

The Impact Of Morphological Awareness Versus Phonological Awareness On Arabic Spelling

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Abstract

In general, studies investigating the role of morphological knowledge in spelling suggested that morphological knowledge, the implicit knowledge of morphology, contributes significantly to spelling development and spelling accuracy (e.g., Treiman and Cassar, 1996; Carlisle, 1988; Deacon and Bryant, 2006). The explicit morphological knowledge reflected in morphological awareness (MA) tasks has been found to correlate significantly with spelling competency and other literacy skills (e.g., Schiff and Raveh, 2007; Apel and Lawrence, 2011; Nagy et al., 2003). Although there is theoretical support for the contribution of phonology to reading and spelling abilities in the very early years (e.g., Berninger et al., 2010), morphological knowledge was found to have more influence on the literacy acquisition beyond the early years and mainly in the upper elementary years of schooling (eg., Tyler and Nagy, 1989; Nagy, et al., 2006). This study investigated the contribution of morphological awareness (MA), in contrast to phonological awareness (PA), to spelling competency among young Arabic-speaking learners. The results revealed that both MA and PA make a significant contribution to spelling performance in Arabic, even though PA had, comparatively, a greater impact on spelling than MA which is consistent with the majority of spelling studies (e.g., Ehri et al., 2001; Caravolas, 2004; Bird et al., 1995). Such a finding is not surprising since morphological operations in Arabic, and mainly the word pattern, are based on phonological patterns built onto consonantal roots.

Keywords: Morphological awareness, phonological awareness, Arabic, spelling,

Introduction

Morphological awareness indicates learners' "conscious awareness of the morphemic structure of words and their ability to reflect on and manipulate that structure" (Carlisle, 1995, p. 194). Recently, considerable research effort has been directed toward the correlation between morphological awareness and spelling development among young learners. Cross-linguistic research highlights the role that morphological knowledge play in improving spelling competency (e.g., Levin et al., 2001; Abu-Rabia & Taha, 2004; Rispens,

2008). Such findings emphasize the crucial contribution morphological knowledge makes towards the general spelling abilities in the early ages of learning (see Carlisle, 2000, 1996, 1987; Bourassa et al., 2006; Green et al., 2003). Nagy et al. (2003: 730) postulate that morphological awareness may contribute to both reading and spelling in:

“(a) providing insight into the writing system, (b) enabling readers to read and spellers to produce longer words more accurately and fluently, (c) contributing to syntactic parsing (reading) or packaging

(writing), (d) increasing children's ability to decontextualize language and process it analytically, and (e) facilitating written and oral vocabulary learning, which in turn affects reading and writing acquisition.”

Casalis et al. (2011) provided evidence from the French language to support the crucial role of morphological awareness in improving spelling competency. They examined the relationship between morphological awareness and spelling performance and found that morphological awareness is “associated with spelling performance regardless of whether (or not?) morphological information is involved in the items to be written” (p. 509) and, therefore, it was suggested that “the greater a child’s awareness of morphology, the more accurately (and possibly fluently) he or she will spell” (p. 509).

In general, available Arabic studies on morphological awareness focused on the relationship between morphological awareness and general profiles of spelling (e.g., Taha & Saiegh-Haddad, 2016, 2017; Abu Rabia & Taha, 2006) while investigating the relationship between morphological awareness and spelling performance on Arabic morphological forms has not received much attention.

Phonological awareness, on the other hand, is the ability to attend to, identify, discriminate, blend, segment and manipulate sounds at the sentence, word, syllable, and phoneme level. Konza (2011, p. 1) defined phonological awareness as “a broad term, referring to the ability to focus on the sounds of speech as distinct from its meaning: on its

intonation or rhythm, on the fact that certain words rhyme, and on the separate sounds. When children play with language by repeating syllables; they are demonstrating an awareness of the phonological element of rhyme”.

Phonological awareness has been extensively investigated (e.g., Goswami & Bryant, 1990) and widely accepted as crucial knowledge required for developing reading and spelling. Several studies highlighted the important role of phonological awareness in early spelling development (e.g., Ehri et al., 2001) and have consistently found a significant correlation between phonological awareness and early spelling competency. Phonological awareness was found to be a significant predictor for spelling development as well as spelling difficulties in many alphabetic writing systems (e.g., Caravolas, 2004; Bird et al., 1995). Similarly, Nation & Hulme (1997) assessed the phonological skills of seventy-five children from first, third and fourth grades in the United Kingdom and investigated the relationship between these skills and spelling and reading abilities. Their results suggested a high correlation between phonological awareness, and mainly phonemic segmentation, with reading and spelling. Phonemic segmentation skill was found to be improved with age and was strongly correlated with spelling performance. Consequently, the ability to manipulate sound contents of words lead to successful phoneme to grapheme encoding which is considered an essential competency in spelling (Bourassa & Treiman, 2001).

