

# Phonological Acquisition of Normal Egyptian Children from the Age of Two and Half to Five Years

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## Abstract

This study investigates phonological acquisition of Egyptian children. Thirty children were equally divided into three stages. Stage I: from 2; 6 – 3;0 years, Stage II: from 3;0 – 4;0 years, and Stage III: from 4;0 – 5;0 years. Speech material consisted of 158 words. It was designed to test 25 phonemes and 8 phonological processes of Colloquial Egyptian Arabic. Both substitutional and phonological process analyses were used. Applying 75% threshold of correct production of phonemes, results showed that in Stage I, all consonants were acquired except /r, d, s, z, ʒ, ʁ, ʁ/. In Stage II, /d, z, z, ʁ/ remained un-acquired. In Stage III, /z, z/ remained un-acquired. Applying 25% threshold for process consideration, process map showed that in Stage I, both devoicing and /r/ deviation occurred. In Stage II, only devoicing occurred. In Stage III, all processes disappeared. The results contributions to assessing and treating phonologically disordered children were mentioned.

## 1. Introduction

This study aims at establishing the norms of Colloquial Egyptian Arabic (C.E.A.) phonological development of normal children, i.e., the age of acquisition of phonemes and the age of occurrence of phonological processes, from the age of two and a half to five years. These norms had not been established before. Once they are established, they may serve as the basis for designing a developmental articulation test for assessing phonologically disordered Egyptian children. Using these norms will lead to a more reliable assessment of these children's speech by comparing their speech to the speech of normal children, since the speech characteristics of phonologically disordered children are similar to those of normal children,

but generally delayed [1]. Actually, this is the main intention of this study. Accordingly, the results will be discussed from a therapeutic perspective.

## 2. Method

### 2.1 Subjects:

Thirty children served as the subjects of this study. They were chosen from two nurseries. They all belong to the middle class, come from monolingual families, and do not have speech or language pathological history.

They were divided, based on age, into three stages that will serve as the developmental stages of this study:

- Stage I: from 2;6 – 3;0 years.
- Stage II: from 3;0 – 4;0 years.
- Stage III: from 4;0 – 5;0 years.

Each stage included ten children; five males and five females.

### 2.2 Speech Material:

It is composed of a words list containing 158 words.

They were elicited spontaneously using picture-, or object-naming tasks, and -in case of difficulty- through imitation.

Speech material was recorded using a high fidelity recorder (SONY WM – GX 322) and was phonetically transcribed using I.P.A. symbols (revised 1996).

It was designed to test the following:

- First, the 25 consonant phonemes of C.E.A. in initial, medial and final positions and in mono-, di- and polysyllabic words. Two phonemes: /ʒ/ and /q/ were excluded. These phonemes are considered marginal in C.E.A. [2]. The former is found in very few loan words, and the latter in few words borrowed from Classical Arabic.

- Second, the following 8 phonological processes: weak syllable deletion, final consonant deletion, cluster simplification, devoicing, velar fronting, de-emphasis, sibilant deviation and /r/ deviation.

The criteria for selecting words of the speech material were as follows:

- Choosing words that are most frequently occurring<sup>1</sup> to be familiar to children.
- Choosing nouns and not verbs, as they are easily represented by pictures or objects.
- Avoiding words that may have different pronunciations.
- Avoiding words that may have different lexical representations.

### 2.3 Analysis:

Both substitutional and phonological process analyses were carried out to determine the phonemic inventory and the phonological processes that have undergone in each stage respectively.

#### 2.3.1 Substitutional Analysis:

In substitutional analysis, all words in the list were classified according to phoneme position in the word, i.e., initially, medially and finally. They were analyzed as correct, omitted or substituted.

A correct response of 75% was posited as the threshold for acquisition of phonemes in each stage [4].

##### 2.3.1.1 Results:

- Correct responses of phonemes:

The results of correct responses suggested that:

- In Stage I: All consonants are acquired except /r, d, s, z, ʒ, ʕ, ʁ/.
- In Stage II: /d, z, ʒ, ʁ/ remain un-acquired.
- In Stage III: All consonants are acquired except /z/ and /ʒ/.

It may be noticed that the highly affected articulatory features are voicing, sibilance and emphasis, as they are rather difficult for children. The first two features agree

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<sup>1</sup> Most of the words of the speech material were selected from a list of the most frequently occurring words in Egyptian children's speech from the age of one to six years old [3].

with results reported in the literature ([1] and [5] respectively), while the third feature, emphasis, still needs more study in the field of phonological development of Arabic speaking children before giving any conclusive statements.

Regarding phoneme position as a variable in phonological acquisition, final position was the most difficult one, while initial and medial positions did not differ significantly (see Table 1).

	Stage I	Stage II	Stage III
<b>Initial Position</b>	81%	88%	93%
<b>Medial Position</b>	82%	87%	92%
<b>Final Position</b>	78%	82%	86%

**Table 1:** Average Percentages of Correct Responses of All Phonemes in Each Position at Each Stage

- Common substitutions of phonemes:

The common substitutions of phonemes in the three stages (see Table 2) showed the following general trends:

- Voiceless sounds substituted voiced counterparts.
- Plain sounds substituted emphatic counterparts.
- [l] substituted [r].

Phoneme	Common Substitutions
/b/	[ p ]
/d/	[ t ]
/g/	[ k ]
/ʁ/	[ ʁ ]
/z/	[ s ]
/ʒ/	[ ṣ ]
/ḍ/	[ d, t ]
/ṭ/	[ t ]
/r/	[ l ]

**Table 2:** Common Substitutions of Phonemes in the Three Stages

- Omission of phonemes:

Omission appeared to be a rare phenomenon in normal children; the average percentages of omitted phonemes were 7%, 3% and 2% in the three stages respectively.

