

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/350544494>

The development of phonological awareness among preschoolers

Article in *Early Child Development and Care* · April 2021

DOI: 10.1080/03004430.2019.1607320

CITATIONS

7

READS

1,729

4 authors:



Ahmed Hassan Hemdan Mohamed
United Arab Emirates University

78 PUBLICATIONS 498 CITATIONS

SEE PROFILE



Abdulhameed S. Hassan
Sultan Qaboos University

7 PUBLICATIONS 26 CITATIONS

SEE PROFILE



Ibrahim Alqaryouti
Sultan Qaboos University

123 PUBLICATIONS 421 CITATIONS

SEE PROFILE



Abdullah Alhashmi
Sultan Qaboos University

29 PUBLICATIONS 60 CITATIONS

SEE PROFILE



The development of phonological awareness among preschoolers

Ahmed Hassan Hemdan Mohamed , Abdulhameed Said Hassan , Ibrahim Al-Qaryouti , Abdullah Al-Hashimi & Zuwaina Al-Kalbani

To cite this article: Ahmed Hassan Hemdan Mohamed , Abdulhameed Said Hassan , Ibrahim Al-Qaryouti , Abdullah Al-Hashimi & Zuwaina Al-Kalbani (2021) The development of phonological awareness among preschoolers, Early Child Development and Care, 191:1, 108-122, DOI: [10.1080/03004430.2019.1607320](https://doi.org/10.1080/03004430.2019.1607320)

To link to this article: <https://doi.org/10.1080/03004430.2019.1607320>



Published online: 12 May 2019.



[Submit your article to this journal](#)



Article views: 314



[View related articles](#)




[View Crossmark data](#)



Citing articles: 1 [View citing articles](#)



The development of phonological awareness among preschoolers

Ahmed Hassan Hemdan Mohamed ^{a,b}, Abdulhameed Said Hassan^c, Ibrahim Al-Qaryouti^c, Abdullah Al-Hashimi^c and Zuwaina Al-Kalbani^d

^aCollege of Education, United Arab Emirates University, Al-Ain, UAE; ^bCollege of Kindergarten, Assiut University, Assiut, Egypt; ^cCollege of Education, Sultan Qaboos University, Muscat, Oman; ^dMinistry of Education, Oman

ABSTRACT

The phonological awareness (PA) skills represent a major milestone in the development of reading abilities for preschool children. The purpose of this research study was to examine the developmental trajectories of preschoolers' PA. A related purpose was to explore gender differences in PA. Participants in this study were 767 preschool children (336 males and 431 females) with 249 children in KG1 and 518 children in KG2. These children were randomly selected from a pool of 16 private preschools across the capital of Oman, Muscat. A battery of PA tasks were adapted from the Phonological Awareness Test-Second Edition (PAT-2; [Robertson, C., & Salter, W. (2007). *The phonological awareness test 2 (PAT 2)*. Austin, TX: PRO-ED.] and the Comprehensive Test of Phonological Processing – Second Edition (CTOPP-2; [Wagner, R., Torgesen, J., Rashotte, C., & Pearson, N. (2012). *Comprehensive test of phonological processing* (2nd ed.). Austin, TX: Pro-Ed.]). The PA tasks consisted of 19 subtests: rhyming discrimination, rhyming production, syllables segmentation, phoneme segmentation, isolation (first, medial, and last sound), compound words deletion and phonemes deletion, sound matching (first and last sound), blending words, memory for digits, nonword repetition, and blending nonwords. The results of the study using multi-variate analysis of variance (MANOVA) showed a significant main effect of the grade level, Wilks' lambda [$F(3,763) = 13.44$, $p < .001$, $\eta^2 = .29$, gender, $F(1,763) = 1.96$, $p < .001$, $\eta^2 = .06$], while the interaction (grade level X gender) was not significant.

ARTICLE HISTORY



Received 30 October 2018
Accepted 10 April 2019

KEYWORDS

Phonological awareness;
development; gender;
preschool

Phonological awareness

PA is defined as the sensitivity to the sounds of spoken language and the ability to work with those sounds (Goswami, 2000). It is a metalinguistic skill that refers to the ability to understand the phonological qualities and structure of words (Stackhouse & Wells, 1997). PA indicates that words consist of an array of different sound units. Large sound units refer to syllables, onsets, and rimes while small units refer to phonemes (International Reading Association, 1998). Despite differences in the nature of grapheme-phoneme relationships and orthographic representations across language, PA is an essential skill in language acquisition (Ziegler et al., 2010), grapheme-phoneme correspondence and word decoding (Lambrecht Smith, Scott, Roberts, & Locke, 2008). PA skills include the ability to detect similarities between words, the ability to manipulate words through blending and segmentation, and the ability to detect the parts of words such as phonemes and syllables (Alcock, Ngorosho, Deus, & Jukes, 2010). PA describes children's emerging sensitivity to the sublexical, segmental

CONTACT Ahmed Hassan Hemdan Mohamed  ahamdan@uaeu.ac.ae  Special Education Department, College of Education, United Arab Emirates University, PO Box 15551, Al-Ain, UAE

structure of the phonological component of language that includes sensitivity to larger and smaller units. (Justice, Bowles, & Skibbe, 2006).

One of the prominent theories about PA is the developmental progression theory which views PA as an essential element in the development of early literacy skills that consists of different tasks in various levels of development (Chard & Dickson, 1999; Treiman & Zukowski, 1996). To judge one's competency in PA tasks, there should be a continuum ranging from easy to more complex skills. The type of sound manipulation and the size of the unit determine the degree of difficulty in PA tasks. Tasks that assess phoneme discrimination are more demanding than word or syllable discrimination (Anthony & Lonigan, 2004).

Research studies have shown that there is a universal sequence in the development of PA (Durgunoglu & Oney, 1999; Goswami & East, 2000). This sequence starts with children's sensitivity to rhymes and syllables. Awareness of onset and rime comes next. At last, the awareness of the smallest units of speech (phonemes) develops (Goswami, 2002). Mesmer and Williams (2015) developed a model in which it starts with syllable awareness, then to letters and sounds, and lastly to concept of word.

Phonological awareness in Arabic language

Arabic is a Semitic language that has an abjad orthography depending mainly on consonants. Three long vowels (a:, u:, and i:) and all consonants are represented in the orthography. Short vowels are optional and are characterized by additional diacritic-like vowel signs which are used in resources for young children who learn to read until grade 5 (Abu-Rabia & Siegel, 2002). Another characteristic of Arabic orthography is the mandatory connecting of some letters based on their positions in words. Such connections produce Arabic orthography as the same letter alters its shape based on its position in the word (Tibi & Kirby, 2018). Arabic language has a diglossic nature in that there is a linguistic difference between its spoken and written form. This difference is evident in the Arabic language vocabulary, morphology, and phonology. Modern Standard Arabic (MSA) and Spoken Arabic (SA) are different according to their phonemic nature (Saiegh-Haddad, Levin, Hende, & Ziv, 2011). Arabic is different from other languages in that formal exposure to MSA befalls prior to the start of formal school (Hudson, 2002). Arab preschoolers and first graders showed difficulty in phonemic segmentation of MSA structures (Saiegh-Haddad, 2004, 2007).

The Arabic phonological awareness is different from other languages because of its specific nature of the Arabic phonological and orthographic systems. Arabic language is phonemic; consisting of consonants and an exception of three letters used as both long vowels and diphthongs (Levin, Saiegh-Haddad, Hende, & Ziv, 2008). In non-vocalized texts, short vowels are neglected (Abu-Rabia, 1999). Arabic words are usually written in a cursive script with the shape of the letter or grapheme may be changed according to its position in the word (initial, medial, or final). Arabic letters are different from each other depending on the number and position of the dots that appear below or above the letter (Abu-Rabia & Taha, 2004).

