

THE ONSET OF CROSSLINGUISTIC DIFFERENCES IN SPEECH DEVELOPMENT

David Ingram

The University of British Columbia, Vancouver, Canada

ABSTRACT

Recent research indicates that the effects of the ambient language appear earlier than what was once believed. Here, two theories are discussed to account for this. One, the interaction theory, assigns this effect to the interaction between the child's perceptual and articulatory systems. The other, the NeoJakobson theory, makes the bolder claim that such effects reflect linguistic organization on the part of the child. Evidence for the latter is presented.

1. INTRODUCTION

The last twenty years have represented a tremendous increase in our knowledge about the abilities of infants to vocalize and perceive speech. There has been, however, a crossover concerning our knowledge in these two areas on infant development. Twenty years ago, I would have said that our knowledge of infant speech production was noticeably ahead that of infant speech perception. Based on the work of Irwin and others, we had a reasonable

picture of the stages through which infants progress from cooing to babbling to the first words. Today, it looks like the greatest gains in our knowledge have taken place in our understanding of infant speech perception, inspired by the great interest generated through the methodological developments made in this area.

This is not to say that we have made no strides in the area of infant speech production. There has been the refinement of our knowledge of the stages of infant speech production, as seen in the important research of Oller and others (e.g. Oller [10]). Another development has been the initiation of important research on crosslinguistic influences on infant development. Today, however, I think it is fair to say that the latter work is only in its 'infancy', if you would excuse the pun.

In this paper, I will attempt to explain why I make this claim, and lay out what I see as the crucial issues which will influence research in infant speech production in the years ahead. I also hope that these remarks will

provide a useful backdrop for the other papers that have been prepared for this symposium on "Speech acquisition and development".

2. THE MATURATIONIST VIEW

Until quite recently, the dominant view of infant speech production has been what might be called a 'maturationist' view of development. This point of view, expressed by Lenneberg [7] and supported by data in Locke [8], sees the infant's speech as more or less controlled by a biologically determined sequence of development. Since this development is controlled by factors within the infant, there will not be any noticeable sign of the influence of the ambient language for a relatively long time. The following quote from Locke [8] (p. 84) captures this point of view quick succinctly:

"I will suggest that no genuine accommodations to the adult system will be evident until the child reaches the *systemic stage* of phonological acquisition, which probably occurs at some time after the first 50 words are in use".

There are at least two features of this proposal that need to be elaborated. One concerns the extent to which individual variation takes place. As argued in Locke [9], this does not mean that all children will vocalize in exactly the same way. Biological models of development still allow for variation. The critical point is that the

variation that exists will be constant across linguistic environments.

A second aspect concerns the time at which crosslinguistic effects will appear. In the above quote, the fifty word stage is cited, but it appears that this is just an educated guess. There is nothing magical about this stage, and indeed, if we are dealing with a biological milestone, one would expect that age is more critical than stage. For example, suppose we were to compare two infants who are developing normally from all indications, except for language. We would anticipate that the infant who starts to speak at age three might show more adjustments to the ambient language than the child who starts at age one.

The issue of when crosslinguistic effects first appear is important for different reasons for different people. For the speech scientist, it is important in coming to understand the development of the speech apparatus. Further, because of the findings on the remarkable perceptual ability of infants, there is the question of how the perceptual system interacts with the articulatory system. If the latter is rather fixed by biological constraints, then its development is basically uninfluenced by the perceptual development taking place. I will refer to this issue as the 'perception-production issue'.

For the linguist, the question of when ambient effects begin is

important for a different reason than just the perception-production issue. The linguist is more concerned with determining when the child has access to, and begins to construct, a linguistic system. For those who tend toward a maturationist point of view, much of the infant's early language, even up to the first 50 words as cited by Locke, is seen as prelinguistic. Such a position requires some discontinuity in development at some point when the infant shifts from a biologically based language to a more abstract and linguistically based one. I will refer to the question of when children begin to use linguistic principles as the 'linguistic issue'.

