The Acquisition of /r/ in Iraqi Arabic

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ABSTRACT:
There is very little research in the field of Arabic language acquisition This study explores the development in the acquisition of the trill /r/ in Iraqi Arabic (IA). It attempts to answer four main questions; (1) What percentage in the total sample produced /r/ correctly? (2) Is this the age of customary, acquisition, or mastery for IA children? (3) Does the production accuracy of /r/ vary by position in the syllable and child sex? (4) How is the acquisition of /r/ developed within this age group? Samples were collected from 20 normally developing children between the ages of 1:8 and 3:7. The results showed noticeable sex differences in the acquisition of /r/. Besides, /r/ was produced more accurately in syllable-initial than syllable-final position. Statistics reflected a cross-dialectal variation among Arabic dialects, where Iraqi children acquired /r/ at different age it is acquired in other Arabic dialects, such as Jordanian Arabic. However, results of this paper go in support of previously suggested universal sound acquisition as /r/ was acquired in IA at about the same age it is acquired in English. The acquisition of /r/ was accompanied by gliding and deletion.
Key words: sound acquisition, Iraqi Arabic, cross dialectal variation.

Introduction

One important aspect of languages that has received noticeable attention is first language acquisition with a focus on speaker's age and development of phonemes acquired in different languages. A large number of research has been conducted on the acquisition and development of phonology in English (Templin, 1957; Sander,1972; Arlt & Goodban, 1976; Dyson & Paden, 1983; Irwin & Wong, 1983; Vihman & Greenlee, 1987; Dyson, 1998). Despite the various methodological procedures these studies adopted, an interesting agreement among these studies has been shown. However, it is not clear whether the findings from research on the acquisition of English sounds appliy to other languages, such as Arabic.

Arabic, the Semitic language spoken by approximately 200 million people, has also received a good deal of attention on the level of its phonology acquisition. Semitic languages fall from the Afroasiatic language group. As a result, they're ideal candidates for a crosslinguistic comparative study to look at developmental data from both languages, which would add to our understanding of both universal and language-specific trends. The

phonological inventory of Arabic overlaps that of English in the presence of specific consonants (e.g. /b, d, k, t, f/) and syllable forms (CV. CVC) However, Arabic has more consonants, which are unique to it, such as the emphatic consonants /tˤ, dˤ, ðˤ, sˤ/, voiceless uvular stop /q/, glottal stop / ɣ/, voiceless and voiced uvular fricatives /x/ and //, and voiceless and voiced pharyngeal fricatives / and / ʕ/ (Amayreh & Dyson, 1998).

The majority of studies carried out on Arabic have focused on adult phonology (Al-Ani, 1970; Kaye,1990; Mitchell,1990). Al-Ani (1970) explored the phonology of Iraqi Arabic from an acoustic perspective. Omar (1973) investigated the acquisition of Egyptian Arabic. Amayreh and Dyson (1998) studied the acquisition of consonants in Jordanian Arabic. Feghali (2008) investigated the Gulf dialects including Iraqi dialect which is the source of the data under analysis. His study was motivated by the assumptions that (1) the age limit of the data under analysis is the period of acquisition and is nearly the same age of the acquisition of English /r/. and (2) that /r/ is acquired late although it is a front consonant. Furthermore, it was suggested by Amayreh and Dyson (2000) that the emergence of /r/ should be addressed.

According to Prather et al (1975), English /r/ is acquired at the age of (3:4). Templin (1957) claimed that it is acquired at the age of (4:0) Amayreh and Dyson (1998) considered it as potential to be acquired at the age of (6:4) in Jordanian Arabic. The age limit of our data is (3:7). Therefore, the findings will be compared to these studies in accordance with the level of accuracy will be arrived at.

Table (1): Levels of accuracy as defined by Sander (1972)

Level of accuracy	Percentage of correctness
Customary production	at least 50%
Acquisition	at least 75%
Mastery	at least 90%

These levels were adopted to answer research question (2) above and will be used to categorize the development process along the whole age group.

Methods
Subjects

The data was collected in Ramadi, Iraq. A total of 20 normally developing children chosen at random from a variety of social classes, with a focus on the inner-city population from the general Ramadi population. These children aged between 1:8-3:7 years old. There were no children who had been reported as having a delay in language development by tutors, parents, or caregivers. Furthermore, during the assessment, each child's language ability and oral-facial speech mechanism were observed and any potential child, who looked to be out of normal limits in these areas were excluded.

Subjects recruitment

Informed written consent forms were provided to directors and teachers of randomly selected children centres in Ramadi. Parents of children enrolled at these centres received information packages. Parents who were interested in participating in the research were contacted by phone to set up a meeting and answer any additional questions. They were asked to refer other families who might be interested in taking part in the study. The researcher phoned referred families and provided additional information as well as explaining the research goals.

Procedure and stimuli

An audio and video recording of a spontaneous speech was made on a single occasion, which lasted for approximately 30 minutes. The parent was instructed to interact naturally with his or her child. During all recording sessions, a set of toys and picture books were made available to the child. A 40-word picture-naming test designed to elicit spontaneous single-word responses representing consonants in all possible positions in the word i.e. initial, medial, and final (Amayreh, 1994). An AC adapter-powered TASCAM DR-40 audio recorder was put on the table as close to the child as possible and without they notice. Audio files were recorded at 44.1 KHz 16 bit as wav files and saved on an external hard drive in preparation to analysis.