Children start learning the sound structure of language and develop essential PA skills during preschool (Pullen & Justice, 2003). There is a relationship between PA and early literacy acquisition (Wendy, 2007). Children's awareness of rhyming words starts approximately at 3 years of age (Lonigan, Burgess, & Anthony, 2000). There is a significant relationship between children's awareness of nursery rhymes and subsequent readings skills (Bryant, MacLean, Bradley, & Crossland, 1990). Alliteration, the ability to identify words starting with the same phoneme, is another skill that emerges during preschool following rhyming skills (Anthony & Lonigan, 2004). Phonemic segmentation is considered the most difficult task and about 20% of children cannot accomplish segmentation tasks by grade 1 without supervision or instruction (Troia, Roth, & Graham, 1998).

Abou-Elsaad, Ali, and Abd El-Hamid (2016) explored Arabic PA skills and their relationship to word reading abilities in 80 Egyptian Arabic-speaking children aged 5–8 years old. They found developmental patterns of Arabic PA. Kim, Petscher, Foorman, and Zhou (2010) explored the letter-sound

knowledge as a function of letter-name knowledge, PA, and letter characteristics in 653 English-speaking kindergarten children. They found that PA had a noteworthy influence on letter-sound knowledge. Tibi (2010) examined some phonological awareness tasks in Arabic-speaking children and found that the identification of the initial sound in the word and rhyme oddity were fairly easier than syllable detection and phone segmentation. This result corroborates what Adams (1990) found as children acquire larger units (syllables) earlier than smaller units. Saeigh-Haddad (2003) investigated the PA skills of 23 kindergarteners and 42 first graders on two phonemic awareness tasks and concluded that first graders' PA was better than kindergarteners'. Also, they found that phoneme isolation was more difficult in MSA than spoken dialect and that final phoneme isolation was easier than initial phoneme isolation. Duranovic, Huseinbasic, and Tinjak (2012) examined the phonological discrimination, rhyme, initial phoneme detection and letter knowledge in 505 preschool children. The results showed that there was a developmental trend in PA and letter knowledge. López (2012) examined the developmental progression of PA in 241 Spanish-English bilingual preschoolers. She found a developmental progression by language and change in performance across language when children go to school.

Gender differences in PA

PA development depends on the tacit phonological representations originated from the natural phonological development (Hulme, Snowling, Caravolas, & Carroll, 2005). The topic of gender differences in verbal and reading abilities has received considerable attention in the field. However, no consistent findings were found. Hyde and Linn (1988) concluded that gender differences no longer exist. However, Machin and Pekkarinen (2008) stated that females outperformed males in reading. Moura, Mezzomo, and Cielo (2009) examined gender differences in phonemic awareness and found that females were better than males in most of the tasks. Below, Skinner, Fearington, and Sorrell (2010) reported a relationship between gender differences in PA and gender differences in reading ability. Cormier and Dea (1997) found an advantage for females whereas Hecht and Greenfield (2002) did not find such differences. Most of the research conducted on the development of PA in preschoolers was done in English.

Teaching phonological awareness to preschoolers in Oman

The following is a short description of teaching PA in preschool in the Child Care Center run by the only public university in the country, Sultan Qaboos University where the researchers received the funding to conduct this study. All of the sounds are taught with a reference word. Objects are placed alongside their equivalent picture and the child is initially taught this vocabulary. For example, the reference words for the first list are as follows: sun, moon, ball, hand, tiger, rock, fish, cat, watch, pin, leaf, and juice. Once the child has mastered the vocabulary, he or she is asked to extract the initial sound (and occasionally medial or final sound) of each word. Sometimes, it is necessary to emphasize the initial sound to aid this process. The pictures are replaced by sound lower case letter symbols and the child is asked to point to the object and name it and then to the letter sound and to say it, for example, 'sun', 's'. Only lower case letter symbols are introduced initially and only letter sounds, not names. The objects and sounds are placed in the order specified above until the first batch has been mastered. The objects are then removed and the child is required to remember the reference word and to say it and then point to the lower case letter symbol and to articulate it.

At this point, the sounds are still in the order they were introduced. Upon mastery, they are then provided with the sounds in random order. The child has to match each object to the relevant letter symbol. The objects are then removed and the child is provided with each letter symbol. The child must state the reference word and articulate the sound and trace the letter symbol with his or her finger. Tracing the sound is a pre-writing skill. It must be performed with the correct stroking

order. Once the child has demonstrated that he/she knows each sound and its reference word and is able to trace each letter correctly, they move onto the next batch of sounds. As a preliminary activity, it is advised that children are exposed to a range of sounds which they are then asked to identify by indicating the correct picture to match each sound. Examples include a bouncing ball, an airplane, and a fire engine. This is to ensure that the child is aware of what constitutes a sound before being asked to isolate sounds in speech. After introducing the concept of rhyming words through various examples, the child is provided with two cards. One has a picture of a bee and the other has a picture of a hat. The child is then provided with a range of objects which should be sorted according to the rhyming sound. The objects provided are as follows: tree, three, bat, key, cat, and rat. An example is done with the child initially to ensure understanding. In the Rhyming Objects Box 1 activity, the child is provided with sixteen objects which constitute eight rhyming pairs. The objects are placed in a single vertical line. The first is then placed alongside the second and the names of the two objects are articulated to ascertain whether they are rhyming words or non-rhyming words. When a match is found, the object is left placed alongside its rhyming pair until all eight pairs are discovered. In the rhyming objects box activity 2, the box contains extra sixteen objects to match in a similar manner. It contains rhymes that are more difficult than those found in the first box. The rhyming cards activity contains 24 pairs of rhyming words. Each pair fits together when a match is found. This mechanism allows the child to find their own mistakes should they have any. The sheer number of rhymes along with the move from three dimensional objects to picture cards places this activity at this point in the sequence. The rhyming objects to pictures and words activity contains two sets of cards and ten objects, each with the same activity structure. This activity is to be undertaken once the child has begun reading in the English classroom and is able to put letter sounds together to read words. The child is required to read each word with its picture cue and then to find the two objects to match the words with the same rhyming pattern. The purpose of this activity is to teach the child to recognize rhyming patterns within written words. Rhyming is also taught incidentally within the classroom when stories and songs or rhymes contain them. Children are asked to predict words based upon a rhyming pattern (Child Care Center, 2018).

Rational for the study

Preschool is not yet listed in the basic education system in the Ministry of Education (MOE) in Oman. Mostly, children go to private (bilingual) or international schools to access preschool education. Curriculum in these schools is different and it does not follow unified standards. Some private schools are affiliated to certain nationalities or communities (India, Egyptian, and etc.). In these private and international schools, children join two levels, KG1 and KG2. These schools usually accept children starting from three or four to six years old. The MOE supervises these schools via the department of Private Education. Supervisors from this department conduct regular visits to these schools to monitor teaching and evaluate teachers. Sometimes, training workshops are organized for teachers in these schools. Teachers working in these schools have credentials ranging from high school to university degrees. Although there is an early childhood department at the main public university in the country, Sultan Qaboos University, graduates generally do not find employment opportunities because the preschool is not available in general education classrooms. Numbers of children in preschool classrooms range from 13 to 25 children with one teacher working with them. The classrooms are usually equipped with sufficient learning resources and centres in addition to playgrounds or play courts.

This study is important for several reasons. The study of phonological awareness of preschool children is vital as it is closely related to emergent literacy. Despite increasing awareness of the importance of the role of PA in the development of reading, less is currently known about the PA skills of Omani preschoolers. Up to the knowledge of the researchers in this study, very few research studies about phonological awareness of Omani preschoolers have been published in the Arabic region.

