

# IMITATION IN SPEECH DEVELOPMENT : A LITERATURE OVERVIEW

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## 1. INTRODUCTION

Speech development in young children has been studied quite often in a linguistic (mainly phonological) way, with respect to the production and perception ability of infants and young children (Menyuk,1971;Locke,1983;Ferguson,1986;Juszyk,1986). Development of children's speech and their acoustic-phonetic correlates, however, are still considered as an area of research in which many aspects have to be elicited.

The early stages in the development of speech movements, often called the prelingual period, have been explored, among others, by Koopmans-van Beinum & Van der Stelt (1986). Based on the source-filter model of speech production, they describe speech movements using the respiration cycle as segmentation unit:

1. Uninterrupted phonation
2. Interrupted phonation without articulatory movement
3. Interrupted phonation with one articulatory movement
4. Phonatory variations
5. Chains of reduplicated articulations (canonical babbling)
6. Meaningful words

Recently, an acoustic approach of infant vocalization (by sound analysis procedures) has been explored by some investigators. Oller (1986) describes the canonical syllable as the minimal rhythmic unit of natural languages. This rhythmic unit in infant vocalization has been defined in terms of phonetic properties.

Bickley et al. (1986) and Holmgren et al. (1986) prove by acoustic measures and perceptual judgements that rhythm already emerges at a very early stage, just before the start of canonical babbling which turns out to be at about 6-8 months of age (Van der Stelt & Koopmans-van Beinum, 1986); consonant-vowel like units are considered to be the base of rhythmical production.

With regard to the perception ability of young children, the auditory processing mechanism is fully developed (Juszyk,1986). But whether a special speech perception mechanism is inherent to the child, is still a matter of discussion in many studies. Is discrimination of acoustic contrasts directly related to discrimination of phonetic entities (Pisoni,1977), or is the discrimination of speech contrasts just a parallel but independent process of the acoustic analysis (Eimas et al., 1971)?

A study of speech development involves many closely related areas of sound perception and production mechanisms. With regard to an acoustic-phonetic analysis of speech development, the child's production data cannot be separated completely from the 'language-input' (Snow & Ferguson,1977). A particular traceable language learning situation is the imitative process. Linguistic advancement as a function of growth in age is stimulated by a dual imitative system: On the one hand, the child's imitation of adult

speech will contribute to its speech development, on the other, by imitating the child's utterances, the adult is able to correct and improve the child's speech forms. This concerns the content of the (imitated) utterance as well as the form of the utterance.

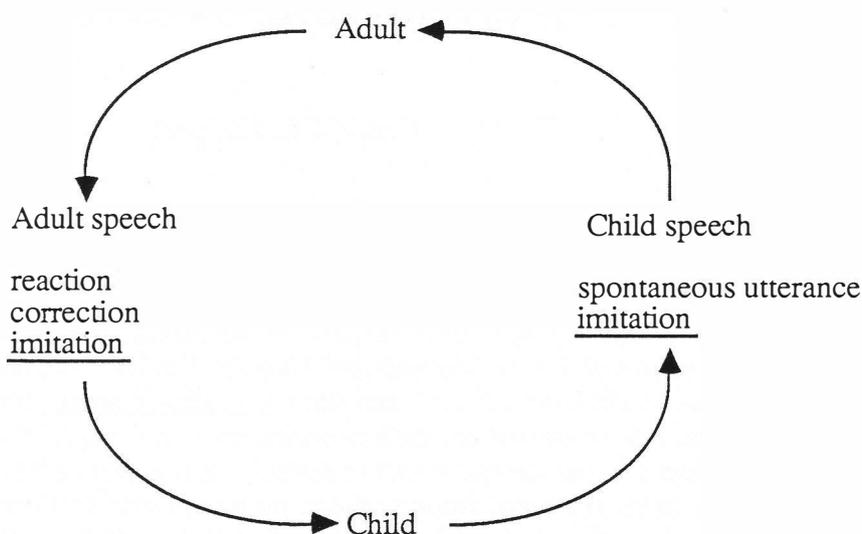


Fig.1 Model of the place of imitation within the communication chain.

In Figure 1, we give a model of the role of the imitative mechanism in the communication situation adult-child. Within this communication chain we will concentrate on two aspects of the imitative behaviour:

- Perception of the adult's speech forms by the child. These speech forms will be either reproduced within a short delay of time (imitation), or (re)produced spontaneously, that is not immediately.
- The child's imitations and also its spontaneous utterances will lead to a reaction of the adult and will result very often in a corrective imitation by the latter. The communication chain is closed by the child's perception of these utterances.

In this way, the language learning situation can be considered as a traceable process and will allow a controlled acoustic-phonetic analysis.

