The child goes on saying):
	t̪a ββu: ββu: wa?
	'Lotus pond'

Stage X: (15 months 24 days to 18 months)

In the last stage, in addition to one-word utterances, the child also produced two and three word utterances in a spontaneous situation. These long utterances developed from familiar vocabulary in the form of repetitions and combination of different words.

Verbal-vocal play still occurred in soliloquy. The proto-language was hardly used during this stage. The child used 'words' to replace the proto-language in conveying his intentions. A question may arise here: Does the child still use pitch contrast to signal the functions practised in the proto-language as by this stage pitches have become lexically contrastive, i.e. tones?

In signalling his intentions, in addition to words other prosodic and para-linguistic features were also used, e.g. rhythm, tone of voice, nasalization, and facial expression; these were often accompanied by gestures. Taking as an example, the word [ˌma:] 'dog', if he wanted to inform about the presence of a dog (Informative function) a happy tone of voice was used, with a smile, but if he wanted a toy dog (Instrumental function), quick rhythm, demanding tone of voice, and nasalization (crying-like) were used. The affirmative function was mostly conveyed by repeating what the adult said.

By this stage, progress in phonetic development was considerable. The high tone and the falling tone appeared but they were inconsistently used. The consonants acquired are as follows:

In the initial position almost all plosives and affricates had appeared, but velars [kh] and [k] rarely occurred and most often alveolars [th] and [t] were alveolars [t] or [d] which was not yet consistently produced.

For nasals, only labial and alveolar [m], [n] occurred; velar [ŋ] did not yet occur as the velar closure in the child system had not been developed.

The only sibilant in Thai, [s], was not yet developed. At this stage [dʒ] [tɕ] or [th] were used for the conventional [s].

There are 2 non-sibilant fricatives in Thai, [f] and [h] but only [ɦ] was produced by the child, e.g. [ɦɔ::::::] (onomatopoeia for the roars of a tiger).

Semivowels [w j]were produced fluently in the initial position. However, in disyllables or in long utterances, harmonization of consonants and tones also occurred, e.g. [¯tu ¯ten] for [`tu: -jen] 'refrigerator'.

Liquids, [l r], were not yet developed, and [j] was used instead, e.g. [¯jot] for [¯rot] 'car', [`je:] for [-bai`le:] 'Birley' (an orange drink).

In final position, the stops [p t] occurred and sometimes alternated with the glottal stop. The velar stop rarely occurred, and the glottal stop was usually used instead. Thus, overall, the glottal stop was produced the most frequently. For this child, the use of the glottal stop in place other stops in the final position is articulatorily reasonable. In Thai, the oral closure for stops in final position is accompanied by simultaneous glottal closure (cf. Henderson, 1964). The child at this stage was not fully capable of making oral closure at the same time as the glottal closure was being made. Thus,only one closure which would retain the unexploded quality of the stop was made, i.e. glottal closure.

All nasals, [m n ŋ], occurred in the final position. With regard to clusters, none of the initial clusters of the adult language were found.

The vowels acquired are as follows:

All front vowels of the adult system, [i e ɛ a], occurred. The vowel length contrast was not yet consistent. The contrast between [e] [ɛ] was still unclear. In the same way all back vowels of the adult language occurred, but the degrees of openness and rounding were not clearly produced, i.e. [u o ɔ] were sometimes used interchangeably. In other words, the rounding feature was produced in accordance to the adult model, but the degree of openness was variable. The back unrounded vowels, [ɯ ɤ], also appeared but less frequently than the rounded ones. Interestingly, [ɯ] quality appeared frequently in the early stages, but rarely occurred at the lexical level in this stage.

The possibilities of diphthongization used by this stage are: [iɛ ua əi au ai uəi]. Selected examples of vocabulary are given below.

Ex. 8

Child's forms	Meanings	Adult forms
[˩phu:]	rose apple	[-tɕhom ˩phu:]
[_pha?]	monk	[¯phra]
[_pi?]	to close	[_pit]
[_piɛ?]	to be wet	[_piək]
[_piɛ?]	skin(fruit)	[_plwək]
[˧mu:]	pork	[˧mu:]
[˨mu:n]	to turn round	[˨mun]
[˧thɔ:]	two	[˧sɔ:ŋ]
[˩doi]	together, also	[˩duəi]
[˨jo:]	'Hello'(telephone)	[-hal˨lo:](loan word)
[¯jen]	'cold'	[-jen]
[_nɔ?]	'outside	[˩nɔ:k]
[˧thu _piɛ?]	polish/wet	[˨thu:_piək]
[¯nai¯tu¯ten]	in/refrigerator	[-nai˩tu¯jen]
	etc.	