Moreover, no cited studies about PA in Omani preschoolers exist in international journals. As preschool is not yet listed as a stage in basic education in the country, more studies are needed to alienate the PA skills of preschoolers in Oman. The purpose of this study was to explore the developmental trend in preschoolers' PA. A related purpose was to explore the gender differences in PA.

Method

Participants

Participants in this study were 767 preschool children (336 males and 431 females) with 249 children in KG1 and 518 children in KG2. These children were randomly selected from a pool of 16 private preschools across the capital of Oman, Muscat. Mean ages for KG1 children ranged from 45 to 58 months ($M = 51.5$, $SD = 2.6$) and KG2 children from 62 to 71 months ($M = 66$, $SD = 2.5$). The average classroom size of preschools is around 25 children. Most of the children in these classrooms were Omani and some children came from other Arab countries such as Egypt, Iraq, Jordan, Sudan, Tunisia, and etc. Children generally came from middle-class families with a medium socioeconomic status. Children's IQs were assessed using the Raven's Colored Progressive Matrices (RCPM) and ranged from 95 to 130 with an average IQ of 110 and a standard deviation of 16.23.

Instruments

The subtests included in the PA test in this study were mainly drawn from two well-known tests in the field. These tests are the Phonological Awareness Test- Second Edition (PAT-2) and the Comprehensive Test of Phonological Processing- Second Edition (CTOPP- 2). The following is a description of the subtests included in the PA test used in this study.

The Phonological Awareness Test-Second Edition (PAT-2; Robertson & Salter, 2007). The PAT-2 is individually administered. The test is developed to evaluate phonological processing deficits and phone-grapheme correspondence. The test has a broad range of tasks that are related to success in early reading and spelling such as rhyming, segmentation, isolation, deletion, substitution, and blending (Robertson & Salter, 2007). The first part consists of the rhyming subtest that consists of discrimination and production tasks. The discrimination tasks evaluates the children's ability to recognize words presented in pairs. The production task evaluates children's ability to produce a rhyming word when they are given a stimulus word. In this study, 10 pairs of words constitute the discrimination task and 10 words constitute the production task. The second part consists of the segmentation subtest that is comprised of segmentation of sentences, syllables, and phonemes. The sentences segmentation requires that the children to divide 10 sentences into their essential words. The syllables segmentations subtest requires that the children divide 10 words into syllables. The phonemes segmentation subtest evaluates the children's ability to segment 10 words by phoneme or sound. The third part of the PA test is the isolation subtest that consists of three tasks: initial, final, and medial. In the initial task, children are required to recognize the first phoneme in 10 words. In the final isolation task, children are required to recognize the last phoneme in 10 words. In the medial isolation task, children are required to recognize the middle phoneme in 10 words. The fourth subtest consists of the deletion subtest that is comprised of two tasks: compounds and syllables and phonemes. In the compounds and syllables task, children are required to say 10 words and repeat them while deleting one syllable in each of these words. The phonemes task requires that the children say 10 words and then repeats them with deleting a sound or a phoneme in each word. The fifth subtest consists of the substitution subtest that is comprised of substitution with manipulatives. In this task, children are required to manipulate colored blocks to represent phonemes, separate or isolate a phone in 10 words, and then changes these sounds or phonemes to constitute new words. The sixth task consists of the blending subtest that is comprised of two tasks: the syllables and

phonemes. The syllables task requires that children blend syllables together to constitute 10 words given that children are given individual syllables. The phonemes task requires that children blends phonemes together to constitute a word when children are given individual phonemes. For all subtests from the PAT-2, the child gets one point for the correct answer and 0 point for the wrong answer.

The Comprehensive Test of Phonological Processing – Second Edition (CTOPP-2; Wagner, Torgesen, Rashotte, & Pearson, 2012). The CTOPP-2 assesses phonological processing abilities. From the phonological processing part of the CTOPP-2, the researcher used the sound matching, blending words, and blending non-words subtests. The sound matching subtest consists of 25 items that assess children's ability to match sounds. The subtest is divided into two sections. The first section has 13 items where the examiner says a word, pauses, and then says three more words while pointing to pictures or drawings that represent the four pictures and children are required to recognize the picture that matches the word starting with the same sound provided by the examiner. The second section of the subtests consists of 12 items where the children are required to recognize the picture that matches the word ending with the same last sound provided by the examiner. In this subtest, the examiner uses a picture booklet that comprises all the pictures in the subtest. The blending words subtest consists of 24 items that evaluate the children's ability to blend or combine sounds to constitute words. The child listens to audio-recorded individual sounds and then is required to combine or blend the separate sounds together to form a complete word. The blending of non-words consisted of 26 items that evaluate children's ability to blend speech sounds to make nonwords. The child listens to a series of audio-recorded separate sounds and is then required to combine or blend these individual sounds together to constitute a nonword. From the phonological memory part of the CTOPP-2, the researcher selected the memory for digits and nonword repetition subtests. The memory for digits subtest consisted of 28 items that evaluate the child's ability to repeat a series of numbers that range from two to eight digits. The child first listens to a series of audio-recorded numbers presented to by the examiner at a rate of one number per second, he/she is required to repeat the numbers in the same way he/she heard. The nonwords repetition subtest consists of 20 items that evaluate the children's ability to repeat nonwords ranging from 3 to 7 sounds. The child is required to listen to a series of an audio-recorded made-up words and repeat them accurately as he/she head them.

The researchers in this study developed a pool of appropriate linguistic units to use in the subtests adapted from both the CTOPP-2 and PAT-2. These words, pairs of words, syllables, sentences, phonemes, compound words, sounds, and nonwords were shown to experts in Arabic language who judged different word forms and selected the appropriate ones for preschoolers. The experts recommended using MSA words to eliminate any cultural bias that might exists among different nationalities in the classroom. The experts also recommended the final list of words that avoids any dialect differences among diverse students in the classroom. This pool of words was piloted on four preschool classrooms (2 KG1 classrooms and 2 KG2 classrooms). Teachers of these classrooms were asked to evaluate the preciseness of these words, syllables, sounds, sentences, and etc., and whether children in their classrooms understood the meaning of these words and sentences. The words, sounds, or sentences that were difficult for the preschoolers were taken out and replaced by others that make sense to the children. Also, all the pictures used in the PA tasks were piloted using one KG1 classroom and one KG2 classroom to make sure children understand these pictures. The audio-recorded sound files in some subtests were also piloted to make sure that the audio content is understandable. All the piloting of the subtest items were conducted in preschools other than those used in the main data collection. The content validity of the PA test was explored by consulting a group of 11 faculty members in teaching Arabic, early childhood teachers, school teachers, and supervisors whose major is teaching Arabic. These experts were asked to check the wording of all the test items and whether any subtest needs any kind of change. A few rewording issues have been resolved and the revised test was shown again to the experts who approved the changes. The reliability values using Cronbach's Alpha for all the PA subtests were acceptable. The reliability values are shown in [Table 1](#). To examine the criterion-related validity of the PA subtests,

Table 1. Reliability values of the PA subtests using Cronbach's Alpha.