Transcription

The samples were analyzed to examine children's development in the acquisition of /r/ and also to help answering the study research questions. In order not to limit itself, the study investigated the words regardless to the number of syllables they include. Queries were ran and designed to elicit the production of /r/ in onset and coda position to explore the effect of position on the accuracy of production. To examine the effect of position on children's accuracy and to find out sex differences within each age group, each age group was analyzed separately. For giving an overall description to the development of /r/ along the whole age group, other queries were ran. After calculating the results, they were presented in charts and then described in relation to the variable like position in the syllable and sex of the child. Some queries searched each sex separately and some others combined them together. Details of the queries ran are given in tables 2-4 in the Appendix.

Three aspects of accuracy were considered: (1) the percentages of accuracy for each age group producing /r/ in onset and coda positions, (2) the percentages of accuracy for the whole age group producing this sound, and (3) the percentages of accuracy between males and females within and among groups. Results were presented using Figure s (columns and bar charts) to show the averages of correctness in each age group with reference to sex and position differences. To compare the performance of both sexes at each age group, percentages of correct production were calculated and then represented. To determine the realizations of /r/ in onset and coda positions, all children's productions in this age group were explored.

Results

The younger age group i.e. (1:8-2:3) revealed noticeable variations between males and females in the production of /r/. Figure 1 illustrates the percentages of the production accuracy in this age group with reference to the position of the segment in the syllable.

Figure 1. Percentages of /r/ produced correctly by IA children in the age group (1:8-2:3)
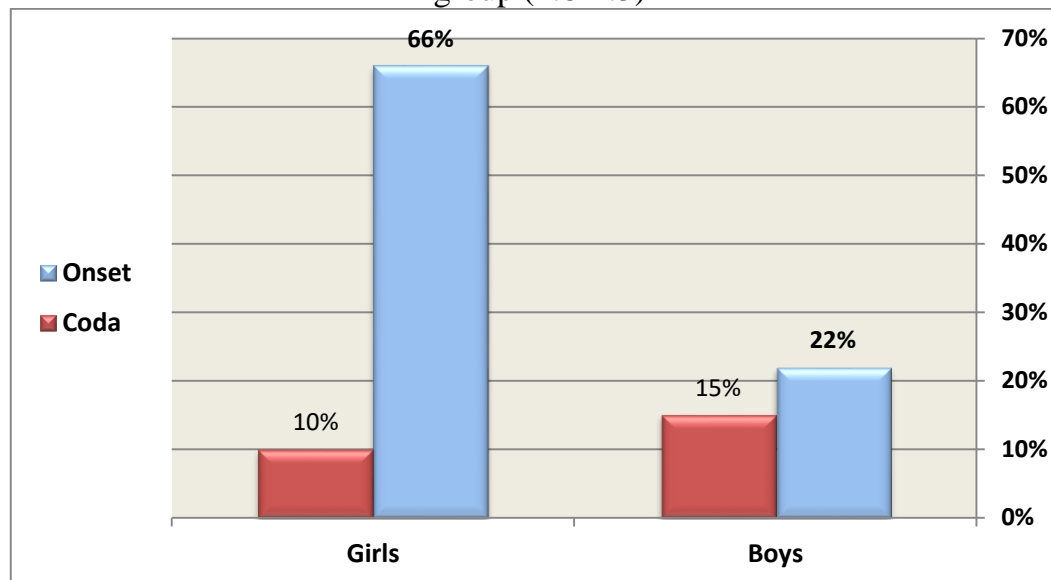
As it can be seen, in onset position, females have more accurate production than males achieving 66% correctness compared to only 22% done by males. In coda position, all children have approximately similar percentages of correctness scoring 15% and 10% for males and females, respectively. In order to find out how incorrect productions were distributed; all incorrect realizations were explored.

These resulted into two categories:

(1) In onset position more than 78% of /r/ tokens were glided by all children, while 22% were produced as /r/. For example:

Orthography: [barra]
IPA target: [barra]
IPA actual: [bə.ˈlə]

(2) In coda position, approximately 88% were glided while the rest were deleted.as

