Development of an articulation test for bahdini kurdish preschool-age children

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ABSTRACT:

Articulation tests record and analyze children's speech. They are used to determine which sounds children can or cannot say or if the speech errors the children produce are developmentally appropriate or they are delayed. The aim of this study was to develop an articulation test for Bahdini Kurdish preschool-age children. For this purpose, a picture-naming test was designed to elicit spontaneous single-word responses representing 26 consonants in initial, medial and final positions and 8 vowels in medial positions. Seven experts were asked to review the test and complete a questionnaire. Then, it was presented to 65 normal Bahdini Kurdish speaking children. They were 38 males and 27 females from three different age groups: 3, 4, and 5 years old. The children's responses were recorded and then scored for each correct utterance and picture identification. The results show that there are no significant differences among the experts' responses which reflect their approval for the test to be a valid tool for collecting the phonetic inventory of the children. There is a significant and high correlation between correct word utterances and picture identification which proves the content validity of the test. Finally, there are no significant differences between males and females indicating that the test is suitable for both genders, while significant differences were found among age groups in which older children performed better than younger ones. Thus, the test is a valid and a reliable tool that can be applied to collect the phonetic inventory of Bahdini Kurdish speaking children.

KEYWORDS: articulation test, Bahdini Kurdish, Kurdish phonetic system, language development

1. Introduction

An articulation test is a systematic procedure used to record, detect and analyse the speech of individuals according to various principles and criteria including appropriate placement of articulation, developing sequences as well as the intelligibility of faulty speech production of individuals with language related issues whether based on their young age with undeveloped phonological skills, or those who have started to use speech sounds later in their life (Ingram and Ingram, 2001). Moreover, tests of articulation are used to determine the basics and the nature of an existing problem or difficulty of an individual in order to look for solution to the diagnosed problem (Bleile, 2002). In other words, by using articulation tests specialists including phonologists, clinicians and pathologists as examiners can examine and check the speaker's ability to produce speech sounds as a result their articulation disorders will be diagnosed and measured systematically. For that reason, articulation tests are considered to be one of the most essential and significant instruments that are used by specialists to figure out the phonetic and phonological errors that could be with consonant, vowel sounds or with the intelligibility of the speech production (Sherman, 1970; Kamhi and Pollock, 2005; Shriberg and Kwiatkowski, 1994; Bleile, 2004).

Various articulation tests are designed for the children of other languages (for Standard American English by Goldman and Fristoe; 2015; for Turkish by Topbas, 2006; for Arabic Abou-Elsaad, Baz andEl-Banna, 2009; for Farsi by Shooshtaryzadeh, 2015). However, no articulation tests for assessing the phonological development of children whose mother tongue is Kurdish exist till now. It is not possible to examine the children's ability to produce their native language (i.e., Kurdish) speech sounds in a systematic way to be able to diagnose and measure any articulation disorders that might affect the intelligibility of their speech. Thus, developing an articulation test especially for Kurdish is very essential because it will be used as a significant tool to investigate the phonological system development in children.

So, the main aim of this study is to develop a Kurdish articulation test by using familiar, culturally based and transparent single words to be used as a tool to measure the production of phonemes in normal preschool-age children.

Kurdish is a member of the northwestern group of Iranian languages that belongs to the Indo-Iranian languages which is a branch of the Proto-Indo-European language family (Zahedi and Mehrazmay 2011; Thackston, 2006). It is divided into a number of dialects, but there is no detailed accurate classification of these

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dialects, their geographical distribution and the subdialect of each dialect. Generally, Kurdish is divided into three dialect groups based on genetic connection, geographic closeness, ethnic identity and typology factors: Northern, Central and Southern Kurdish (Windfuhr, 1989). The Northern Kurdish dialect or Northern Kurmanji (NK), also called Badinani or Bahdini, is spoken by the Kurds of eastern Turkey, north-west part of Iraq and all the Kurds of eastern Syria. It has the biggest number of speakers and has different writing systems: a modified Turkish Latin alphabet, Cyrillic letters and a modified Arabic alphabet (Thackston, 2006). This study is based on the variety of NK spoken in Zakho and Duhok and uses the modified Turkish Latin transliteration. Central Kurdish or Central Kurmanji dialect, also called Sorani, is spoken in the north-east regions of Iraqi Kurdistan, Caucasus Anatolia, north-east of Iran and Syria. Meanwhile, Southern Kurdish or Southern Kurmanji (SK) dialect, also called Pehlewani, is found in Iraq and Iran and covers Shehreban, Dinewer, Hemedan, Kirmashan, Xanekin.

Kurdish is a phonetic language i.e., it is written as it is pronounced (McCarus, 1992). There is a number of studies that deal with the Kurdish phonetic system (such as Marif, 1976; Amin, 1979; Aziz, 1976; Fattah, 1997; Ali, 1989; Thackston, 2006; Rahimpour, 2011; Musa, 2009; Khoṣnaw, 2013), but still identifying the exact number of vowels and consonants in Kurdish is a controversial matter and there is an ongoing debate about a number of sounds in the literature up to date as a result there is no agreed-upon classification of the phonemic inventory in Kurdish. There are debates about the phonemic status of some sounds such as /ʔ/ (Marif, 1976; Ways, 1984). Additionally, some sounds such as /pʰ, tʰ, kʰ, tʃʰ, ɬ/ have a phonemic status in one dialect, while they appear as allophonic variations in another dialect (Thackston, 2006). Moreover, some sounds, for instance, /ħ, ʕ, ɣ, q, ɬ/ entered the language as the result of language contact and they also act as regional allophones (Thackston, 2006 and Mohammed, 2009). This study adopts the consonant system presented by Hasan (2012) for Bahdini Kurdish in which only 26 non-debatable sounds are selected: /p, b, t, d, k, g, q, f, v, s, z, ʃ, ʒ, x, ɣ, ħ, ʕ, h, tʃ, dʒ, m, n, r, l, w, and j/. For vowels, the system identified by Bijankhan and Saleh (2017) for Bahdini Kurdish is used which includes 8 vowels: /aː, iː, e, u, uː, o, i and æ/.