Subtest	Reliability	Subtest	Reliability
Rhyming (discrimination)	0.72	Blending (phonemes)	0.92
Rhyming (production)	0.91	Sound matching (first)	0.94
Segmentation (sentences)	0.82	Sound matching (last)	0.93
Segmentation (syllables)	0.85	Blending words	0.97
Segmentation (phonemes)	0.89	Memory for digits	0.91
Isolation (initial)	0.91	Nonword repetition	0.95
Isolation (Final)	0.92	Blending nonwords	0.93
Isolation (Medial)	0.90		
Deletion (compounds and syllables)	0.92		
Deletion (phonemes)	0.92		
Substitution with manipulatives	0.91		
Blending (syllables)	0.91		

they were correlated to teachers' ratings of early literacy using Preschool Literacy Practices Checklist (PLPC; Burgess, Lundgren, Lloyd, & Pianta, 2001). Statements in the PLPC consist of three sections: the first is a background and children's characteristics and the second is about classroom environment characteristics. The third part, approach to learning, consists of four sub-elements: description of literacy philosophy, teachers' beliefs about teaching literacy, actual literacy practices in the classroom, and parents' involvement. The checklist uses a Likert-type rating that consists of four ratings that range from not important (0) to necessary (3). Classroom teachers responded to this checklist. There was a significant correlation that ranged from 0.62–0.87 ($p < 0.01$) between the PA subtests and teachers' ratings of literacy practices in their classrooms.

Procedure

The researchers contacted the Technical Office for Studies and Development (TOSD) at the Ministry of Education to take permission to administer the phonological awareness test on preschools in Muscat governorate. After getting the TOSD permission, the researchers started contacting the private schools who were randomly selected to collect the data and to see how many classrooms from KG1 and KG2 will be selected. At the same time, 10 research assistants were recruited to administer the PA test on preschoolers. These research assistants were female supervisors affiliated to the Directorate of Pre-Basic Education (i.e. preschool education in Oman). These female supervisors usually visit preschool classrooms and monitor the instructional process there. They had enough teaching and supervision experience of at least 10 years in preschool education. For the purpose of data collection in this study, these supervisors received a two-day training in which the researchers informed them about the contents of the subtests, instructions, and preparations for administering the test in a secure and reliable method. The supervisors were trained to follow the subtests instructions literally. Also, they were briefed about the toys used in the substitution subtest in which the children used colored blocks to represent phonemes. They also saw the picture books that contained the pictures and activities related to the phonological processing subtests. They also listened to the audio-recorded files related to some of the subtests and made sure they make sense of phonemes, sounds, words, nonwords, and sentences in these recordings. After consenting children's parents in the selected classrooms across the schools participating in the study, the research assistants started the administration of the PA tests. The administration of the test took one month and a half.

Results

To analyze changes in PA tasks, a two-way multivariate analysis of variance (MANOVA) was conducted. The use of MANOVA allowed to control for type I errors. The independent variables were gender and grade level and the dependent variables were the PA subtests. Means, standard deviations, F values, and eta squared values are shown in Table 2. Results showed a significant main

Table 2. Means, standard deviations, and *F* values, of gender and grade level across the PA subtest.

Subtest	KG1				KG2				F Gender	η^2	F Level	η^2
	Male		Female		Male		Female					
	M	SD	M	SD	M	SD	M	SD				
Rhyming (discrimination)	7.24	1.97	7.41	1.85	7.57	2.26	8.01	1.95	3.71*	.06	8.44**	.01
Rhyming (production)	3.52	2.39	3.86	2.44	4.03	2.78	4.13	2.52	1.23	.002	3.71*	.01
Segmentation (sentences)	7.49	2.63	7.72	2.88	8.22	1.92	8.39	1.94	2.21	.003	19.32**	.03
Segmentation (syllables)	7.31	2.73	6.66	3.09	7.48	2.34	7.70	2.34	0.49	.001	12.20**	.02
Segmentation (phonemes)	6.90	2.58	7.06	2.42	7.70	1.99	8.29	1.70	5.63*	.01	40.43**	.05
Isolation (first)	7.71	2.59	8.18	2.53	8.84	2.16	9.36	1.45	9.45**	.01	51.99**	.10
Isolation (last)	6.38	2.89	7.84	2.36	7.48	2.63	8.17	2.35	0.68	0.01	64.31**	.10
Isolation (middle)	5.74	2.38	5.23	2.67	7.11	2.58	7.31	2.47	0.31	.001	73.33**	.10
Deletion (compounds)	7.72	2.64	7.51	2.65	8.37	1.90	8.48	2.18	0.08	0.01	21.48**	.03

*Significant at the 0.05 level.

**Significant at the 0.01 level.

effect of the grade level, Wilks' lambda [$F(3,763) = 13.44, p < .001, \eta^2 = .29$, gender, $F(1,763) = 1.96, p < .001, \eta^2 = .06$], while the interaction (grade level X gender) was not significant. The between-subjects tests indicated that females outperformed males in both KG1 and KG2 in rhyming (discrimination), $F(1,763) = 3.71, p < .05, \eta^2 = .06$, segmentation (phonemes), $F(1,763) = 5.63, p < .05, \eta^2 = .01$, isolation (first), $F(1,763) = 9.45, p < .001, \eta^2 = .01$, substitution with manipulatives, $F(1,763) = 3.70, p < .05, \eta^2 = .01$, and blending phonemes, $F(1,763) = 3.88, p < .05, \eta^2 = .01$. Overall, females' performance on these tasks was significantly higher than males' in both KG1 and KG2. From [Figure 1](#), there is a trend of females' superiority over males. The eta squared values showed small to medium effect size.

Also, the between-subjects tests indicated that a developmental progression of PA tasks across grade levels except for the syllables blending, nonword repetition, and blending nonwords. Means, standard deviations, *F* values, and eta squared values are shown in [Table 3](#). Overall, KG2 male and female students outperformed their counter peers in KG1 in rhyming (discrimination), $F(1,763) = 8.44, p < .001, \eta^2 = .01$, rhyming (production), $F(1,763) = 3.71, p < .05, \eta^2 = .01$, segmentation (sentences), $F(1,763) = 19.32, p < .001, \eta^2 = .03$, segmentation (syllables), $F(1,763) = 12.20, p < .001, \eta^2 = .02$, segmentation (phonemes), $F(1,763) = 40.43, p < .001, \eta^2 = .05$, isolation first, $F(1,763) = 51.99, p < .001, \eta^2 = .10$, isolation (last), $F(1,763) = 64.31, p < .001, \eta^2 = .10$, isolation (middle), $F(1,763) = 73.33, p < .001, \eta^2 = .10$, deletion (compound), $F(1,763) = 21.48, p < .001, \eta^2 = .03$, deletion (phonemes), $F(1,763) = 27.63, p < .001, \eta^2 = .04$, substitution with manipulatives, $F(1,763) = 130.04, p < .001, \eta^2 = .15$, blending (phonemes), $F(1,763) = 8.26, p < .001, \eta^2 = .01$, sound matching (first), $F(1,763) = 50.75, p < .001, \eta^2 = .06$, sound matching (last), $F(1,763) = 10.92, p < .001, \eta^2 = .01$, blending words, $F(1,763) = 23.31, p < .001, \eta^2 = .03$, and memory for digits, $F(1,763) = 41.04, p < .001, \eta^2 = .05$. The eta squared values showed medium to large effect size.

Discussion

In this study, we explored the developmental trend in preschoolers' PA. Also, we examined the gender differences in PA. This is considered the first research study that examines the development of PA in preschool children in Oman. We found evidence of PA developmental trajectories in most of the subtests except for the syllables blending, nonword repetition, and blending nonwords. Overall, it can be concluded that a developmental trend was clear in the performance of preschool children in Oman.

A number of advantages should be noted for this study. It is considered the first research study in Oman to study the PA development in preschoolers using a plentiful of PA tasks. Second, the number of participants was reasonable and represented a satisfactory representation of diverse preschool children in the county. Third, the PA tasks in this study encompassed various PA skills that covered phonological ability and phonological memory.