Orthography: [2arb3a]
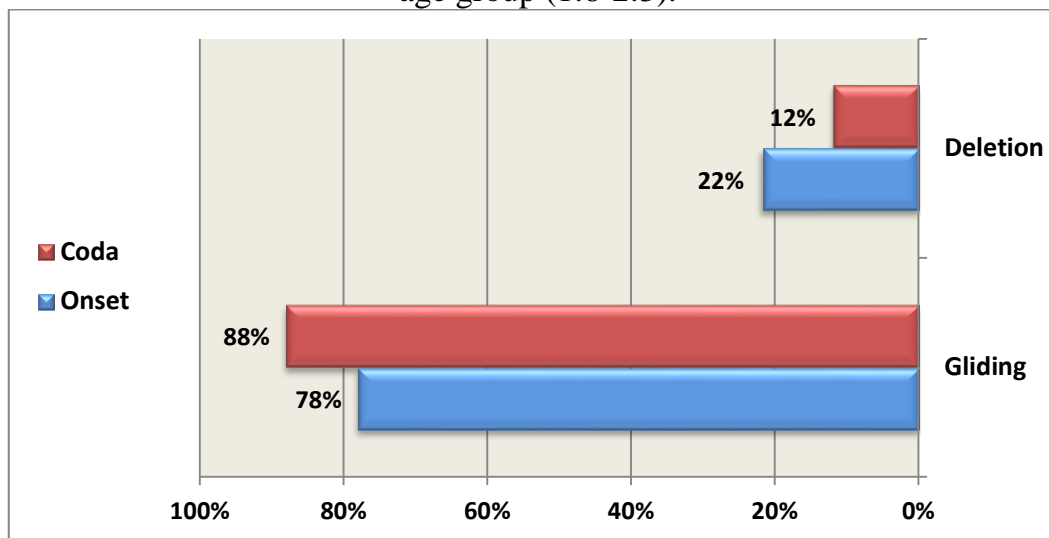IPA target: [ˈʔər.bɑ.ʕə]
IPA actual: [ˈəw.bɑː]

Interestingly, deletion appears only in coda position with loan words only as in:

Orthography: [car]
IPA target: [kɑr]
IPA actual: [kɑː]

Figure 2. The distribution of incorrect /r/ realizations by IA children in the age group (1:8-2:3).

In the Second age group (2:4-2:11), children's production of /r/ were explored. For this job, two queries were carried out: the first mined their realizations in onset position while the second query examined them in coda position. The total percentages were calculated and presented in bar chart for evaluation. As the results show, in this age group, males' accuracy in producing /r/ in onset and coda position sharply developed. However, the percentages in Figure 3 indicate that they were more accurate in producing /r/ in onset than in coda position. For them, this age group was an age of mastery when they scored 92% compared to their 22% in their peers in the first age group. On the other hand, girls' production significantly fell from 66% in the first age group to 38% in this age group.

Overall, males scored more accurate production than females. In coda, all children scored gradual improvement. Males' performance increased from 15% to 25%, while females' performance was doubled from 10% to 20%.

Figure 3. Correct production of /r/ by IA children in the age group (2:4-2:11)
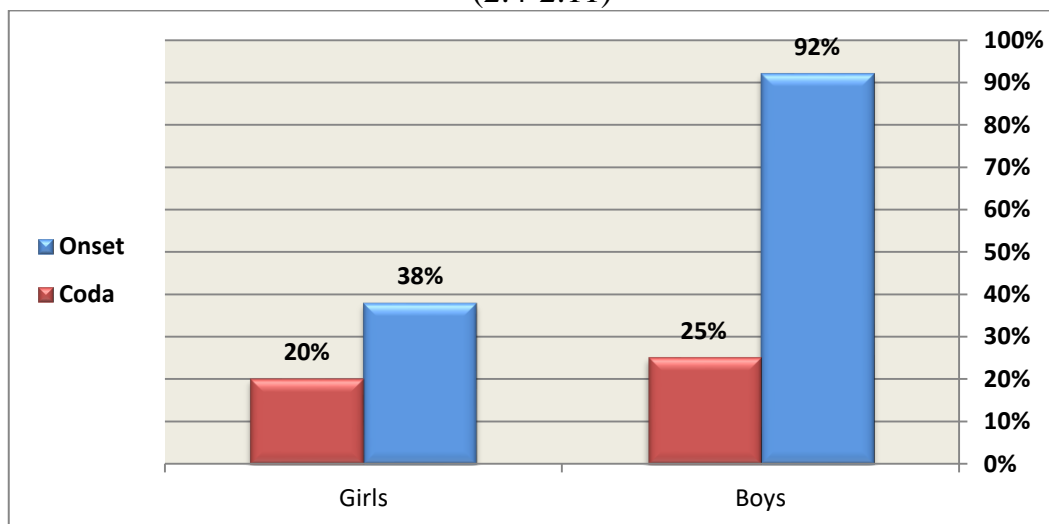
Incorrect productions were important to be explored. For this goal a query was ran which revealed the emergence of two aspects: Deletion and gliding.