The study

Given the effects of Arabic morphology on the orthographic representation of Arabic words, this study was designed to investigate the extent to which morphological awareness contributes to the spelling performance compared to phonological awareness which has been extensively investigated in the literature (see, for example, Stanovich, 1988; Goswami, 2000).

The morphological awareness task was designed to investigate the relationship between learners' morphological awareness and their performance on spelling morphological forms. In addition, the impact of MA on spelling was compared with the impact of PA on spelling through the phonological awareness task which has been widely studied (e.g., Goswami & Bryant, 1990) and found to contribute significantly to early spelling development (e.g., Ehri et al., 2001).

The study sought to shed light on the impact of both types of awareness and to find which one has more influence on the spelling performance in Arabic. In order to investigate the extent to which MA contributes to the spelling performance compared to PA, the descriptive statistics for all measures were calculated, thereafter, correlation and multiple regression analyses were utilized to examine the relationship between MA and PA with spelling performance on morphological forms.

Participants

107 Arabic-speaking participants took part in the study. They ranged in age from 7 years, 3 months to 15 years, 2 months (grades 2 to 8) with an average age of 11

years, 4 months. All learners were native speakers of Arabic and were recruited in two governmental single-sex schools in Irbid city, in north Jordan. All participants came from middle socio-economic classes. In addition, they had no sight, hearing, or serious health problems.

Materials

Due to the lack of standardized measures in Arabic language, the researcher specifically developed three tasks in Modern Standard Arabic (MSA), which is commonly used in school books and instructions, for the purposes of this work.

Morphological awareness task

Morphological awareness is considered as crucial knowledge that contributes to the development of literacy as it involves both analytical and synthetic aspects of word formation rules (Carlisle, 2000). It was very important to assess and compare the learners' explicit and implicit knowledge of morphology. Explicit knowledge of morphology is represented by a morphological awareness task which is "consciously accessed, allowing verbalization and generalization of knowledge across situations". On the other hand, the implicit knowledge of morphology is represented by the spelling task which "underlie(s) practical skills devoid of conscious understanding; a person has an ability to do something but cannot explain his or her success" (Critten, Pine, & Messer, 2013, p. 2). Therefore, performance on a MA task and spelling task will indicate the relationship between the two levels of morphological knowledge, implicit and explicit knowledge.

This task required the learner to, orally, generate a proper morphological form of a given word to complete a sentence. It comprised of twenty-five testing items in addition to practice items to ensure that learners understood what was required (see Appendix A, for the full test).

Some of the testing items were adapted from Carlisle (2000) and others were created by the researcher such as the task of morphological measures. The morphological awareness task was comprised of four subtests and was intended to assess the learner's morphological skills.

Phonological awareness task

This oral task was designed to assess learners' ability to identify and manipulate sound units of oral language. It comprised of twenty-five testing items and ten practice items to ensure that learners understood the requirements of the task (see Appendix B, for a copy of the Phonological Awareness Task). The task was intended to assess the essential skills of phonological awareness, which were presented randomly in the task.

The third task was the the spelling task which is an isolated word spelling task and worked as a measure of spelling ability. This dictated spelling task aimed to measure the student's accuracy in spelling morphological forms and not for speed. This task comprised of 400 common words representing all morphological forms in Arabic. Participants were informed to use diacritics in their writing.

Procedures

Learners were individually required as far as possible to give a proper response to the testing items in the PA and MA tasks. Two points were awarded for the correct

response, one point for the near correct response, and a zero point for the incorrect response. The maximum possible score was 50. This scoring system was chosen to help us to understand if the learner demonstrates a thorough or a partial understanding of the required skill, or his/ her response indicates inadequate understanding of the skill.

All tasks were conducted on the school campus. Experimenters administered practice items before each task . In order to ensure consistent presentation of the tasks, all tasks were presented in the same order: the phonological and morphological awareness tasks were firstly administered individually. Thereafter, learners conducted the spelling task in groups.