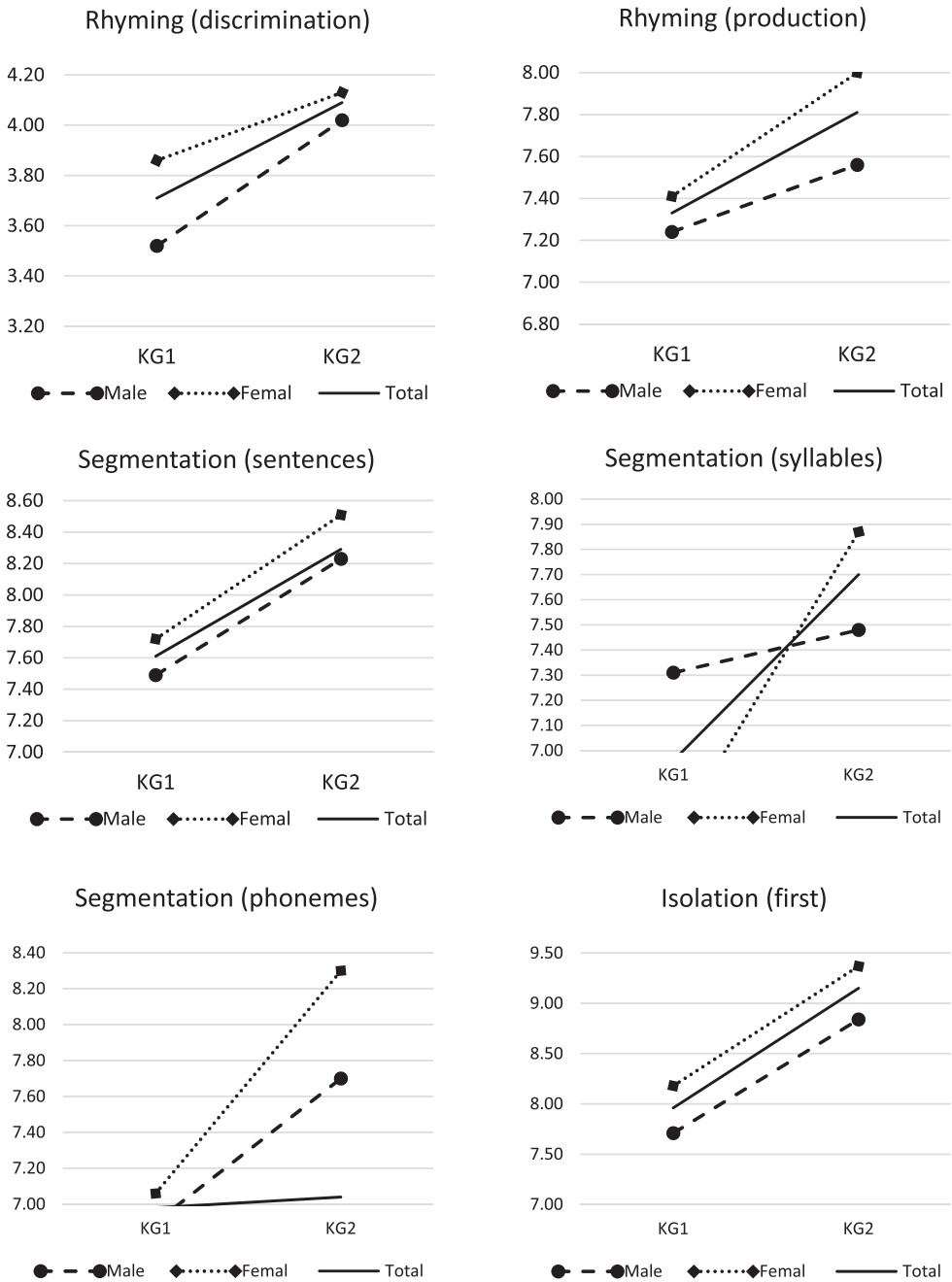


Figure 1. Charts representing the study participants' scores on the 19 PA subtests.

The results of this study support what Lonigan, Burgess, Anthony, and Barker (1998) found in that as children developed, their phonological sensitivity increased and became more stable. Also, McDowell, Lonigan, and Goldstein (2007) concluded that age predicted children's (aged 2–5 years old) PA. Also, Duranovic et al. (2012) concluded that children's PA and letter knowledge increased with age.

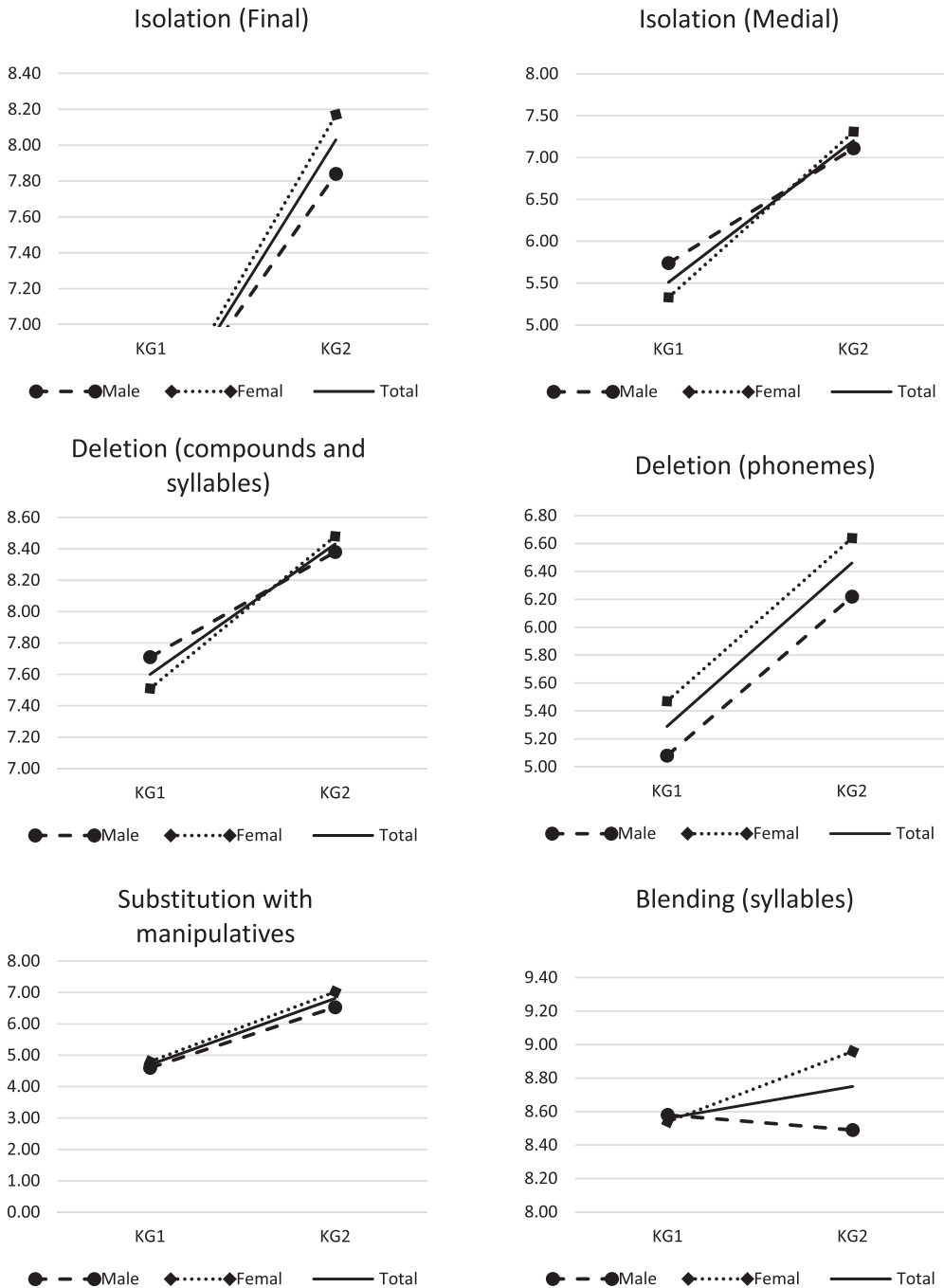


Figure 1. Continued

Some subtests were difficult for children as evident in their subtests scores. For example, the rhyming (production) subtest's means were lower than 5 for all children, although there was a developmental trend in children's scores as there was a significant difference in favour of KG2 children. No significant differences were detected between males and females. The highest mean obtained was that of KG2 females ($M = 4.13$). This is similar to what Duranovic et al. (2012) found