Figure 4. Incorrect production of /r/ by IA children at age (2:4-2:11)
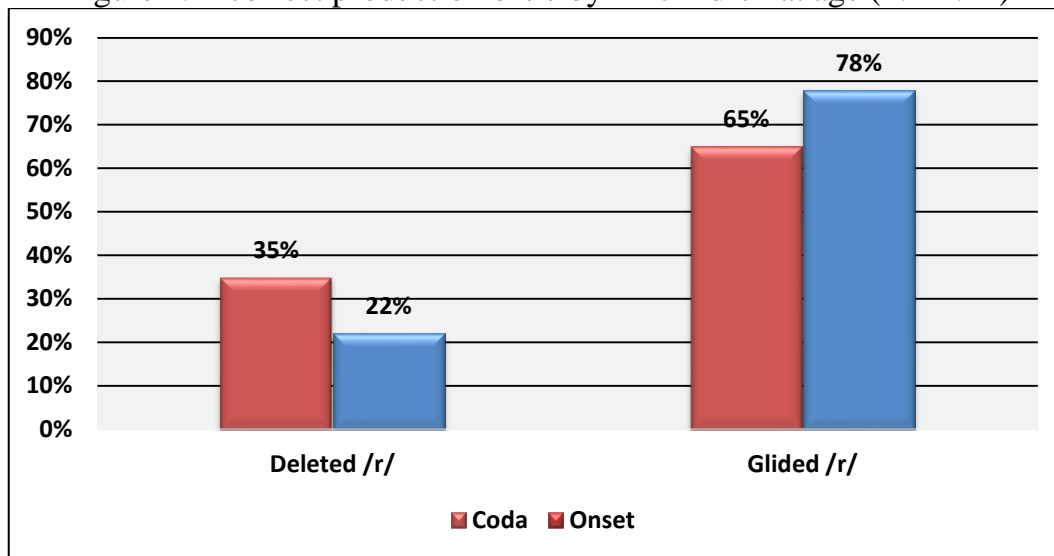
What framed this distribution is that gliding was the dominant feature of incorrectness. It occurred in onset more than in coda. On contrary, deletion was more in coda than in onset.

The third age group (3:0- 3:7) was explored to examine the percentages of correct realizations of /r/. Children's productions of /r/ in onset and coda positions were analysed. Their correct realizations were calculated. Figure 5 below shows in percentages the correct production of /r/ in onset and coda in the age group (3;0-3;7).

Figure 5. Percentages of /r/ produced correctly by IA children in the age group (3:0-3:7)
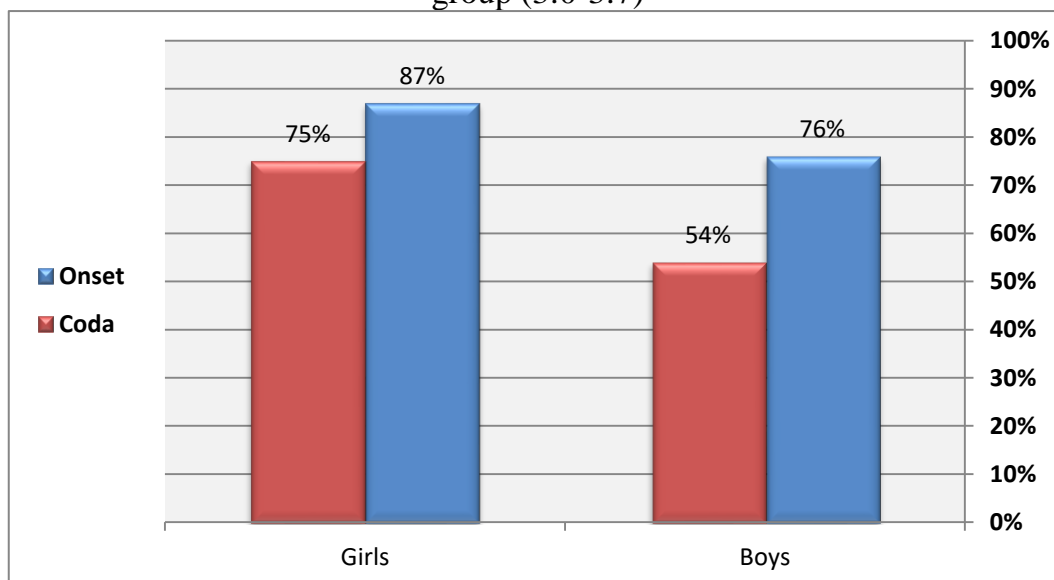
The percentages indicated that females were more accurate in their productions than boys. In onset position, they achieved 87% correctness compared to males 76%. In coda position, their correctness was 75% while the males only achieved 54%. Comparing the percentages with those shown

in Figure 3 earlier, it can clearly be noted that overall, this age group scored a noticeable development in the correct production of /r/ with an exception that males' achievement in onset gradually fell from 92% to 76% However, their accuracy in coda were doubled from 25% to 54%. It was essential to know how incorrect realizations were distributed. To determine this, all children's productions were examined.