3. TWO ALTERNATIVE VIEWS

Most recently, at least two alternative positions have appeared to the one expressed by the maturationists. One point of view, referred to as the 'interactional hypothesis' in de Boysson-Bardies, Halle, Sagart & Durand [1], claims that the effects of the ambient language occur earlier than previously thought. This hypothesis has the following properties:

1. the early perceptual abilities of the infant enable it to show some effects of the ambient language at least during the later stages of the babbling period;
2. these effects are likely to be subtle at first, and may require more sophisticated analyses than previously done;

3. children's first 50 words will show crosslinguistic differences in their phonetic inventories.

The data for this position are primarily found in de Boysson-Bardies, Halle, Sagart & Durand [1] and in de Boysson-Bardies & Vihman [2]. In the former study, differences are found in the formant structure of vowels in the babbling of infants in French, Cantonese, English, and Arabic linguistic environments. The latter study expands indications of such differences through the study of consonantal patterns in French, English, Japanese, and Swedish infants.

The interactional hypothesis primarily focuses on the perception-production issue. As discussed in de Boysson-Bardies & Vihman [2], this interaction between perception and articulation takes place while the child is still by and large 'prelinguistic'. For example, they state "...we never assumed that selection on ambient language implied phonetic segmentation" (p. 17). Rather, they believe the following (p. 17):

"A segmentally unanalyzed acoustic representation may provide targets for a motor plan sufficient to initiate an epigenetic selection of articulatory gestures".

This point of view is one which I have referred to elsewhere as the Stanford theory (c.f. discussion in Ingram [4]). It sees the development of the first words as primarily devoid of any linguistic

organization into either phonemes or distinctive features.

An alternative to this belief is the opinion expressed years ago by Jakobson [6] that children show linguistic organization around the time of their first words. There are at least two aspects of Jakobson's theory which have been shown by more recent research to be incorrect. One was his conception of an abrupt shift in the infant's phonetic abilities once word acquisition appears. A number of recent studies have shown that this shift involves continuity rather than discontinuity (e.g. Vihman, Macken, Miller, Simmons & Miller [12]). The second error was that children of all linguistic environments show the same initial phonological system. As found in de Boysson-Bardies & Vihman [2], there are phonetic differences in infants in different linguistic environments from the onset of word acquisition.

Neither of these errors, however, directly negates Jakobson's primary claim that children use linguistic organization at the onset of word acquisition. My own research in this area (c.f. Ingram [5], for a summary) has maintained this aspect of Jakobson's original theory. I have referred to this position as a NeoJakobsonian point of view, since it retains the flavor of his ideas on this period, but rejects his claims about the transition from babbling to the first words. This point of view adds the

following strong claim to the three already mentioned above:

4. crosslinguistic effects in children's phonetic inventories indicate that infants show linguistic organization of their words at the onset of acquisition, not at some later time in development.

These various points of view result in four positions about when effects of the ambient language appear and how what they indicate about the infant's linguistic abilities. These are summarized in Table 1.

Table 1. Four theories on infant phonological acquisition.

1. *Maturationist theory.* Infant babbling and the first words are determined biologically without linguistic processing or effects of the ambient language (e.g. Locke [9]).
2. *Interaction theory.* Infant babbling and the first words show effects of the linguistic environment, but the organization of this effect is prelinguistic.
3. *Jakobsonian theory.* The first words show linguistic organization but no effects of the ambient language.
4. *NeoJakobsonian theory.* The first words show linguistic organization and effects of the ambient language.

4. DIRECTION OF RESEARCH

The results of recent research of the sort being conducted by de Boysson-Bardies and her colleagues suggest that neither Maturationist theory nor Jakobsonian theory can be

maintained. The unresolved issue is no longer when crosslinguistic effects appear but rather when they show linguistic organization. The resolution of this question requires detailed linguistic analyses of the first words of children across several linguistic environments.

One way in which this can be done is through the examination of the phonetic inventories of children acquiring different vocabularies. In several places, I have argued that children during the acquisition of the first fifty words or so acquire what I refer to as the basic phonological inventory. These are a basic set of consonants, vowels, and syllable types are used to determine the basic phonological features of the language.