## 2. THE USE OF IMITATION

The imitative aspect in speech and language development is not easy to deal with and contradictory findings make it a difficult matter to reach agreement upon. As will be discussed in the next paragraphs, the majority of research about the role of the imitative mechanism deals with the acquisition of morpho-syntactic markers and hardly any acoustic-phonetic study has been realized in this domain (Blasdel & Jensen, 1970; Kent, 1977).

One can distinguish two conflicting viewpoints concerning the imitation mechanism:

- theories that treat language as a system of rules and reject imitation as a learning process; children's sentences have internal structures.
- theories that treat language acquisition as a behavioural response and emphasize the role of imitative speech.

Arguments against the imitative learning process are:

- No clear evidence is present that the acquisition of morphemes/words is related to the imitation of the adult utterance and, in many cases, imitations deviate much from the modelled form. According to Ervin (1964), the child must acquire rules that underlie sentence construction. Language acquisition is considered to be the result of learning deep structures and transformational rules while imitative speech just reflects the surface form. Therefore, imitations cannot be treated as a learning system but rather as a characteristic of language behaviour.
- Ervin (1964) and Bloom (1970) found that imitations are not more complex than spontaneous utterances nor grammatically progressive. They are just as telegraphic as spontaneous forms, not more complex, and with the same omissions. As a result, they cannot account for the acquiring process.
- The imitative speech forms do not advance the child's developmental process but rather reflect the process. The adult speech form is reformulated according to the child's own system of rules already acquired and is not the source of structural change (Ervin, 1971).

Arguments in favor of the imitative learning process are:

- Although the imitations can be very deviant from the adult utterance they cannot be considered as creative speech forms but only as modifications of the adult sentence; the imitation is a reduction or an expansion of the modelled form (Snow, 1979; Clark, 1976; Kuzcaj, 1983). Possible causes are short term memory, constraints on the speech mechanism (reduction), and ability to couple imitative and creative speech forms (expansion).
- Imitation will be developmentally progressive because of its selectivity (Bloom et al., 1974; Ferguson, 1986). That is, children seem to imitate those forms they may learn something from. Imitations are rehearsals of the modelled utterance and reflect an overt information processing. Children using imitations are elaborating their own system in a frozen form that will become productive and improved in a later stage (Moerk, 1977). The information is stored and only will become productive when the child is able to extract the principal components from it.

From a phonetic point of view, we believe that the rehearsal aspect of imitative speech is responsible for acquiring the sound system of adult speech as well as for structural changes as stress pattern and intonative modulations. And, beyond the language acquisition process, imitations can reveal some aspects of adaptive behaviour of the imitator. With regard to these aspects of imitative speech, we are interested in the acoustic output related to the acoustic input.

### 3. METHODOLOGY IN CLASSIFICATION

A major problem in studying imitations and the nature of imitations, is a methodological one. In most studies of speech development, two different categories are introduced:

	<u>imitator</u>	<u>imitated person</u>	
a.	child	adult	(the child imitates the adult)
b.	child	child	(the child imitates itself)

Our point of departure, however, is to examine imitation in the speech communication process within four different categories:

- |    |       |       |                                  |
|----|-------|-------|----------------------------------|
| a. | child | adult | (the child imitates the adult)   |
| b. | child | child | (the child imitates itself)      |
| c. | adult | child | (the adult imitates the child)   |
| d. | adult | adult | (the adult imitates him/herself) |

This enables us to look at:

- The acoustic-phonetic properties of speech development within the child's speech form toward the adult model. However, the perception mechanism of children cannot be neglected in this study.
- The way in which the adult speech is tailored to a special phonetic style or mode to stimulate the child's speech level. Perception and storage of these adult speech forms will lead to imitation or spontaneous production by the child (see also Koopmans-van Beinum, 1987, this volume). Moreover, it is quite possible that the adult's 'tailored' speech forms makes it easier for the child to imitate (Malsheen, 1980).

Concerning the concept of imitation, different definitions have been used in different studies. Some of them use very restricted definitions, other studies use wider ones. An example of a restricted definition is the one used by Ervin (1964), an example of a wider definition is the one used by Moerk (1977).

Ervin (1964)	Imitation is the immediate reproduction of the model without any deviation except reduction.
Moerk (1977)	Imitation is the reproduction of part or all of the model; only reduction or phonetic assimilations according to the child's own rules are allowed.

For grouping different types of imitation we refer to the classification of Snow (1979) who tried to resolve the methodological problem by giving the following parameters:

- exact imitation (EI)
- reduced imitation (RI)
- expanded imitation (XI)

In order to be used in an acoustic-phonetic analysis of speech, we will complement these three definitions of imitation used by Snow. As we will concentrate in our study on the phonetic form of speech utterances, and not on lexical or morphological acquisition, phoneme specification within the imitation definitions has to be added; our additions are marked with (+).