The study is important because it will provide the first language specific articulation test for Kurdish, especially for Bahdini dialect. It can be used by phonologists and speech therapists as a useful tool to examine the phonological development and detect any articulation problems in children. It can be used as a first step to understand the children's articulation and its deficiency in order to provide them the suitable treatment and assistance. The study is carried out to answer the questions:

1. Is the test developed is a valid and a reliable tool that can be applied to collect the phonetic inventory of Bahdini Kurdish speaking pre-school-age children?
2. Is the test suitable for males and females?

The following section provides an overview of the types of articulation found in the previous studies. Section three will present the main methodological issues used in the data collection and analysis. Sections four and five describe the main findings of the study and their discussion. Finally, section six provides the main conclusions arrived at, recommendations and suggestions for further study.

2. **Theoretical background and literature review**

Different types of valid, reliable and widely used tests of articulation are identified in the literature for English and for other languages, but no tests for Kurdish are available until now.

For English, a number of standardized articulation tests are designed including: The Arizona Articulation Proficiency Scale (Arizona-3), Diagnostic Evaluation of Articulation and Phonology (DEAP), Hodson Assessment of Phonological Patterns-Third Edition (HAPP3), Goldman- Fristoe Test of Articulation GFTA -3 and Assessment of Phonological Processes. Arizona-3 (Fudala, 2000) is used to recognize speech misarticulations for individuals between 1.6-18.11 years old. It tests over-all articulatory proficiency, facilitate, identify and select children for speech therapy advancement. DEAP (Dodd, et al, 2002) provides various diagnoses of speech disorders in 3.0-8.11 years old children. It contains two screens and three assessments that can help specialists to differentiate between articulation disorders and phonological delay in children and consistent and inconsistent phonological disorders. HAPP-3 (Hodson, 2004) is planned particularly for children with extremely unintelligible spoken language. The test contains stimulus words and phonetic transcription in which objects and pictures are used to elicit 50 stimulus words. The GFTA-3 for American English (Goldman, and Fristoe, 2015) is used to measure speech consonant sounds abilities in children, adolescents, and young adults' speech production. The test consists of Sounds-in-Words and Sounds-in-Sentences tests. In the Sounds- in- Words, pictures are used to elicit the pronunciation of the main speech sounds, while the Sounds-in- Sentences evaluates spontaneous sound production in connected speech in which the examinee is required to recite a short story based on a picture cue. At the end individual performance, articulation of consonant sounds, types of misarticulation are measured and compared to national, gender- differentiated norms. Assessment of Phonological Processes for Standard American English (Hodson, 1980) requires identifying 55 common items such as parts of body or any other likewise plain concepts. These words contain all the consonants except for/w/, /j/ and /h/. It was administered individually to 60 normally-developed and intelligible children between 4 and 5 years of age in both genders. All the utterances were phonetically transcribed and were scored by an expert indicating all the phonological processes affecting the articulation of speech sounds. Part of the test was devoted to children with articulation and intelligibility problems.

For Turkish, the Articulation and Phonology Test (Sesletim–Sesbilgisi (SST) is the first comprehensive standardized articulation and phonology test (Topbas, 2006) that includes the Assessment of Articulation (SET)

and Phonological Analysis Sub-test (SAT). SET is used to assess children's abilities of articulation of singleton and cluster Turkish consonants in the beginning, middle, and final positions in words. This sub-test includes 93 pictures, mainly nouns, and color terminologies, that can be identified by young children who are expected to say the pictured word or if the children failed to utter the word, imitative response was also accepted. SAT is specifically centered on the analysis of phonological processes. It covers only 13 thematic compositions pictures to elicit expressive language in connected speech which the participants are expected to describe the picture.

For school-age Arabic speaking children, the Mansoura Arabic Articulation Test (MAAT) is specifically designed for this purpose (Abou-Elsaad, Baz andEl-Banna, 2009). It uses common and visually evident words that can be used as a main criterion to compare the phonemes in both normal and phonologically disordered Arabic-speaking children. For this purpose, a picture-naming task including 106 pictures was constructed representing single-words designed to include consonants in initial, middle, final and double positions as well as vowels in medial position to prompt responses from the selected subjects spontaneously. MAAT was reviewed by three phoneticians and then presented to 100 normal Arabic-speaking Egyptian children randomly chosen from kindergartens, including both genders with ages ranging between 3:5 and 5:8. The test was approved by the experts and significantly sufficient relationship was recorded between picture identification and correct word utterances which verified the content validity of the test and the consistency of MAAT.

For Persian, the test of articulation (Zarifian, e al, 2017) includes a subtest of diagnostic assessment of articulation and phonology in order to confirm its reliability and validity. The test was directed to 387 children aged between 3 - 6 years. The child's ability in producing each consonant and vowel sounds is evaluated. The consonants occurred only in initial and final positions. The Persian version test achieved a satisfactory level of test-retest and scoring-scoring reliability and configuration validity.

There are also attempts to design articulation tests that are workable for a number of common languages, for instance, Prabhu et al (2015) for a number of languages in India. The test material was developed using 76 Sanskrit words which are common in the languages under study. A total number of 60 children, with the age range of 3-8 years, were involved in the study. The phonemes were embedded in the target words which were recorded in a sound treated room and analyzed. The results are discussed with respect to age and pattern of the acquisition of speech sounds. By 8 years of age almost all the phonemes are acquired and some problems in the articulation of some sounds are detected in earlier ages.