Based on the results of substitutional analysis, a developmental chart of C.E.A. consonant phonemes is established (see Chart 1).

In this chart, consonants are arranged according to place and manner of articulation. The horizontal axis represents

place of articulation divided into three main divisions: front (including bilabial and labiodental), middle (including dental and palatal) and back (including velar, uvular, pharyngeal and laryngeal). The vertical axis represents manner of articulation divided into six main divisions: nasal, stop, fricative, semi-vowel, lateral and trill.

Stage I (2;6-3;0)	m	n							
	b	t	t̥	d			k	g	
							ʔ		
	f	s					ʃ	ʒ	
							h	ɦ	
	w						j		
		l							
Stage II (3;0-4;0)	m	n							
	b	t	t̥	d			k	g	
							ʔ		
	f	s	s̥			ʃ	ʒ		
							h	ɦ	
	w						j		
		l							
		r							
Stage III (4;0-5;0)	m	n							
	b	t	t̥	d	d̥		k	g	
							ʔ		
	f	s	s̥			ʃ	ʒ		
							h	ɦ	
	w						j		
		l							
		r							

\* 75% of correct production of a phoneme is the threshold for acquisition.

**Chart 1: Developmental Chart of C.E.A. Phonemes from 2; 6 to 5;0**

### 2.3.2 Phonological Process Analysis:

Two kinds of processes were examined: structural or syllabic and systemic or segmental.

- Structural processes include:
  - Weak syllable deletion (W.S.D.).
  - Final consonant deletion (F.C.D.).
  - Cluster simplification (C.S.).
- Systemic processes include:
  - Devoicing (Dev.).
  - Velar fronting (V.F.).
  - De-emphasis (Dem.).
  - Sibilant deviation (S.D.).
  - /r/ deviation (/r/ D.).

In this analysis, all words in the list that are applicable to each process were grouped together.

The percentage of occurrence of each process in each stage was determined by dividing the number of actual occurrences of the process by its possible number of occurrences, multiplied by 100.

If the percentage of occurrence of a process is 25% or above, it is considered present in a child's speech [4].

#### 2.3.2.1 Results:

- In Stage I: both /r/ deviation and devoicing scored above 25% (38% and 28% respectively).
- In Stage II: only devoicing scored above 25% (32%).
- In Stage III: all processes scored below 25%.

These results are in line with reported results in the literature. /r/ is considered a problematic sound ([1] and [5]). Devoicing is considered as one of the most common errors among children ([1] and [6]).

Based on the results of phonological process analysis, a developmental chart of phonological processes is established (see Chart 2).

	Structural Processes	Systemic Processes
Stage I (2;6-3;0)	weak syllable deletion final consonant deletion cluster simplification	DEVOICING velar fronting de-emphasis sibilant deviation /r/ DEVIATION
Stage II (3;0-4;0)	weak syllable deletion final consonant deletion cluster simplification	DEVOICING velar fronting de-emphasis sibilant deviation /r/ deviation
Stage III (4;0-5;0)	weak syllable deletion final consonant deletion cluster simplification	devoicing velar fronting de-emphasis sibilant deviation /r/ deviation

\* Lowercase letters mean that the process is disappearing, i.e. below 25%.

\* Uppercase letters mean that the process is present, i.e. 25% and above.

**Chart 2: Developmental Chart of C.E.A. Phonological Processes from 2; 6 to 5; 0**

Based on the results of this study, a chart of the general phonological development of C.E.A. is introduced (see Chart 3).

Stage I (2;6-3;0)	Stage II (3;0-4;0)	Stage III (4;0-5;0)
m b f w	m b f w	m b f w
t s	t s	t s
l n d	l n d	l n d
k g ʔ ʕ h	k g ʔ ʕ h	k g ʔ ʕ h
DEVOICING velar fronting de-emphasis sibilant deviation /r/ DEVIATION	DEVOICING velar fronting de-emphasis sibilant deviation /r/ deviation	devoicing velar fronting de-emphasis sibilant deviation /r/ deviation
weak syllable deletion final consonant deletion cluster simplification	weak syllable deletion final consonant deletion cluster simplification	weak syllable deletion final consonant deletion cluster simplification

\* 75% of correct production of a phoneme is the threshold for acquisition.  
 \* Lowercase letters mean that the process is disappearing, i.e. below 25%.  
 \* Uppercase letters mean that the process is present, i.e. 25% and above.

Chart 3: Chart of C.E.A. Phonological Development from 2; 6 to 5; 0

### 3. Conclusions

- From a therapeutic perspective, the chart of phonological development of C.E.A. may be used in assessing phonologically disordered Egyptian children to decide whether their phonological development is in accordance with normal phonological development or not.
- If it appeared that the child's phonological development is not appropriate to his/her chronological age, he/she is considered for therapy. The developmental chart allows the speech therapist to figure out the discrepancies in the child's speech that will be the targets for therapy.
- These discrepancies may be the absence of certain phonemes that must be acquired at the child's age stage or at earlier stage(s). They may also be the presence of phonological processes that must be

absent or disappearing in the child's age stage or in earlier stage(s). It is preferable that the therapist selects those targets of earlier stage(s) than those of the child's age stage, i.e., follows an ordered progression.

- The phonemes /z/ and /z̥/ are the last to be treated, as they are difficult phonemes that are acquired after five year old.
- /r/ deviation and devoicing processes will usually be the last processes to be treated, as they are the most difficult ones.
- Finally, it must be noted that the developmental dimension is not the only dimension that must be taken into consideration in planning therapy. There are other factors that contribute to the order of selection of targets for therapy such as the percentages of occurrences of these targets, and also their effect on intelligibility, which is a very important factor in selecting targets for therapy.

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