Figure 6. The distribution of /r/ produced by IA children in the age group (3:0-3:7)
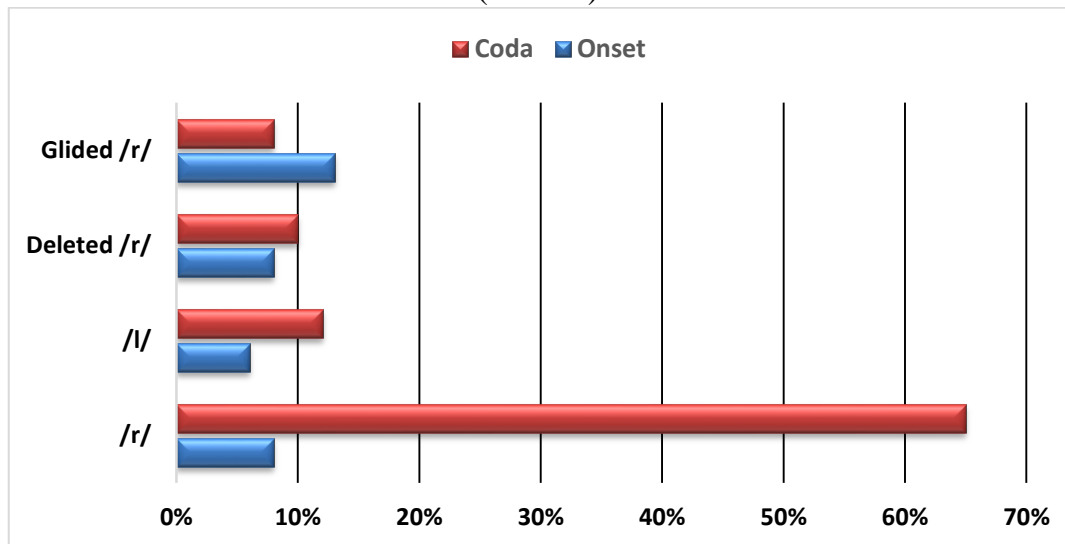
Data shown in Figure 6 indicated that children correctness was high scoring 80% in onset and 65% in coda. It was noted that gliding which scored a high level in the second age group, fell into just 13% in onset and 8% in coda. Following Grunwell (1982), gliding is mostly noted at the age (2:0- 3:0) which is closer to our data age level. 6% and 12% were realized as /l/ in onset and coda respectively.

Deletion occurred more in coda than in onset scoring 10% and 8% for coda and onset respectively. In coda, deletion might be lower because the deleted cases are English words which imposed some language specific features imposed by input (mother or interviewer's production). Examples of these words are:

1. Orthography: [hummer]
        IPA target: [ˈhʌ.mər]
        IPA actual: [ˈhʌ.mə]
2. Orthography: [turtle]
        IPA target: [ˈtʌr.təl]
        IPA actual: [ˈtɛ.tə]
3. Orthography: [car]
        IPA target: [IA:r]
   IPA actual: [ˈIA:]
        Similar percentages were scored for a /r/- to- /l/ change.

For this case, articulation complexity tends to be the reason for most of the incorrect realizations of /r/. Interestingly, both /l/ and /r/ are alveolars. This indicates that children were aiming at /r/ but they were still unable to

control manner of articulation and therefore they just approximated the trill to be /l/.

Figure 7 summarizes the development in the production of /r/ in onset and coda positions along the three age groups of Iraqi children.

Figure 7. The development in the accuracy of /r/ produced by age group
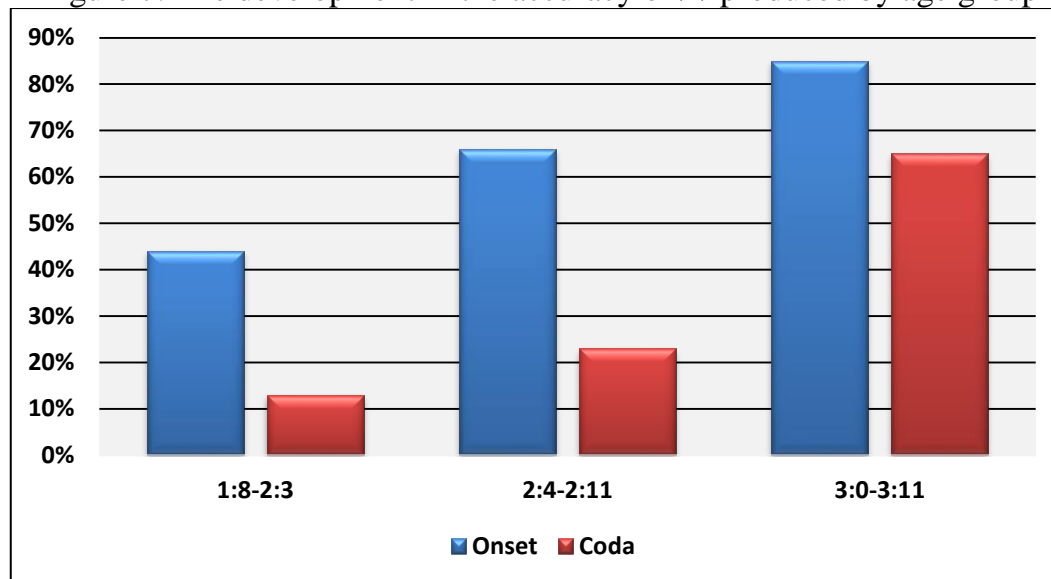
In general, the acquisition of /r/ increased with age. However, males' acquisition developed faster than girls. In each age group, children were more accurate in producing /r/ in onset than in coda position. This went in parallel with the crosslinguistic view that children's early words are characterized by an open syllable shape. This age was reported by Demuth and Fee (1995) as 'Sub-Minimal Word stage' where early words have a CV shape.

In the first age group, accuracy in onset scored 44% compared to 13% in coda. In the second age group children performed a 66% accuracy in onset with 23% in coda. The onset-to- coda difference in the third age group was less with 85% and 65% for onset and coda respectively. Overall, in spite of the noticeable effect of the position of /r/ within a syllable, children's accuracy in this age had significantly developed.