All the tests mentioned above are language specific and cannot be used for the speakers of other languages. That is why, this study attempts to develop a language-specific articulation test for Bahdini Kurdish only. This test is similar to many of these tests in that a picture-naming task is used, but it is different from the others in that it is applied to normal pre-school age children and it tests the production of all consonants and vowels of Kurdish in different positions in words only. In addition, it aims to examine the phonological development in this age, i.e., whether the children can or cannot produce the Kurdish sounds, and identify any phonological errors or processes that the children produce in the process of sounds acquisition in this age. This test elicited only spontaneous single-word responses unlike many others in which the examiners used imitation strategy in points where the child fails to name the shown picture. All in all, despite their differences, all of the tests have the same primary objective, which is to evaluate the phonological abilities and disorders of the participants.

3. Methodology

3.1 Participants

The data of the present study were collected from 65 native Bahdini Kurdish children including both genders between 3 to 5 years of age. Both genders are included in the study in order to examine the effects of gender and that the test is suitable for both genders. Age groups 3, 4, 5 were chosen because it is considered to be the most suitable age groups for the aims of the study with the fact that children by age 2 have a limited range of vocabulary size which are not understandable in most cases, as the result, it will be impossible for them to name all the pictures represented in the test. The age 6 participants were not recruited as the phonological processes seem to disappear in children by age 6 (Vihman, 1996; Hoff and Naigles, 2002). The subjects were recruited from day-care centres and kindergartens in Zakho with the permission of their care givers, parents and teachers using the simple random sampling in which individuals from larger population with an equal chance were selected to have unbiased and more accurate results (Cohen, Manion and Morrison, 2007). Table 1 shows the participants of the study.

Table 1: *Participants of the study*

Gender	Age	No	Total
Male	3	16	38
	4	10	
	5	12	
Female	3	7	27
	4	12	
	5	8	

3.2 Bahdini Kurdish Articulation Test

The Bahdini Kurdish articulation test (henceforth BKAT) is based on a picture naming test. It went through a number of stages including: design stage, validation stage, and application stage.

3.2.1 Design Stage

The picture-naming test containing 86 pictures was designed in order to elicit spontaneous single-word responses. The pictures represent 8 vowels only in middle position: /a: i: e, u, u:, o, i and æ/ and all possible initial, middle and final positions of 26 Bahdini Kurdish consonants identified in Hasan (2012): /p, b, t, d, k, g, q, f, v, s, z, ʃ, ʒ, x, ɣ, ħ, ʕ, h, ʧ, ʤ, m, n, r, l, w, and j/. The sound /j/ sound in final position was not represented in the designed test because none of the words were suitable or familiar for children of the selected age groups for the test. In addition, the vowels are represented only in the middle position because of the restricted distribution of Kurdish vowels in that all vowels cannot occur in the three different word positions. All the words are familiar and easy to young children and can be pictured in full color without any difficulty or ambiguity. Moreover, the selected pictures representing the test words were suitable for the chosen age groups. The pictures and the target words for each sound in each position are presented in Appendix 1.

3.2.2 Validation Stage

Validity measures the extent to which the test evaluates the accurate articulation capabilities of children in the tested age groups. For the validation purpose, the designed test was reviewed by seven judges including six experts in English and Kurdish phonetics and phonology and a childhood psychologist (see Appendix 2). They were asked to evaluate the test and complete a questionnaire that includes questions related to the suitability of the tested words (1 and 2), the suitability of their corresponding pictures (3, 4 and 5), the suitability of the participants' age groups for the test (6) and the overall comments of the judges on the test (7):

1. Are the words familiar to the children of these age intervals?
2. Are the words suitable for the tested sounds and their positions?
3. Are the pictures clear and of a good quality? If no, please mark the photos.
4. In the case, if there are pictures which are not clear, is it acceptable to give the child a hint or some cues?
5. Do the pictures represent the tested words?
6. Are the age groups (3, 4, 5 years old) suitable for the test as participants?
7. Any suggestions or comments about the designed test in general? If yes please indicate them.

The responses of these questions are either yes which means that the judge agrees to the item or no which means that the judge does not agree. The responses are scored 1 for yes and 0 for no. The agreement responses for each questionnaire item are changed to percentages and then compared across judges.

3.2.3 Application Stage

Before presenting the test to the children, they were evaluated according to their phonological development, hearing and visual abilities, conversational skills and other language related issues. The researcher took the impressions of their teachers and parents with regard to the children's performance at the nursery and at home. For that purpose, a form was designed to record personal and linguistic information about each child. Each child was tested individually in a 10-20-minutes session in a quiet place. Their responses are also recorded by phone using voice recorder application. In most cases, familiar people remained in the room where they were asked to stay without any attempts to help the child to say the intended word. The examiner would ask 'What is this?' and the child would reply by naming the picture. However, in the cases, where the subjects did not name the picture spontaneously or correctly, some additional cues or hints were provided including some other questions and showing the real object of a particular pictured word that can be found in that particular place or showing other similar items.

3.2.4 Procedures of Data Analysis

The collected data were analysed with regard to the children's ability to utter the words correctly for each sound position and their ability to identify the pictures. The researcher listened to the recordings and each child was given a score 1 for each correctly uttered word and picture identification and a score 0 for incorrect utterance and unidentified picture. The given responses were counted as incorrect once the child uttered other words rather than the intended word, mispronounced words or if he uttered other words that are used to describe the pictured words instead of the target response. A score of 1a is given when the subject uttered the correct word with a hint while 0b score was given once a picture was not familiar to the subjects. The children's overall correct responses were changed to percentages according to different age groups and genders. Then, the percentages are compared across gender groups to examine whether there is gender effect and across age groups to examine the effects of age on the test performance. The SPSS program is used for statistical calculations.

4 Results

This section presents the detailed results of BKAT through two main stages which are validity of the judges and application of the test.

4.1 Validity of the judges

The responses of the seven judges to the questionnaire items are summarised in Table 2.