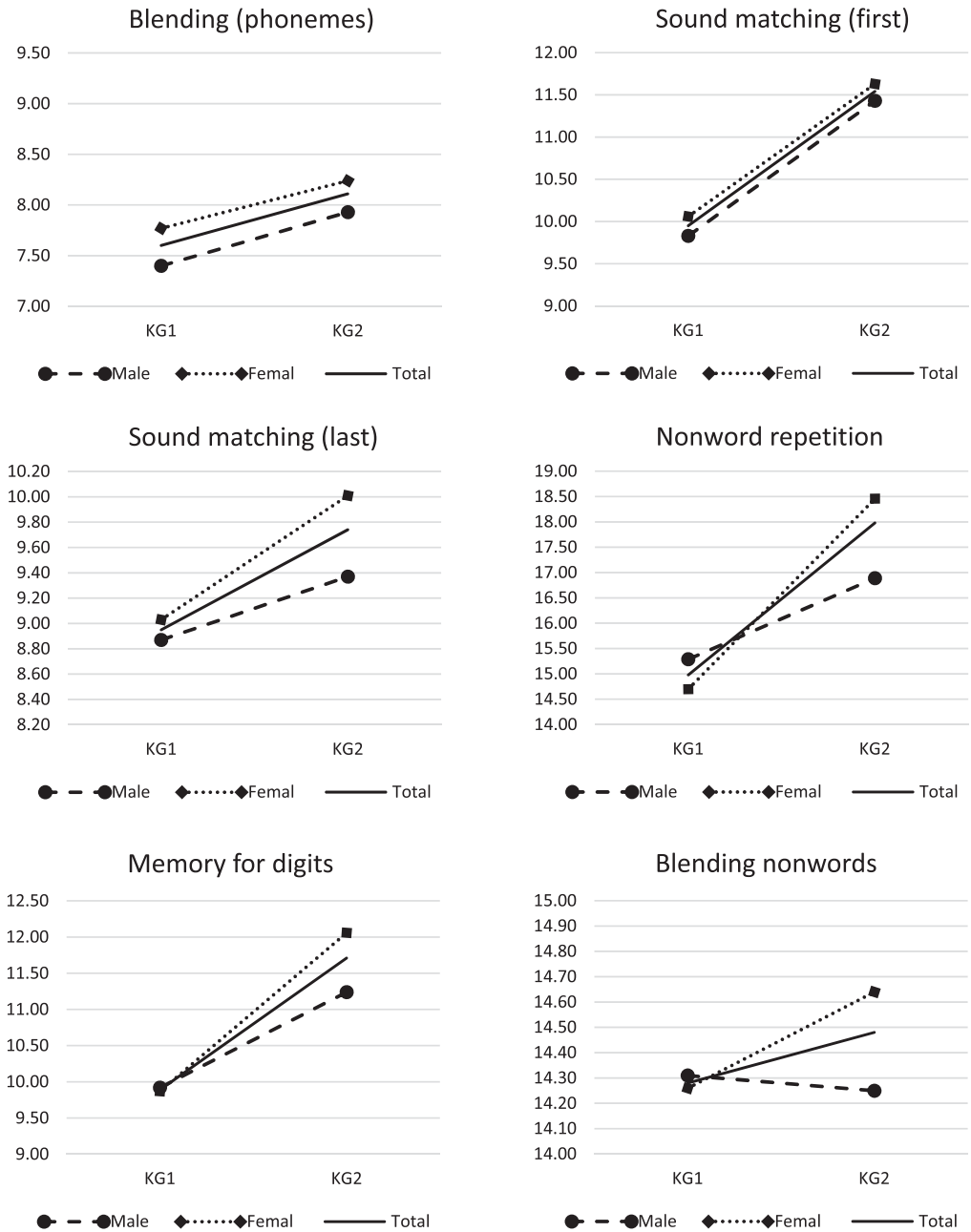


Figure 1. Continued

in their study. This might be logical in that the progression of PA in early years starts from syllable awareness, onsets and rhymes awareness, and PA awareness (Goswami & Bryant, 1990). PA develops in a continuum that ranges from manipulation of syllables toward manipulating phonemes (Wendy, 2007). There is an evidence that children’s rhyming skills develop earlier than their phoneme skills (Carroll, Snowling, Hulme, & Stevenson, 2003). This result is consistent with what Pullen and Justice (2003) recommended that when teaching rhyming should begin with easier tasks such as rhyme discrimination and gradually move to more difficult tasks of rhyme production

Blending nonwords

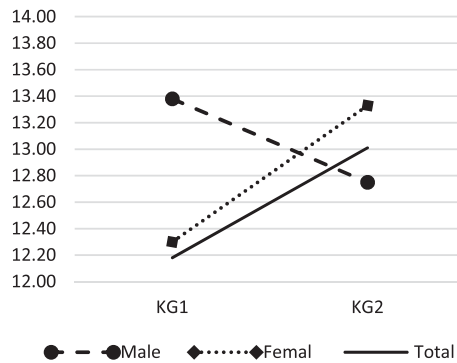


Figure 1. Continued

Table 3. Means, standard deviations, and *F* values, of gender and grade level across the PA subtest.

Subtest	KG1				KG2				F Gender	η^2	F Level	η^2
	Male		Female		Male		Female					
	M	SD	M	SD	M	SD	M	SD				
Deletion (phonemes)	5.08	2.73	5.47	2.69	6.22	2.86	6.64	2.90	.07	.01	27.63**	.04
Substitution with manipulatives	4.59	1.82	4.84	1.63	6.53	2.61	7.03	2.58	3.70*	.01	130.04**	.15
Blending (syllables)	8.57	1.94	8.54	2.09	8.49	2.17	8.95	1.88	1.95	.01	1.05	.01
Blending (phonemes)	7.40	2.42	7.77	2.09	7.93	2.34	8.24	2.16	3.88*	.01	8.26**	.01
Sound matching (first)	9.84	3.78	10.07	3.78	11.43	2.26	11.63	2.31	.95	.01	50.75**	.06
Sound matching (last)	8.87	3.27	9.03	2.90	9.37	3.01	10.01	2.62	3.08	.01	10.92**	.01
Blending words	15.29	7.63	14.69	7.01	16.89	7.31	18.47	6.93	.78	.01	23.31**	.03
Memory for digits	9.92	3.69	9.87	3.37	11.24	3.46	12.06	3.60	1.96	.01	41.04**	.05
Nonword repetition	14.31	5.33	14.26	5.14	14.25	5.14	14.64	5.01	.19	.01	.17	.01
Blending nonwords	13.39	7.52	12.31	6.86	12.75	6.67	13.33	7.14	.21	.01	.13	.01

*Significant at the 0.05 level.