A comparison of the data in Figures 8 and 9 indicates that there were small sex differences in the acquisition of /r/ in coda. Both achieved a noticeable progress from (15% - 54%) by males and from (10% - 75%) by females. At the age of (3:7), all children arrived at the level of acquisition where their accuracy mean was 84.5%. They varied in the production of /r/ in onset position. Age (2:11) was a critical period for females whose accuracy dropped from 66% to 38% and then grew to become 87% in the third age group as explained in Figure 9. On contrary, age (2:11) was a model age for males who arrived the level of mastery when scoring a 92% accuracy, but this fell into 76% at the end of (3:7).

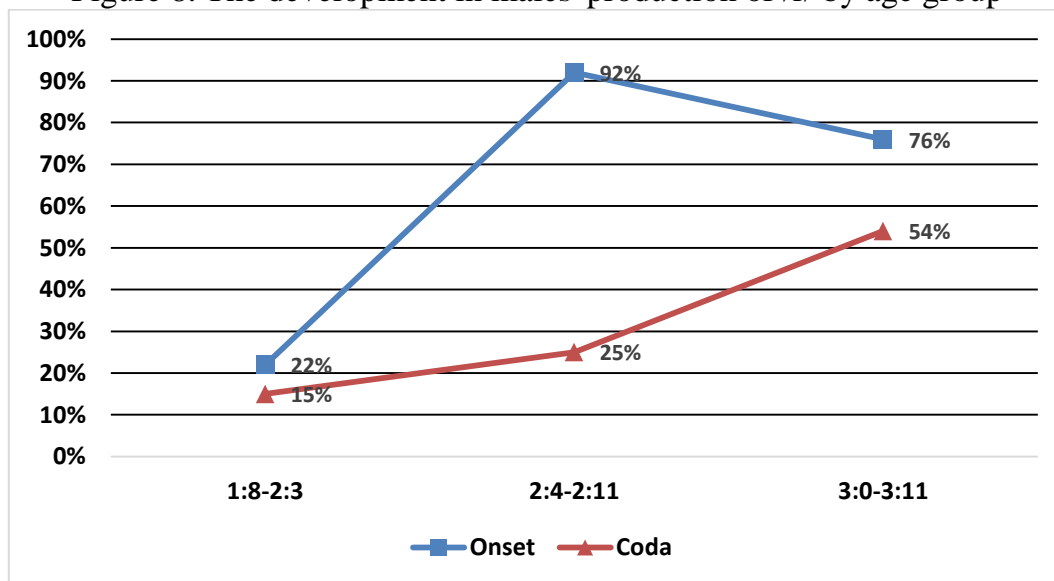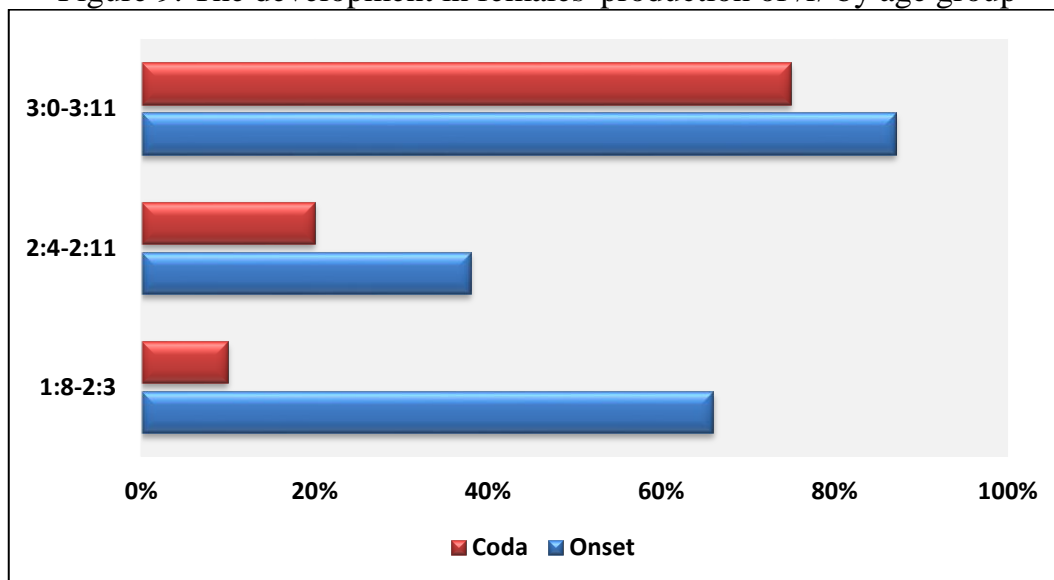Figure 8. The development in males' production of /r/ by age group