Table 2. *The responses of the judges to the questionnaire*

No	Questions	Judge 1	Judge 2	Judge 3	Judge 4	Judge 5	Judge 6	Judge 7

1	Are words familiar to the children of these age intervals?	yes	yes	No	Yes	no	no	yes
2	Are the words suitable for the tested sounds and their positions?	yes	yes	Yes	Yes	yes	yes	yes
3	Are the pictures clear and of a good quality? If no, please mark the photos.	yes	yes	Yes	Yes	yes	yes	yes
4	In the case, if there are pictures which are not clear, is it acceptable to give the child a hint or some cues?	yes	yes	Yes	Yes	yes	yes	yes
5	Do the pictures represent the tested words?	yes	yes	Yes	Yes	yes	yes	yes
6	Are the age groups (3, 4, 5 years old) suitable for the test as participants?	yes	yes	Yes	Yes	no	yes	yes

One of the judges asked to select and use a clearer picture for the word <bazing> /ba:zing/ (bracelet) for medial /z/ and also suggested to replace the word <jûr> /ʒu:r/ (room) for initial /ʒ/ with another word because the Arabic loanword <mezel> is commonly used by Kurdish people. Thus, a better picture is selected for <bazing> and the word <jûr> was replaced by <jin> /ʒin/ (woman). The same judge also suggested changing the word <ne'na'> /næʕnæʕ/ (mint) for final /ʕ/ believing that it would probably be hard for the child to recognize the picture and produce it but the word was not changed because there were not any other words familiar and easy for children that ends in /ʕ/. It was also thought that the word <vayrus> /vairus/ (virus) would probably be difficult for the 3 year old but it was kept in the test because of the current corona pandemic it was identified and uttered by almost all the participants. Moreover, the same judge said that the word <lîmon> /li:mon/ (lemon) would be produced as <nîmok> /ni:mok/ in testing the initial /l/ and also <bibar> /bibær/ could be used for <filfil> (pepper) but as a result it was found that<filfil> is commonly used and for that reason it is kept the same,

for medial /l/ but <lîmon> was replaced by <landik> (Kurdish baby cot/crib). Furthermore, two judges commented that the children might produce the most common words /hæta:v/ instead of /rɔʒ/ (sun) for medial /o/, / jisir/ instead of /pir/ for /i/. For those reasons, in the final version of the test /rɔʒ/ (sun) was replaced by /gɔlup/ (bulb) and /pir/ by <dil> /dil/ (heart). Moreover, the judges stated that /dew/ (doogh) might be confused with milk but it was not deleted from the test because the researcher could not find any other suitable word to replace it. Moreover, two judges thought that / ti:msʌḥ/ (crocodile) in testing final /ḥ/ may not be familiar to the subjects and because the researcher did not find another suitable word so it is kept. Finally, it is worth mentioning that the changes are made according to judges' remarks. The percentages of the suitability of the tested words (questions 1 and 2), the suitability of their corresponding pictures (questions 3, 4 and 5) and the suitability of the participants' age groups for the test (question 6) are summarized in Table 3. The table shows that statistically by using Kruskal Wallis Test there are no significant differences among the judges' opinions ($p>0.05$).

Table 3: *comparison of the judges' opinions to the questionnaire items in percentages*

Judges	suitability of the tested words	suitability of their corresponding pictures	suitability of the participants' age groups
Judge 1	100	100	100
Judge 2	100	100	100
Judge 3	50	100	100
Judge 4	100	100	100
Judge 5	50	100	0
Judge 6	50	100	100
Judge 7	100	100	100
Mean	78.57	100	85.71
Kruskal Wallis H	4.727	.000	6.000
Sig.	.579	1.000	.423

The percentage of agreement about the suitability of the tested words, suitability of their corresponding pictures and suitability of the participants' age groups from the judges' opinions reflects their approval for the selected test items.

4.2.1 Test Application

The percent of correct responses for each sound for correct utterance and picture identification in initial, medial and final positions are summarized in Table 4. At least half of the children (50%) should be able to produce the correct utterances and identify the pictures, otherwise it is removed.

Table 4: *The overall responses of children to the test items in percentages.*

Tested sound	initial		medial		Final	
	correct utterance	identified picture	correct utterance	identified picture	correct utterance	identified picture
/b/	92%	94%	97%	98%	92%	94%
/p/	98%	100%	97%	98%	68%	68%
/t/	97%	97%	82%	83%	94%	94%
/dʒ/	98%	98%	98%	98%	100%	100
/tʃ/	100%	100%	98%	100%	97%	97%
/ħ/	37%	37%	97%	97%	17%	17%
/x/	100%	100%	100%	100%	46%	48%
/d/	100%	100%	91%	92%	49%	48%
/r/	78%	78%	98%	100%	98%	98%
/z/	85%	85%	83%	83%	98%	98%
/ʒ/	85%	85%	71%	71%	52%	52%
/s/	94%	94%	95%	97%	95%	97%
/ʃ/	98%	100%	100%	100%	91%	92%
/ʕ/	46%	46%	91%	94%	18%	18%
/ɣ/	83%	83%	18%	18%	92%	92%
/f/	95%	98%	98%	98%	89%	91%
/v/	78%	78%	60%	62%	98%	98%
/q/	46%	46%	97%	100%	75%	75%
/k/	100%	100%	94%	97%	94%	94%
/g/	33%	33%	100%	100%	71%	71%
/l/	91%	91%	82%	82%	97%	97%
/m/	75%	75%	98%	98%	95%	97%
/n/	100%	100%	92%	92%	100%	100%
/h/	97%	97%	62%	62%	98%	98%
/w/	92%	92%	78%	78%	45%	45%
/j/	85%	85%	26%	26%	-	-
/æ/			95%	95%		
/u:/			85%	85%		
/o/			95%	95%		
/i:/			100%	100%		
/a/			100%	100%		
/e/			75%	74%		
/i/			91%	91%		
/u/			100%	100%		

The table shows that the children were able to produce the correct utterance and identify their corresponding pictures for the majority of the consonants and all the vowels. However, they were not able to produce the correct utterance and identify the corresponding pictures for the sound /ħ/ and /ʕ/ in initial and final positions, for /x/, /d/ and /w/ in final position, /ɣ/ in medial position and /q and g/ in initial position and /j/ in medial position. Thus, the pictures representing these sounds in these positions will be removed from the final version of the test because the researchers could not find other familiar words and pictures for those sounds in these positions to replace them.