**Significant at the 0.01 level.

or generation. This can be interpretation of children's low scores in the rhyming production tasks. Looking at children's scores in the rhyming discrimination subtest in this study shows that they did not have difficulty in dealing with the pairs of words they were presented. For the rhyming discrimination task, there was significant gender and developmental differences as females were generally better than males with KG2 females scoring the highest. This result is also consistent with what Nicolson and Fawcett (2004) found that large differences in rhyming detection exist among preschoolers.

Another difficult task for the children is substitution with manipulatives. The researcher assistants who administered this subtest reported that children in KG1 had difficulty in understanding the instructions of the test although the assistants spent a considerable time in visually demonstrating how to manipulate the cubes used in replacing the sounds in the words. However, there was a significant difference in both gender and developmental level in this subtest.

The overall trend of gender differences in PA in this study was that females outperformed males in all of the subtests. Lundberg, Larsman, and Strid (2012) studied the development of PA in preschoolers and found a clear gender effect. They concluded that this clear advantage could be attributed to females' early stimulation of language functions. Sherman (1978) pointed to the Big Twig hypothesis that 'as the twig is bent, so the three will grow' as females start their life with a small advantage in verbal ability while males shows superiority in spatial ability. These differences might lead to different

orientations of both sexes in interacting with the environment. Females usually prefer verbal and social interaction while males prefer physical manipulation of objects. This leads to widening the gap between males and females in verbal and spatial abilities.

Conclusion

Some conclusions can be drawn from this study. First, the findings are generally consistent with existing research in the field of PA in preschool children. The study found a consistent developmental trajectory in most of the PA tasks in favour of KG2 children. Also, females outperformed males in some PA subtests. There is a need to train preschoolers on PA tasks in order to rule out challenges that they might encounter when they access formal schooling.

Limitations

This study has some limitations. The main limitation is that the sample was drawn from Muscat, the capital of Oman. Different dialects of Arabic language are spoken in Oman. Generally, MSA is used in preschools. However, in other areas in the country there are different dialects in some governorates. Children belonging to families speaking in these dialects might have difficulty understanding MSA. Since the PA subtests used in this study were written in MSA, it is not easy for preschool children speaking in different dialects to fully understand the content. Therefore, the content of the PA subtests should be used with caution with other preschoolers whose dialect is not colloquial Arabic or those who struggle in understanding MSA. Also, the results of this study should be interpreted with caution as it just represents one governorate in the country. However, Muscat is considered the biggest in the country in terms of population and the largest in the cultural and indigenous representation of spoken dialects.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This research was funded by an internal research grant from Sultan Qaboos University (IG/EDU/PSYC/14/01).

Notes on contributors

Dr. Ahmed Hassan Hemdan Mohamed is an associate professor at the Special Education Department, College of Education, United Arab Emirates University, UAE. His research interests include special education and early childhood.

Dr. Abdulhameed Said Hassan is an associate professor at the Psychology Department, College of Education, Sultan Qaboos University, Oman. His research interests include measurement and evaluation.

Dr. Ibrahim Al-Qaryouti is an associate professor at the Early Childhood Education Department, College of Education, Sultan Qaboos University, Oman. His research interests include special education and early child education.

Dr. Abullah Al-Hashemi is an associate professor at the College of Sharia Sciences in Muscat, Oman. His research interests include Islamic sciences.

Dr. Zuwaina Al-Kalbani is an educational expert at the Ministry of Education, Oman. Her research interests include language learning.

ORCID

Ahmed Hassan Hemdan Mohamed  <http://orcid.org/0000-0002-8225-2310>

References

- Abou-Elsaad, T., Ali, R., & Abd El-Hamid, H. (2016). Assessment of Arabic phonological awareness and its relation to word reading ability. *Logopedics Phoniatrics Vocology, 41*(4), 174–180. doi:10.3109/14015439.2015.1088062
- Abu-Rabia, S. (1999). The effect of Arabic vowels on the reading comprehension of second- and sixth-grade native Arab children. *Journal of Psycholinguistic Research, 28*(1), 93–101. doi.org/10.1023/A:1023291620997
- Abu-Rabia, S., & Siegel, L. (2002). Reading, syntactic, orthographic, and working memory skills of bilingual Arabic- English speaking Canadian children. *Journal of Psycholinguistic Research, 31*, 661–678. doi:10.1023/a:1021221206119.
- Abu-Rabia, S., & Taha, H. (2004). Reading and spelling error analysis of native. *Reading and Writing, 17*(7-8), 651–690. doi.org/10.1007/s11145-004-2657-x
- Adams, M. (1990). *Beginning to read: Thinking and learning about print*. Cambridge, MA: MIT Press.
- Alcock, K. J., Ngorosho, D., Deus, C., & Jukes, M. C. H. (2010). We don't have language at our house: Disentangling the relationship between phonological awareness, schooling, and literacy. *British Journal of Educational Psychology, 80* (1), 55–76. doi:10.1348/000709909X424411
- Anthony, J. L., & Lonigan, C. J. (2004). The nature of phonological awareness: Converging evidence from four studies of preschool and early grade school children. *Journal of Educational Psychology, 96*, 43–55. doi:10.1037=0022-0663.96.1.43.
- Below, J. L., Skinner, C. H., Fearington, J. Y., & Sorrell, C. A. (2010). Gender differences in early literacy: Analysis of kindergarten through fifth-grade dynamic indicators of basic early literacy skills probes. *School Psychology Review, 39*(2), 240. doi:10.1177/1098300712459080
- Bryant, P. E., MacLean, M., Bradley, L. L., & Crossland, J. (1990). Rhyme and alliteration, phoneme detection, and learning to read. *Developmental Psychology, 26*, 429–438. doi:10.1037=0012-1649.26.3.429.
- Burgess, K. A., Lundgren, K. A., Lloyd, J. W., & Pianta, R. C. (2001). *Preschool teachers' self-reported beliefs and practices about literacy instruction (Cierra Report 2-012)*. Ann Arbor, MI: Center for the Improvement of Early Reading Achievement. (ERIC Document Reproduction Service No. ED452513).
- Carroll, J. M., Snowling, M. J., Hulme, C., & Stevenson, J. (2003). The development of phonological awareness in preschool children. *Developmental Psychology, 39*(5), 913–923. doi:10.1037/0012-1649.39.5.913.
- Chard, D. J., & Dickson, S. V. (1999). Phonological awareness: Instructional and assessment guidelines. *Intervention in School and Clinic, 34*, 261–270.
- Child Care Center. (2018). *Teaching phonological awareness to preschoolers in Oman*. Sultan Qaboos University, Oman.
- Cormier, P., & Dea, S. (1997). Distinctive patterns of relationship of phonological awareness and working memory with reading development. *Reading and Writing: An Interdisciplinary Journal, 9*(3), 193–206. doi:10.1023/A:1007932721290
- Duranovic, M., Huseinbasic, M., & Tinjak, S. (2012). Development of phonological awareness and letter knowledge in Bosnian preschool children. *International Journal of Linguistics, 4*(2), 18–34.
- Durgunoglu, A. Y., & Oney, B. (1999). A cross-linguistic comparison of phonological awareness and word recognition. *Reading and Writing, 11*, 281–299.
- Goswami, U. (2000). Phonological representations, reading development and dyslexia: Towards a cross-linguistic theoretical framework. *Dyslexia, 6*, 133–151. doi:10.1002/(sici)1099-0909(200004/06)6:2<133::aid-dys160>3.0.co;2-a
- Goswami, U. (2002). Phonology, reading development, and dyslexia: A cross-linguistic perspective. *Annals of Dyslexia, 52* (1), 139–163.
- Goswami, U., & Bryant, P. E. (1990). *Phonological skills and learning to read*. Hove, East Sussex, England: Psychology Press.
- Goswami, U., & East, M. (2000). Rhyme and analogy in beginning reading: Conceptual and methodological issues. *Applied Psycholinguistics, 21*, 63–93.
- Hecht, S. A., & Greenfield, D. B. (2002). Explaining the predictive accuracy of teacher judgments of their students' reading achievement: The role of gender, classroom behavior, and emergent literacy skills in a longitudinal sample of children exposed to poverty. *Reading and Writing, 15*(7-8), 789–809.
- Hudson, A. (2002). Outline of a theory of diglossia. *International Journal of the Sociology of Language, 2002*, 1–48.
- Hulme, C., Snowling, M. J., Caravolas, M., & Carroll, J. (2005). Phonological skills are (probably) one cause of success in learning to read: A comment on Castles and Coltheart. *Scientific Studies of Reading, 9*, 351–365. doi:10.1207/s1532799xssr0904_2
- Hyde, J. S., & Linn, M. C. (1988). Gender differences in verbal ability: A meta-analysis. *Psychological Bulletin, 104*(1), 53–69. doi:10.1037/0033-2909.104.1.53
- International Reading Association. (1998). *Phonemic awareness and the teaching of reading: A position statement from the board of directors of the international reading association* [Brochure]. Newark, DE: Author.
- Justice, L. M., Bowles, R. P., & Skibbe, L. E. (2006). Measuring preschool attainment of print-concept knowledge: A study of typical and at-risk 3- to 5-year-old children using item response theory. *Language, Speech, & Hearing Services in Schools, 37*(3), 224–235. doi:10.1044/0161-1461(2006/024)
- Kim, Y. S., Petscher, Y., Foorman, B. R., & Zhou, C. (2010). The contributions of phonological awareness and letter-name knowledge to letter-sound acquisition—a cross-classified multilevel model approach. *Journal of Educational Psychology, 102*(2), 313–326.