Figure 9. The development in females' production of /r/ by age group

Discussion

      The present study explored the development in the acquisition of the trill /r/ in Iraqi Arabic. It examined the production of 35 male and 35 female children aged at (1:8-3:7). A general survey of this age group revealed that children's accuracy developed in onset and coda positions with a faster rate in onset. In answer to questions (1) and (3) addressed in the introduction, analyses showed that along this age group, children scored different percentages in their correct productions of /r/. They registered highest levels of accuracy during the third age subgroup i.e. (3;0-3;7). Along the whole age group, syllable-initial /r/ was significantly more accurate than syllable-final /r/ which indicated that children were prone to producing onset rather than coda. That supported the universal view of CV syllable in children's early words reported by Demuth and Fee (1995) as' Children's early words are characterized by an open syllable shape' and assured by (Locke 1983 cited in Amayreh & Dyson 2000) as 'syllable- final consonants are rare in the child's early words'. Results also showed, Females were more

successful than males in the first and third subgroups, while males were more accurate in the second subgroup. The production of /r/, although developed, did not reach the level of mastery. At the age (3:7), children exceeded the acquisition level at onset position when their accuracy was 84%, but they were still at the customary level in coda when they scored a 65% accuracy. Taking the average rate of both syllable-initial and syllable-final accuracy, and in answer to question (2) of the study, this age group was the period of acquisition (75% correctness) for /r/. This supported Prather et al's (1975) view that, in English, /r/ is acquired at the age of (3:4) which is three months earlier than the age limit of our subjects. It also was close to Templin (1957) view that /r/ is acquired at the age of (4:0).

On the other hand, this finding contradicted Amayreh and Dyson's (1998) conclusion that, in Jordanian Arabic, /r/ is acquired late at the age of (6:4). Consequently, it falsified Jakobson's (1968) universal theory that the acquisition of phonemes in all languages follow similar patterns and ages of acquisition.

Another considerable finding revealed that /r/ was acquired relatively late although it is a front consonant. This late acquisition tends to be due to the fact that this consonant is not as frequent as other back consonants acquired early like, for example, stops and nasals. However, /r/ was frequent enough to falsify this claim. Therefore, it might be ascribed to the fact that this late acquisition is caused by articulatory complexity rather than frequency.

The acquisition of /r/ was accompanied by two main phonological processes: gliding and deletion. In accordance with the way these processes developed, /r/ was glided and then deleted. The most considerable process was gliding which was reported in Figure 10 below.

Figure 10. The development of gliding through the acquisition of /r/ by age group
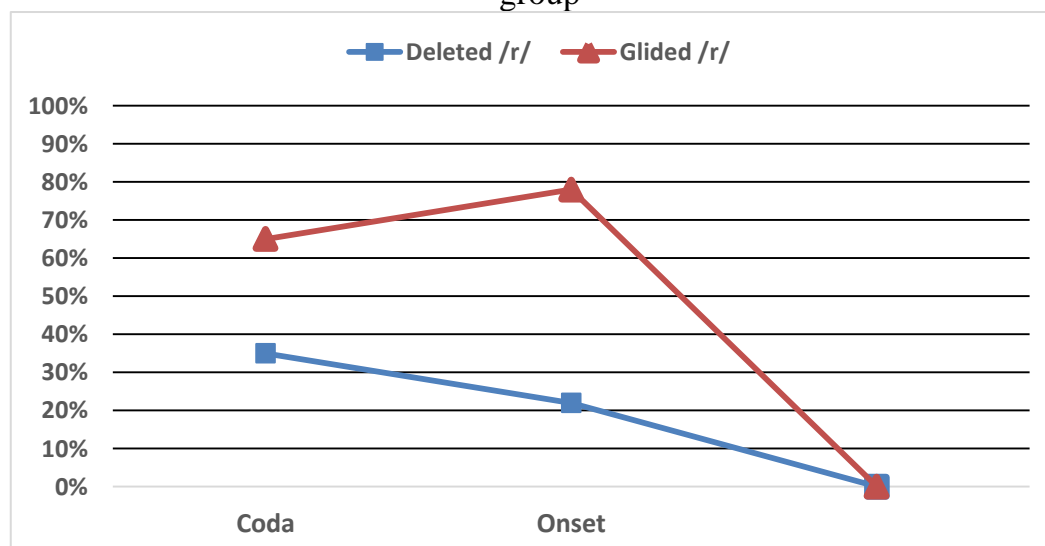
In general, gliding occurred high but sharply decreased. Taking the average percentages reported in Figure 10, glided /r/ in onset and coda fell from 83% at age (1:8) to 9% at the end of (3:7). Interestingly, this rate of decrease conflicted with the rate at which accurate productions of /r/

increased. In other words, as the third age group was the age of highest accuracy, it was the age at which gliding relatively diminished. This went in parallel with Grunwell's (1982) chronology of phonological processes.

Another process accompanied the acquisition of /r/ was deletion which also considerably dropped along the whole age group. Figure 11 framed this decline.