Moreover, cues were used in the following words to prompt the correct utterance including: <perde> /pærdæ/ (curtain), <zer> /zær/ (yellow), <resh> /ræʃ/ (black), <me'cîn> /mæʕdʒi:n / (toothpaste), < ẍaz> /ɣa:z/ (gas), /qæpa:ɣ/ (lid), <kef> /kæf/ (foam /suds), <vayrus> /vaɪrus/ (virus), <hingivîn> /hingivi:n/ (honey), <belg> /bælig/ (leave), <giya> /giya:/(grass), <zelam> /zæla:m/ (man), <bahîv> /ba:hi:v/ (almond), <hewa> /hæwa/ (wind), <were> /wæræ/ (come), <yarî> /ja:ri:/ (game), <dev> /dæv/ (mouth), <mĕş> /meʃ/ (housefly), <dil> /dil/ (heart).

The mean percent of correct utterances and picture identification for consonants and vowels in the tested positions can be summarized in Table 5.

Table 5: *Summary of the mean percent of correct utterances and picture identification for all the sounds*

	Initial	Medial	Final	Total
Correct consonant utterances	85%	85%	79%	83%
Picture identification for consonants	85%	86%	79%	83.3%
Correct vowel utterances		93%		93%
Picture identification for vowels		93%		93%

The table shows that there is a relationship between correct utterance and picture identification for all the sounds in all positions. Pearson's correlation coefficient was used to investigate the linear relationship between these two variables. A highly significant and adequate correlation was observed between correct utterance and picture identification (p= 0.003792, r=0.996208).

4.3 Age and Gender

Statistical analysis was performed to examine the effects of age groups and gender on the test performance.

Regarding the impact of age on the test, the children are divided into three age groups: 23 children were 3 years old, 22 were 4 years old and 20 were 5 years old. The mean percent of correct utterances and picture identification for consonants and vowels for each age group can be summarized in Table 6.

Table 6: *Comparison of the test items performance among the three age groups*

	2016 (5 years) (n=20)	2017 (4 years) (n=22)	2018 (3 years) (n=23)	F	Sig.
Correct consonant utterances	86.99%	81%	79%	6.326	.002
Picture identification for consonants	87.05%	81%	80%		
Correct vowel utterances	98%	92%	89%	3.059	.057
Picture identification for vowels	97%	92%	89%		

The table shows that the rate of the test performance is increasing as the age increases, i.e. there is a better performance in older children. The statistical test One-Way ANOVA is performed to examine whether the differences in the performance between these three age groups is significant or not. The table shows highly significant differences between the three age groups for consonants, while for the vowels the difference is slightly above the significance level (p=0.05).

Besides, the multiple comparisons using Scheffe further confirmed that the older age children performed better than the other two age groups as shown in Table 7.

Table 7: *Multiple comparisons between age groups (The mean difference is significant at the 0.05 level.)*

(I) Age	(J) Age		Std. Error	Sig.	95% Confidence Interval

		Mean Difference (I-J)			Lower Bound	Upper Bound
2018	2017	-.02137	.02418	.677	-.0807	.0380-
	2016	-.08278*	.02418	.003	-.1421	-.0234
2017	2018	.02137	.02418	.677	-.0380	.0807
	2016	-.06141*	.02414	.040	-.1207	-.0021
2016	2018	.08278*	.02418	.003	.0234	.1421
	2017	.06141*	.02414	.040	.0021	.1207

Table 7 shows that there is no statistically significant difference in the performance of the children of age 3 and 4 while highly significant differences are seen in the performance of 3- and 4-years old children in comparison to the 5 years old ones.

Table 8: *Comparison of the test performance of the children according to gender*

	Male (n=38)	Female (n=27)	T	Sig
Correct consonant utterances	71%	84%	-.491	**.624**
Picture identification for consonants	83%	84%		
Correct vowel utterances	92%	94%	-.344	**.733**
Picture identification for vowels	92%	93%		

The table shows that the percentages of females' performance in the test items are better than those for males. However, by using the statistical test of Independent Samples Test to examine the effect of gender on the test performance, no significant differences (p < .05) were observed in the performance of males and females of the test. This indicates that gender has no effect on the test performance.

5. Discussion

Children's speech development ultimately reflects phonological acquisition during first language acquisition. In many cases, new sounds are produced more accurately in response to the designed articulation test. Testing the accuracy of speech production is essential for diagnosing disorders. Articulation tests are relatively quick, easy and more systematic to process and score. They help collect information about the child's sound inventory by recording the production of each speech sounds including consonants and vowels in the test at each word position, demonstrating the child's ability to produce sounds. They also show if the child is significantly delayed in normal phonological development. If the phonological problem is related to an articulation error, an articulation test should be used. BKAT is developed to contain all Bahdini Kurdish consonants in all possible consonant positions within a word and vowel sounds only in medial position. BKAT is designed to fill the gap in Kurdish literature specifically in the Bahdini Dialect when it comes to systematically evaluate preschool children's

As for gender variable, the mean percent of correct utterances and picture identification for consonants and vowels for each gender group can be summarized in Table 8.

phonological abilities and any language related disorders because no articulation tests that include all the possible speech sounds in every possible position in a word is available for Kurdish until now. It is essential to indicate that BKAT only included single words to elicit spontaneous responses without any prompts to influence the children's production in uttering the words as they see them as a picture shown to them. Furthermore, the results arrived at were recorded from normal children as its main objective and limitation but it can also be used to collect and analyze data related to language development in children with language disorders. In addition to that, articulation tests like BKAT can also be used to evaluate the intelligibility measures for educational and clinical fields to compare the language development to their peers.