Conclusion

Evidence from the vocalizations of the child under study shows that his vocalizations were restricted and systematic, and that there is a gradual transition from babbling to speech. Moreover, the characteristics of the vocalizations in the early babbling stages of the child in this study are not different from those of children in non-tonal environments reported so far in the literature. Thus at the babbling stage, it may be difficult to distinguish children with different language backgrounds solely on the basis of vocalizations. However, at some stage, stage V in this study, one can possibly detect the dissimilarity through the appearance of the basic characteristic features of the language of the environment. Therefore, it could be said that the child learnt all his language from those around him, only the spontaneous early babbling may have been innate.

Growth of complexity in the speech development of this child shows a great deal of similarity to Waterson's findings for English (Waterson, 1971). It proceeds along the following lines:

What is new is produced in a familiar frame. Monosyllables go from a less complex to a more complex form, i.e. open syllables first, then closed syllables. In the closed syllables, there is no contrast in syllable onset and ending; later, contrast in these places appears. In longer utterances, repeated elements are generally used before those with differentiated elements. It also appears that syllables in vocal-verbal play have a higher degree of complexity than those produced spontaneously in conversation, and that the more complex features occur first in babbling, and later in speech. In the course of speech development, it appears that the proto-language is a transition stage between communicating without language and communicating with language. It has an important role as a preparation for the child to use more complex utterances functionally when speech is acquired.

The acquisition of language specific features is summarized as follows:

The acquisition of the tones of the child in the present study can be described as a development from pitch, which appears to be greatly variable in the early stages and gradually becomes less variable. Low and mid pitches are the first to become consistent and basic in the child's vocalizations. These pitches are later distinguished by the presence of final glottal constriction with low pitch, and no final glottal constriction with mid pitch. Low and mid tones are the first to be consistently used at the lexical level; the rising tone appears later on. These three tones are used from Stage VIII onwards. It is not until Stage X when the falling and high tones appear; however, they are inconsistently produced at that time. The evidence that the rising tone is acquired before the falling tone has been stated by Sarawit (Sarawit, 1976) who reported on "Assimilation in child language acquisition". She mentioned in passing that her subject, a bilingual Thai-American English, acquired the rising before the falling tone.

Such a sequence of tone acquisition appears to contradict the Li and Thompson (Li and Thompson, in press) findings that the children they studied had more difficulty with the rising tone than with either the level or falling tones. These two opposing findings are probably related to the nature of the system of tones in the two different languages.

In Mandarin there is only one falling tone (51), but there are two tones with a rising component, i.e. rising tone (35) and low-dipping tone (214), and these two tones, because of their phonetic similarity in ending, would very probably be less easy to discriminate and hence cause problems for production. The children in the Li and Thompson study acquired the high level tone (55) early, so the contrast between the high level and the falling tones would seem to be more distinct for the children than that of the high level and the rising tones, as children learn the gross contrasts of the language first, and then gradually refined them.

In the case of the Thai child in this study, the mid and low tones were acquired before the rising tone, and since the child frequently used the low tone for the words with the falling tone (both the falling and the low tones have a falling component), it appears that the low and the falling contrast was less clear than the low and rising contrast. Thus, the rising tone was acquired before the falling tone, the reverse of the case in Mandarin.

Aspiration, which is one of the language specific features, appeared indistinctly and sporadically in Stage VI, and gradually became more clearly articulated. It was produced first in terms of friction and breathiness. These were more refined in later stages, and by Stage X the voiceless aspirated plosives became functional units.

Final glottal constriction appeared to be widely produced in the early vocalizations, but it was not until Stage VI that final glottalization appeared to be functional and gradually came to be used in words of the CVC structure where there are final stops: [p t k ʔ] in the adult language.

NOTES

[1] An early version of this paper was presented at the Ninth Annual Forum on Child Language Research, Stanford University, April 1977.

[2] Pitch is related to the frequency with which the vocal cords of the speaker open and close during the utterance (Abercrombie, 1967: 27).

[3] Tone is related to the functional distinction carried by the pitch of each lexical item in the language.

[4] [b͡bb] and [p͡pp] represent labial trills, and [b͡l] represents labial liquid.

[5] No data were available between 7 months 21 days and 7 months 30 days.

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