- Lambrech Smith, S., Scott, K. A., Roberts, J., & Locke, J. L. (2008). Disabled readers' performance on tasks of phonological processing, rapid naming, and letter knowledge before and after kindergarten. *Learning Disabilities Research & Practice*, 23, 113–124. doi:10.1111/j.1540-5826.2008.00269.x
- Levin, I., Saiegh-Haddad, E., Hende, N., & Ziv, M. (2008). Early literacy in Arabic: An intervention study among Israeli Palestinian kindergartners. *Applied Psycholinguistics*, 29(3), 413–436. doi:10.1017/S0142716408080193
- Lonigan, C. J., Burgess, S. R., Anthony, J. L., & Barker, T. A. (1998). Development of phonological sensitivity in 2- to 5-year-old children. *Journal of Educational Psychology*, 90(2), 294–311. doi:10.1037/0022-0663.90.2.294
- Lonigan, C. J., Burgess, S. R., & Anthony, J. L. (2000). Development of emergent literacy and early reading skills in preschool children: Evidence from a latent variable longitudinal study. *Developmental Psychology*, 36, 596–613. doi:10.1037=0012-1649.36.5.596.
- López, L. M. (2012). Assessing the phonological skills of bilingual children from preschool through kindergarten: Developmental progression and cross-language transfer. *Journal of Research in Childhood Education*, 26(4), 371–391. doi:10.1080/02568543.2012.711800
- Lundberg, I., Larsman, P., & Strid, A. (2012). Development of phonological awareness during the preschool year: The influence of gender and socio-economic status. *Reading and Writing*, 25(2), 305–320. doi:10.1007/s11145-010-9269-4
- Machin, S., & Pekkarinen, T. (2008). Global sex differences in test score variability. *Science*, 322(5906), 1331–1332. doi:10.1126/science.1162573
- McDowell, K. D., Lonigan, C. J., & Goldstein, H. (2007). Relations among socioeconomic status, age, and predictors of phonological awareness. *Journal of Speech, Language, and Hearing Research*, 50(4), 1079–1092. doi:10.1044/1092-4388(2007/075)
- Mesmer, H. A. E., & Williams, T. O. (2015). Examining the role of syllable awareness in a model of concept of word: Findings from preschoolers. *Reading Research Quarterly*, 50(4), 483–497.
- Moura, S. R., Mezzomo, C. L., & Cielo, C. A. (2009). Phonemic awareness stimulation and its effects regarding the variable gender. *Pró-Fono Revista de Atualização Científica*, 21(1), 51–56.
- Nicolson, R., & Fawcett, A. (2004). *The dyslexia early screening test—second edition (DEST-2)*. London: The Psychological Corporation; A Harcourt Assessment Company.
- Pullen, P. C., & Justice, L. M. (2003). Enhancing phonological awareness, print awareness, and oral language skills in preschool children. *Intervention in School and Clinic*, 39(2), 87–98. doi:10.1177/10534512030390020401
- Robertson, C., & Salter, W. (2007). *The phonological awareness test 2 (PAT 2)*. Austin, TX: PRO-ED.
- Saiegh-Haddad, E. (2003). Linguistic distance and initial reading acquisition: The case of Arabic Diglossia. *Applied Psycholinguistics*, 24, 431–451. doi:10.1017/S0142716403000225
- Saiegh-Haddad, E. (2004). The impact of phonemic and lexical distance on the phonological analysis of words and pseudowords in a diglossic context. *Applied Psycholinguistics*, 25(04), 495–512. doi:10.1017/S0142716404001249
- Saiegh-Haddad, E. (2007). Linguistic constraints on children's ability to isolate phonemes in Arabic. *Applied Psycholinguistics*, 28(04), 607–625.
- Saiegh-Haddad, E., Levin, I., Hende, N., & Ziv, M. (2011). The linguistic affiliation constraint and phoneme recognition in diglossic Arabic. *Journal of Child Language*, 38(02), 297–315. doi:10.1017/S0305000909990365
- Sherman, J. (1978). *Sex-related cognitive differences: An essay on theory and evidence*. Springfield, IL: Thomas.
- Stackhouse, J., & Wells, B. (1997). *Children's speech and literacy difficulties 1: A psycholinguistic framework*. London: Whurr Publishers.
- Tibi, S. (2010). Developmental hierarchy of Arabic phonological awareness skills. *International Journal of Special Education*, 25(1), 27–33.
- Tibi, S., & Kirby, J. R. (2018). Investigating phonological awareness and naming speed as predictors of reading in Arabic. *Scientific Studies of Reading*, 22(1), 70–84. doi:10.1080/10888438.2017.1340948
- Treiman, R., & Zukowski, A. (1996). Children's sensitivity to syllables, onsets, rimes, and phonemes. *Journal of Experimental Child Psychology*, 61(3), 193–215. doi:10.1006/jecp.1996.0014
- Troia, G. A., Roth, F. P., & Graham, S. (1998). An educator's guide to phonological awareness: Measures and intervention activities for children. *Focus on Exceptional Children*, 31(3), 1–12.
- Wagner, R., Torgesen, J., Rashotte, C., & Pearson, N. (2012). *Comprehensive test of phonological processing* (2nd ed.). Austin, TX: Pro-Ed.
- Wendy, A. A. (2007). *Potential precursors to the development of phonological awareness in preschool children* (PhD Thesis). Psychology, University of Auckland.
- Ziegler, J. C., Bertrand, D., Tóth, D., Csépe, V., Reis, A., Faisca, L., ... Blomert, L. (2010). Orthographic depth and its impact on universal predictors of reading: A cross-language investigation. *Psychological Science*, 21, 551–559. doi:10.1177/0956797610363406