#### I Exact imitations (EI)

- (Snow) Reproductions of the word(s) without any reductions or additions.
- (+) No phonemic reduction, phonemic addition or allophonic variation is allowed.

## II Reduced imitations (RI)

- (Snow) Reproduction of at least one content word. No words or morphemes that are not present in the modelled utterance are allowed.
- (+) A reduction of at least one phoneme must be present and allophonic variation of the imitated phonemes is not allowed.

## III Expanded imitations (PI)

- (Snow) At least one content word must be imitated and at least one word or morpheme must be added to the modelled utterance.
- (+) Expansion of at least one phoneme must be present and allophonic variation of the imitated phoneme is not allowed.

## IV Substituted imitations (SI)

- (+) At least one phoneme of the modelled utterance must be substituted in the imitation. The substituted phoneme can be really distinct from the original, but it can also constitute an allophonic variation of the original. Every change, other than reduction or expansion, is classified as substitution.

## V Form imitations (FI)

- (+) Speech sounds cannot be identified, but intonation and/or stress pattern is clearly imitated.

## VI Remaining utterances (MU)

- (+) Words, identical to the imitated words that precede, but used in spontaneous utterances; They have to be used beyond a fixed limit of time (= 5 utterance after the modelled utterance) and they can serve as reference for productive vs. imitated speech.

## 4. RELEVANCE

Several studies about linguistic growth in imitative speech (Snow, 1979; Clark, 1976) have demonstrated that reduced imitations decrease with increase in age, whereas exact imitations increase and expanded imitations become more and more productive. This marks a control of the imitated word(s), placed in creative utterances. The imitation includes an assimilation of speech information that will become productive through use. Imitation can be seen as the major factor in the learning of the articulations which normally accompany the development of the phonemic system.

The arguments in defense of imitation as a learning mechanism consider imitative speech as an active process in speech development. In our opinion, studying the phonetic aspects of imitative speech (segmental and suprasegmental) has the advantage that production data can be obtained in a controlled condition. Studdert-Kennedy (1986) considers the imitative practice to be central to the development of the combined

perceptual and motor system for speech. The interaction between the verbal input of the adult and the verbal (imitative) output of the child can reveal the following aspects:

- How is the child manipulating the acoustic-phonetic properties of the adult speech signal? This enables us to study the children's utterances in their attempt to match the modelled adult form.
- How are adults manipulating their speech toward the child's system?

The fact that imitation plays a significant role in speech communication is not only apparent in dialogues between adult and child, but also in dialogues between adult and adult, for example during adaptation to a particular dialect or speech style. Therefore, imitations and repetitions can reflect the way an imitator matches his speech toward the modelled form and also the auditory and/or proprioceptive feedback in the motor control pattern.

As we have mentioned above, hardly any detailed acoustic study has been realized within the imitation topic. Kent (1977) found that differential sensitivity of the auditory mechanism and motor articulation performance improve with maturation; preschool children (2-6 years) seem to be less sensitive to speech sound contrasts than adults, and production of segmental and suprasegmental features will improve with age. In the next few years we will examine these features within imitative speech as a mechanism of learning and we will take into account the difficulties that are present in an acoustic study of children's speech.

We will concentrate our analysis on the non-segmental level of the imitative utterances such as intonation and stress pattern in relation with their physic correlates, but also a further examination at the segmental level such as duration and formant structure will be considered. The main interest of this study is to deliver a frame of physical reference qualities in a child system of intonation and accentuation. Moreover, in a study of imitative speech forms, the original and the imitation, i.e. the input and the output, are directly related one to another.

## 5. EXPERIMENTAL CONDITIONS

In our longitudinal research, 5 mother-child couples will be followed during two years. We have the extraordinary possibility to examine speech development of children who have been studied already during their first two years of life (Koopmans-van Beinum & Van der Stelt, 1986; Van der Stelt & Koopmans-van Beinum, 1986). All couples are inhabitants of Amsterdam and its environs and each of them will be tape recorded every three months. Also video recordings will be made to allow a more accurate selection of the imitative speech forms, present in each one-hour record session. As will be evident, only audio-tapes are used for the acoustic analysis. In order to make measurements reliable, a rather structured situation during the record session is created while mother and child are in an interactive communication situation. At this moment every child has been recorded one time and the children range in age from 2;3 - 2;6 years.

The selection of the different imitative utterances will be made by a panel of four members. Selection criteria for the different types of imitation are operationalized in such a way that the listeners can classify them according to different codes. The panel consists of a psycholinguist, a phonetician, a speech trainer and a parent; a 75% correspondence between judgements of the listeners will lead to selection for further research.

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