The process of test design went through different stages. In the Judges' validation stage, the test material was checked by seven judges to measure the extent the test can evaluate the articulation abilities of the children in the given age range. The statistical analysis of the judge's validity of the test revealed no significant differences among the experts' responses. The percentages of agreement about the suitability of the tested words, suitability of their corresponding pictures and suitability of the participants' age groups from the judges' opinions are very high and exceeded 75%. This indicates a high degree of stability among the judges' responses and a high rate of approval for the selected test items and the overall test to be a valid tool for collecting the phonetic inventory of the children. In this respect, this study is in agreement with those of the previously conducted studies on preschool children in Arabic (Abou-Elsaad, Baz and El-Banna, 2009; Amayreh and Dyson, 1998).

In the content validity stage, the extent to which the test items are representative of the phonetic inventory that the test was designed to cover is also measured. The statistical analysis revealed a significant and high correlation between correctly said words and picture identification for all sounds in all positions which indicates the suitability of the chosen pictures to represent the tested words. This reflects that the test material is a valid tool to examine the articulation abilities of the children of all the sounds in all positions. In this regard this study is in approval with the studies done previously by Topbas (2006) and Abou-Elsaad,

Baz andEl-Banna, 2009. However, the test performance of the children of some sounds in specific positions was low such as /ħ/ and /ʕ/ in initial and final positions, for /x/, /d/ and /w/ in final position, /ɣ/ in medial position and /q/ in initial position and /j/ in medial position. Some of these sounds are not common in Kurdish especially /ħ/, /ʕ/ and /ɣ/, however, the children were able to articulate them. Thus, the low scoring of these sounds in specific positions is not related to the difficulty in their production but it might be because the tested word and/or the representative picture of these sounds in these specific positions are not familiar to the children in this age group. This was also the difficulty examined in the study by Zarifian, Modarresi, Tehrani, Kazemi, Salavati, Sadeghi, and Shahshahani, (2017) for Persian children.

In addition, discrimination validity for BKAT items is also measured to examine the extent factors such as age and gender affect the test performance of the children. Significant differences in the performance of the test among the tested age groups can be observed. It is found that older age children (age 5) performed better which is reflected in their high percentages in the production of the correct words and their identification of their corresponding pictures. This suggests that older children have more developed phonological system and more developed mental abilities and experience in comparison to younger children (age 3 and 4). In this point, the study is in an agreement of with all previous studies done for children speaking other languages including Topbas (2006), Abou-Elsaad, Baz and El-Banna, (2009), Zarifian, Modarresi, Tehrani, Kazemi, Salavati, Sadeghi and Shahshahani, (2017), by Prabhu, et al (2015) . Besides, the results show that 4-year children performed better than the 3-year ones but this difference is not significant suggesting that there is no significant difference in the phonological development and mental abilities of these two age groups in Kurdish. Regarding gender, although female children scores for correct utterance and picture identification are higher than those of males, statistically no significant differences were found in the test performance of males and females. This suggests that the test is applicable to both sexes. In this regard, the study concurs with earlier studies on preschoolers conducted in Arabic and Turkish languages by Abou-Elsaad, Baz andEl-Banna, (2009) and Topbas (2006).

6. Conclusion

It can be concluded that BKAT is a valid and reliable tool that can be used to gather the phonetic inventory of children who speak Bahdini Kurdish for both genders in the preschool age.

The test is the first articulation assessment for a Kurdish variety; it will help to fill a gap in knowledge in the Kurdish phonological studies related to phonological development in children. This test is specific for the Bahdini dialect and cannot be used for the speakers of other dialects. That is why it is suggested to design articulation tests for other Kurdish dialects or to design a unified Kurdish test that can be applicable to all Kurdish dialects.

More work is recommended in this field of knowledge in general and in developing this test in particular. The test further requires careful work in the selection of the target words and corresponding pictures for those phonemes that did not get the acceptable scores in specific positions and which are removed from the test. Besides, the test can be expanded to include other phonological aspects such as sounds in context, consonant clusters, syllable structure and other aspects of connected speech.

Furthermore, this articulation test is designed initially to evaluate the phonological development in normal children in terms of their ability to produce consonants and vowels for phonological purposes. However, it can be used for children with language disorder and is recommended to be used in clinics and health centers to diagnose patients with language disorders as one of the important tools in detecting the exact problem.

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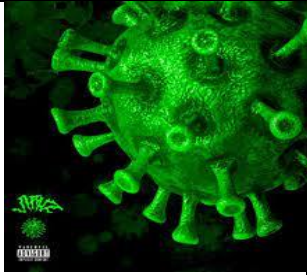
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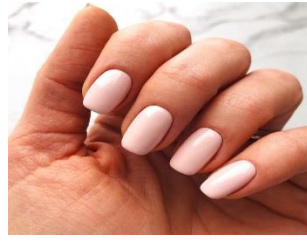
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Appendix 1: Picture Naming Test

No	Latin Alphabet	IPA Symbols	Initial	Middle	Final
1	B	/b/	*Bacan reş /ba:dʒa:n ræʃ /* *Eggplant*	*Tibil /tibil/* *Finger*	*Kebab /kæba:b/* *kabab*
2	P	/p/	*Pivdank /pivda:nik/* *Ballon*	*Tepe /tæpæ/* *Ball*	*Hesp /hæsip/* *Horse*
3	T	/t/	*Trî /tri:/* *Grape*	*Pelatînk /pæla:ti:nk/* *Butterfly*	*Goşt /go:ʃt/* *Meat*
4	C	/dʒ/	*Cilik / dʒilik/* *Clothes*	*Bacan /ba:dʒa:n/* *Tomato*	*Birinc /birindʒ /* *Rice*
5	Ç	/ʧ/	*Çetel / ʧætæl/* *Folk*	*Kefçik /kæfʧik/* *Spoon*	*Pirç /pirʧ /* *Hair*