Table 2 shows some preliminary results of such research from children in five linguistic environments. The English data are from Ingram [3], and the Quiche data from Pye, Ingram & List [11]). The other data are from unpublished data. The Dutch data are from Mieke Beers at the University of Amsterdam, and the Italian data are from Umberta Bortolini of the University of Padua. The French data are from my unpublished analyses of diary data.

Table 2. Basic consonantal inventories from children acquiring English, Quiche, Dutch, and Italian. (Capital letters are used to indicate

alveopalatal sounds, e.g. S indicates the alveopalatal fricative).

<i>English</i>		<i>Quiche</i>					
m	n		m	n			
b	d	g	p	t	tS	k	?
p	t	k				x	
f	s	h	w	l			

<i>Dutch</i>		<i>Italian</i>				
m	n		m	n		
p	t	k	p	t	tS	k
	s	x	b	d	dZ	g
w		h	f	s	S	
				l		

<i>French</i>	
m	
p	t
b	d
f	s
	l

Since the data are very preliminary, and diverse in their analyses and collection procedures, it is of course necessary to be quite cautious in their interpretation. They suggest to me, however, that the extent of differences is extreme, certainly more than would be expected by the Interaction hypothesis discussed elsewhere.

There are of course similarities as might be expected. The data indicate that nasals are early, and that voiceless fricatives are preferred over voiced ones. There are also differences, however, which cannot be explained if a maturational view is maintained. This is perhaps best seen when looking at the fricative systems of the above languages. Some of the languages show early use of alveopalatal

fricatives and affricates, as does Quiche and Italian. English, on the other hand, shows little early use of these despite their presence in the language. While several of the languages show the early use of [f] and [s], these are later in Quiche and Dutch, where the velar [x] tends to be the first fricative.

Other differences can also be seen with the liquids. English has an [l] but it is not an early sound in the language. This is not the case with several of the other languages, however, where [l] is a basic sound. This is particularly striking in the Quiche data, where Pye, Ingram & List [11] report that it is one of the two most used sounds. They also provide a further analysis which reveals that it is also one of the most frequent sounds in the vocabulary addressed to young children.

Such differences even appear with the stop consonants where similarities usually abound. Four of the languages show early three-way place distinctions with early velar sounds. The French data, however, suggest that these velar stops may come in relatively later when compared with the fricatives.

The critical question becomes explaining the source of these differences. Since the children are selecting in several instances from very similar sounds, perceptual differences cannot account for the difference. In Pye, Ingram & List [11] it is proposed that the differences result from the children's linguistic organization of the

more frequent sounds that they hear. This frequency, however, is type frequency rather than token frequency. That is, it is not important that a sound just be frequent, but that it also occur in a range of words, thereby providing information to the child about the sound's linguistic function. This difference between type and token frequency accounts for the fact that the voiced dental fricative in English is acquired very late. It has token frequency, but is restricted in appearance to a small range of function words.

A further argument for this interpretation comes from the patterning of the sounds used. If the interaction hypothesis were correct, there would be no reason to expect linguistically patterned systems at this point in acquisition. An examination of the consonants in Table 2, however, suggests otherwise. The sounds by and large fall into pattern sets where minimal contrasts can be proposed. Of course, much more detailed linguistic analyses of individual children will be needed to substantiate this claim, but the data in Table 2 are at least suggestive that such an interpretation is on the right track.

5. SUMMARY

Research on infant speech production is at an important stage in resolving the question of when children begin to show the effects of the ambient language. Recent

research has suggested that infants may show ambient effects earlier than previously thought, once more sophisticated analyses are conducted on infant speech samples. Even more controversial is the interpretation of this finding. One point of view is to give this little linguistic significance, but to interpret it as indicative of a close connection between the infant's perceptual and articulatory systems. I have presented a more radical interpretation, arguing that it suggests early linguistic processing. Even more subtle and detailed analyses will be needed before this more latter issue will be resolved.

6. REFERENCES

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