Figure 11. The development of deletion through the acquisition of /r/ by age group
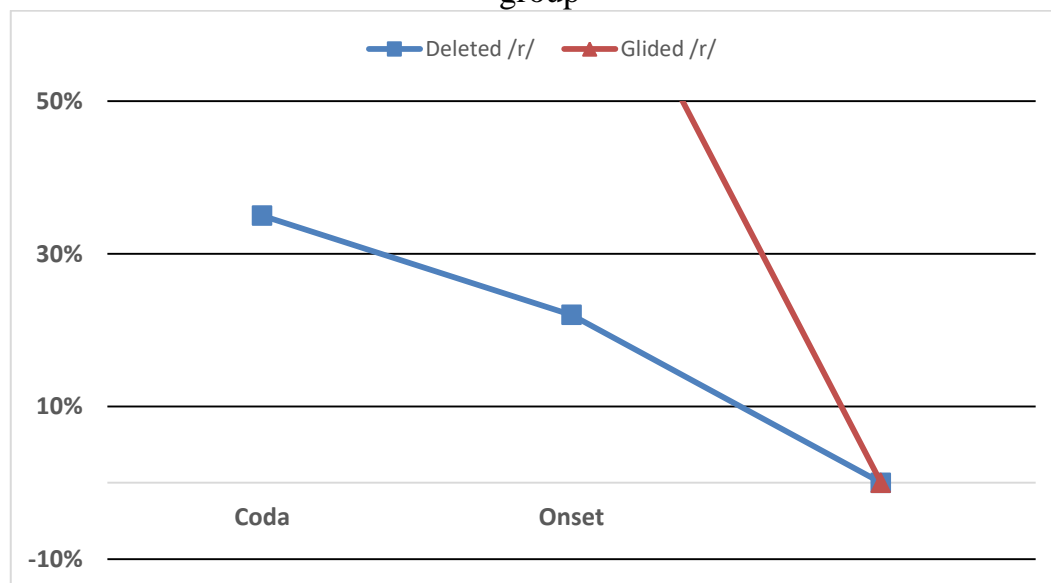
At age (1:8) deleted /r/ cases in onset 22% were more than those in coda 12%. At the middle of year two, deletion in coda peaked to 35% while it remained stable in onset. At age (3:7) deletion relatively vanished at the time children's average of accuracy plotted to the acquisition level 75%.

Conclusions

The majority of phonological development studies are small-scale research investigations on a small number of Arabic dialects. (e.g., Egyptian: Ammar and Morsi, 2006; Saudi: Faraj, 1988، and Palestinian: Ravid and Hayek, 2003). Large-scale research is considered necessary to depict the range of typical developmental trends in Arabic phonology. This stresses the need for conducting further research on Arabic children. Speech-language therapists working with Arabic-speaking people have a limited amount of information (Amayreh & Dyson, 2000). The goal of this research is to demonstrate numerous features of Iraqi Arabic phonological development. It investigated the development in the acquisition of the trill /r/ in Iraqi Arabic in the age period (1:8-3:7). This age period proved to be the age of acquisition (Sander (1972) at which accuracy level was 75%. IA children were more accurate in producing /r/ in onset than in coda position. In general, there were minor variations between male and female children in the acquisition rate. The acquisition of /r/ in IA was accompanied by two major phonological processes: gliding and deletion. /r/ in IA was acquired at about the same age it was acquired in English, but at an earlier age it was acquired in Jordanian Arabic. IA children at later ages are worth investigated to know the age limit at which /r/ is acquired.

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Appendix

Table 1. Comparison among acquisition ages of /r/ in Jordanian Arabic, Iraqi Arabic and English.

Study	Amayreh & Dyson 1998	The present study	Prather et al. (1975)	Templin (1957)
Language	Jordanian Arabic	Iraqi Arabic	English	English
Age of Acquisition	6:4	3:7	3:4	4:0

Table 2. The queries ran to explore age group (1:8-2:3).

Query No	Subjects included	No. of sessions	Mean No. of records	Target measurement
1	Males only	3	3	/r/ : onset
2	Males only	2	6	/r/ : coda
3	Females only	4	2	/r/ : onset
4	Females only	2	2	/r/ : coda
5	All children	5	5	/r/ : onset
6	All children	5	6	/r/ : coda
7	All children	6	4	Deleted /r/ :onset
8	All children	5	3	Deleted /r/ :coda
9	All children	4	4	Glided/r/ :onset
10	All children	6	2	Glided /r/:coda

Table 3. The queries ran to explore age group (2:4-2:11).

Query No	Subjects included	No. of sessions	Mean No. of records	Target measurement
1	Males only	6	4	/r/ : onset
2	Males only	5	2	/r/ : coda
3	Females only	7	4	/r/ : onset
4	Females only	4	4	/r/ : coda
5	All children	6	4	/r/ : onset
6	All children	5	4	/r/ : coda
7	All children	4	4	Deleted /r/ :onset
8	All children	5	4	Deleted /r/ :coda
9	All children	3	3	Glided/r/ :onset
10	All children	3	3	Glided /r/:coda

Table 4. The queries ran to explore age group (3:0-3:7).

Query No	Subjects included	No. of sessions	Mean No. of records	Target measurement
1	Males only	10	8	/r/ : onset
2	Males only	9	8	/r/ : coda
3	Females only	6	3	/r/ : onset
4	Females only	5	4	/r/ : coda
5	All children	5	6	/r/ : onset
6	All children	3	4	/r/ : coda
7	All children	4	3	Deleted /r/ :onset
8	All children	3	4	Deleted /r/ :coda
9	All children	5	4	Glided/r/ :onset
10	All children	2	3	Glided /r/:coda