6	ḧ	/ħ/	*ḧilîk / ħili:k /* *Plum* 	*teḧîn /tæħi:n/* *tahini* 	*tîmsaḧ /ti:msʌħ/* *Crocodile*
7	X	/x/	*Xawlîk /xawli:k /* *Towel* 	*Text /tæxit/* *Bed* 	*Xox /xɔx/* *Peach*
8	D	/d/	*Dest /dæst/* *Hand* 	*Perde /pærdæ/* *Curtain* 	*Erd /ærd/* *Earth*
9	R	/r/	*Ristik /ristik/* *Necklace* 	*Dergeh /dærgæh/* *door* 	*Ber /bær/* *Stone*
10	Z	/z/	*Zer /zær/* *yellow* 	*Bazing /ba:zing/* *Bracelet* 	*Muz /Mʊz/* *Banana*
11	J	/ʒ/	*Jin / ʒin /* *Woman*	*Ḧejîr /hɜ:ʒi:r/* *Fig*	*Mĕwîj /mɜ:wi:ʒ/* *Raisons*

12	s	/s/	*Sĕv /sɜ:v/* *Apple* 	*Misask /misa:sik/* *Lollipop* 	*Miqes /miqæs/* *Scissors*
13	ş	/ʃ/	*Şe / ʃæ /* *Comb* 	*Pişîk /piʃì;k/* *Cat* 	*Reş /ræʃ /* *Black*
14	'	/ʕ/	*'ewir / ʕæwir /* *Cloud* 	*me'cîn /mæʕʤi:n /* *Toothpaste* 	*Ne'ne' /neʕneʕ/* *Mint*
15	ẍ	/ɣ/	*ẍaz /ɣa:z/* *Gas* 	*bebeẍa /bæbæɣa:/* *parrot* 	*qepaẍ /qæpa:ɣ/* *Lid*
16	f	/f/	*Fĕqî /fɜ:qi:/* *Fruits* 	*Befir /bæfir/* *Snow* 	*Kef /kæf/* *Foam/suds*
17	v	/v/	*Vayrus /vaɪrus/* *Virus*	*Hingivîn /hingivi:n/* *Honey*	*Av /a:v/* *Water*

18	q	/q/	*Qaz /qa:z/* *Swan* 	*Pirteqal /pirtæqa:l/* *Orange* 	*Beq /bæq/* *Frog*
19	k	/k/	*Kĕk /kɜ:k/* *Cake* 	*Piskĕt /pisket/* *Biscuits* 	*Ninok /ni:nuk/* *Nail*
20	g	/g/	*Giya /giya:/* *Grass* 	*Agir /a:gir/* *Fire* 	*Belg /bælig/* *Leave*
21	l	/l/	*Landk /landik/* *Kurdish baby cot /crib* 	*Filfil /filfil/* *Pepper* 	*Gul /gɔl/* *Flower*
22	m	/m/	*Mişk /miʃik/* *Mouse* 	*Şamîk / Şa:mi:k/* *Popcorn* 	*Zelam / zæla:m/* *man*
23	n	/n/	*Nan /nan/* *Bread*	*Pencer /pændʒær/* *Window*	*Didan /dida:n/* *Teeth*

24	h	/h/	*Hĕk /hɜ:k/* *Egg* 	*Bahîv /ba:hi:v/* *Almond* 	*Guh /gʊh/* *Ear*
25	w	/w/	*Were /wæræ/* *come* 	*Hewa /hæwa/* *Wind* 	*Dew /dæw/* *Doogh(Yogurt Drink)*
26	y	/j/	*Yarî /ja:ri:/* *Game* 	*Çiya / ʧija:/* *Mountain* 	
27	e	/æ /		*Dev /dæv/* *Mouth* 	
28	û	/u:/		*Sûr /su:r/* *Red*	

29	*o*	/o/		*Golup /gɔluʒ/* *bulb* 	
30	*î*	/i:/		*Şîr / /ʃ i:r/* *Milk* 	
31	*a*	/a/		*Mar /ma:r/* *Snake* 	
32	*ĕ*	/e/		*Mĕş /meʃ/* *Housefly* 	
33	*I*	/i/		*Dil /dil/* *Heart* 	
34	*u*	/u/		*Kur /kur/* *Boy* 	

Appendix 2: Jury Members

No	Name	Speciality	Academic Title	Affiliation
1	Dr. Asmaa Amin Hussein	Linguistics/Phonology	Lecturer	English Department /College of Languages /University of Duhok
2	Dr. Dilbreen Abdullah Ali	Linguistics/Morphosyntax	Assistant professor	Kurdish Department/University of Zakho

3	Dr. Nizar Ismat Ali	Psychological Counseling and Guidance	Lecturer	University of Zakho
4	Dr. Twana Saadi Hamid	Theoretical Linguistics /Phonology	Assistant Professor	University of Sulaimani
5	Dr. Saeed Adris Saeed	Linguistics	Assistant Professor	University of Duhok
6	Dr. Selwa Fariq Salih	Kurdish Phonology	Assistant Professor	Kurdish Department/ University of Zakho
7	Dr. Kusay Ahmed Ahmed	Phonetics and phonology	Associate professor	Nawroz University

اختبار النطق لأطفال ما قبل المدرسة في الكردية البهدينية

الملخص:

تُسجِّل اختبارات النطق كلام الأطفال ، وتتعرف عليه ، وتحلله ، وتُستخدم لتحديد الأصوات التي يمكن للأطفال نطقها أو لا يمكنهم نطقها ، أو ما إذا كانت النطق التي يصدرها الأطفال مناسبة من الناحية التنموية أو أن هناك تأخرفي النطق . الهدف الرئيسي من هذه الدراسة هو تطوير اختبار النطق بشكل خاص لأطفال ما قبل المدرسة فـى الكردية البهدينية حيث تم استخدام كلمات مألوفة وشفافة كمعيار مركزي لإنتاج الأصوات عند الأطفال الطبيعيـن فـى النمو. لهذا الغرض ، تم تصميم اختبار تسمية الصور لاستنباط استجابات تلقائية من كلمة واحدة تمثل 26 حرفًا ثابتًا في المواضع الأولية والوسطية والنهائية و 8 أحرف متحركة في مواضع وسطية. طُلب من سبعة خبراء في علم الأصوات وعلم النفس مراجعة الاختبار واستكمال استبيان. بعد ذلك، تم اجرا الاختبار على 65 طفل طبيعين من المتحدثى اللغة الكرديةالبهدىنيـه تم اختيارهم عشوائيًا من مراكز الرعاية النهارية ورياض الأطفال في زاخو. يـتكـون الأطفال من 38 ذكراً و 27 أنثى من ثلاث فئات عمرية مختلفة: 3 و 4 و 5 سنوات. تم تسجيل ردود الأطفال لكل نطق صحيح للكـلمات وتمبِيز الصورة. تم تحويل الاجابات الصحيحة إلى درجات ونسب مئوية. تظهر النتائج أنه لا توجد فروق ذات دلالة إحصائية بين ردود الخبراء التي تعكس موافقتهم على الاختبار ليكون أداة صالحة لجمع الجرد الصوتي للأطفال. هناك ارتباط كبير وعالي بين النطق الصحيح للكلمات وتعريف الصورة مما يثبت صحة محتوى الاختبار. أخيرًا ، لا توجد فروق ذات دلالة إحصائية بين الذكور والإناث مما يشير إلى أن الاختبار مناسب لكلا الجنسين ، بينما وُجدت فروق ذات دلالة إحصائية بين الفئات العمرية التي كان أداء الأطفال الأكبر سنًا فيها أفضل مما يشير إلى أن نظمهم الصوتية أكثر تطورًا. وبالتالي ، يعد الاختبار أداة صالحة وموثوقة يمكن تطبيقها لجمع الجرد الصوتي للأطفال الناطقين باللغة الكردية البهدىنيـه .

الكلمات الدالة: الكردية البهدينية ، النظام الصوتي الكردي ، اختبار النطق ، تطوير اللغة .

تاقیكرنا بلێڤكرنا دەنگان د كورديا بەهدینی دا بو زاروكێن پێش قوناغا قوتابخانی

پوختە:

تاقیكرنێن بلێڤكرنێ دهَینه بكارئینان بو توماركرن و شلوڤەكرنا ئاخفتنێ, هه ر وەسا بودەست نیشانكرنا وان دەنگان یێن كو زاروك یان نەشێن بێژن داكو بهَێته دیاركرن كا ئەو خەلەتێن دئاخفتنێ داهەین ب گەشەكرنا زاروكی ڤە د گرییاینه یان ژی دئاخفتنێ دا.ئارمانجا سەرەكی یا ڤێ خاندنێ دیزاینكرنا تاقیكرنا بلێڤكرنێ یه ب تایبەت بو زاروكێن بەهدین یێن پێش قوناغا قوتابخانی .دڤێ تاقیكرنێ دا ئەو پەیڤ هاتینه هەلبژارتن بو زاروكان دنیاس و ساناهی بن وەكی پیڤەرەكێ سەرەكی بوگوتنا فونیما دئاخفتنا وان دا .بوڤێ مه بەستێ تاقیكرنەكا   بناڤكرنا وێنەیان هاته دیزاینكرن بو وەرگرتنا بەرسڤێن زاروكا یێن دەستپێكێ یێن دەستپێكێ و بێ كاریگەری. تاقیكرن ژ 26پیتن نه بزوین كو ل دەستپیك و ناڤەراست و دوماهیا پەیڤاندا و هەروەسا 8 پیتێن بزوین كو ب تنێ ل ناڤەراستا پەیڤاندا پیك دهَبن.داخازی ژ حەفت بسپوران هاتیه كرن بو هەلسانگاندنا تاقیكرنێ و هەر وەسا بو پركرنا پرسیارنامەیەكێ پاشان بو ئەنجامدانا تاقیكرنێ 65 زاروكێن ئاسایی هاتینه هەلبژارتن .كو ژ38كور و 27كچان پیك دهات و ژیێن وان 3,4,5 سال بین . بەرسڤێن زاروكان هاتینه توماركرن و نمره كرن بو گوتنا دورست و نیاسینا وێنەیی .ئەنجامان داینه دیاركرن كو چ جیاوازیەكا گرنگ د بەرسڤێن وان بسپوراندا نەبین كو وێ چ هندێ ددەتەدیاركرن كو ئەڤ تاقیكرنه یا دورسته د ئاخفتنا زاروكان.هەروەسان پەیوەندییەكا گرنگ و بەرچاڤ دناڤبەرا گوتنا دورست و نیاسینا وێنەیاندا هەبوو كو ئەڤ چەنده راستیا ناڤەروكا تاقیكرنێ د سەلمینیت.دوماهیێ چ جوره جیاوازی دناڤبەرا هەردوو رەگەزاندا دیارنەبوو.ئەڤەژی وێ چەندێ دگەهینیت كو ئەڤ تاقیكرنه كو ئەڤ تاقیكرنه یا گونجایه بو هەردوو رەگەزا.ل دەمی كو جیاوازییێن گرنگ و بەرچاڤ دناڤبەرا هەرسێ گروپێن ژیی زاروكاندا هاتنه دیتن. كو زاروكێن مەزنتر باشتربون ژ یێن بچوكتر .ژبەرڤێ چەندێ ئەڤ تاقیكرنه ئامیرەكێ دروسته و جهێ باوەرییێ یه كو بهیته بكارئینان بو كومكرنا ئامارێن دەنگی د ئاخفتنا زاروكێن بەهدین دا.

پەیڤێن سەرەكی: كوردیا بەهدینی ,سستەمێ دەنگێت كوردی, تاقیكرنا بلێڤكرنێ,گەشەكرنا زمانی.