Data Analysis

Statistically, the Pearson correlation test using SPSS is the most commonly used analysis to measure the strength of the relationship between variables. The sample correlation coefficient, denoted 'r' and ranges from -1 to +1, measures strength and direction of the linear relationship between two given variables. A correlation value between 0 and +1 indicates a positive relationship in which an increase in one variable leads to an increase in the other one. A negative association, however, is an inverse relationship between two variables in which one variable increases as the other decreases, and vice versa. Zero value indicates no relationship between the two variables. The strength of the relationship is expressed by the extent to which the Pearson correlation coefficient is close to +1 or -1, positively or negatively (Field, 2009)

Results

The statistical analysis demonstrated that tasks used in the current study are reliable and have high internal consistency. The alphas for the morphological and phonological awareness tasks and the spelling task were $\alpha = .71$ and $\alpha = .98$ respectively. These results indicated that alpha scores exhibited a good level in morphological and phonological awareness tests $\alpha = .71$, and a high internal reliability and consistency in the spelling test. The

finding is consistent with Gliem & Gliem (2003) who suggested that “the closer Cronbach’s alpha coefficient is to 1.0 the greater the internal consistency of the items in the scale” (Gliem & Gliem, 2003, p. 87). Based on the descriptive statistics for PA, MA and spelling (see 1), a Pearson product-moment correlation coefficient was computed in order to assess the relationship between the performance on PA, MA and the spelling task.

Table 1: Descriptive statistics of phonological awareness test, morphological awareness test, and total scores of spelling tests

Descriptive Statistics			
	Mean	Std. Deviation	N
Total Score in Spelling	767.4579	261.07157	107
Score in Morphological Awareness Test	35.8286	10.54155	105
Score in Phonological Awareness Test	35.6038	8.79684	106

The overall results of the Pearson correlation analysis revealed a positive, significant correlation between the MA, PA, and the spelling task. Correlation coefficients between variables are presented in Table 2.

A moderate, positive correlation was found between the performance on MA task and spelling performance, $r=0.676$, $n=105$, $p < .000$. This means that increases or decreases in one variable are correlated with changes in the other variable as demonstrated in figure A.

Table 2: The Pearson product-moment correlation coefficient of all measures

		Spelling Total	Score in Morphological Awareness Test	Score in Phonological Awareness Test
Spelling Total	Pearson Correlation	1	.676**	.742**
	Sig. (2-tailed)		.000	.000
	N	107	105	106
Score in Morphological Awareness Test	Pearson Correlation	.676**	1	.560**
	Sig. (2-tailed)	.000		.000
	N	105	105	105

** . Correlation is significant at the 0.01 level (2-tailed).

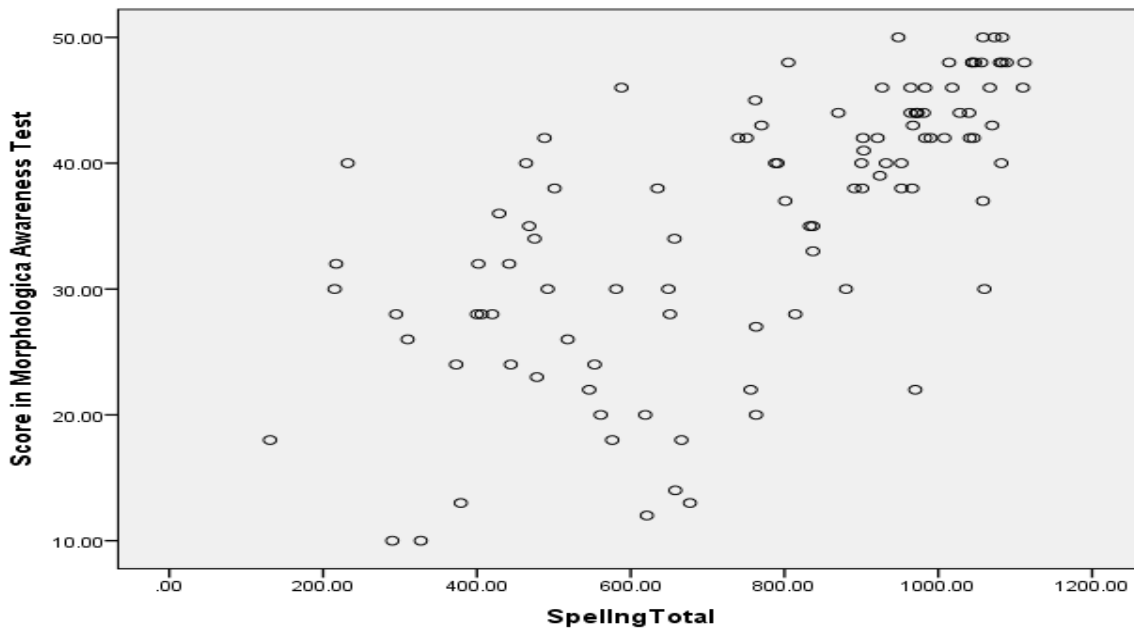


Figure A: A scatterplot summarizes the correlation results between MA and spelling. The results of the correlation between PA and spelling, on the other hand, have also shown a positive correlation between the performance on PA task and spelling, $r = 0.742$, $n = 106$, $p < 0.000$ as summarized in the scatterplot in figure B.

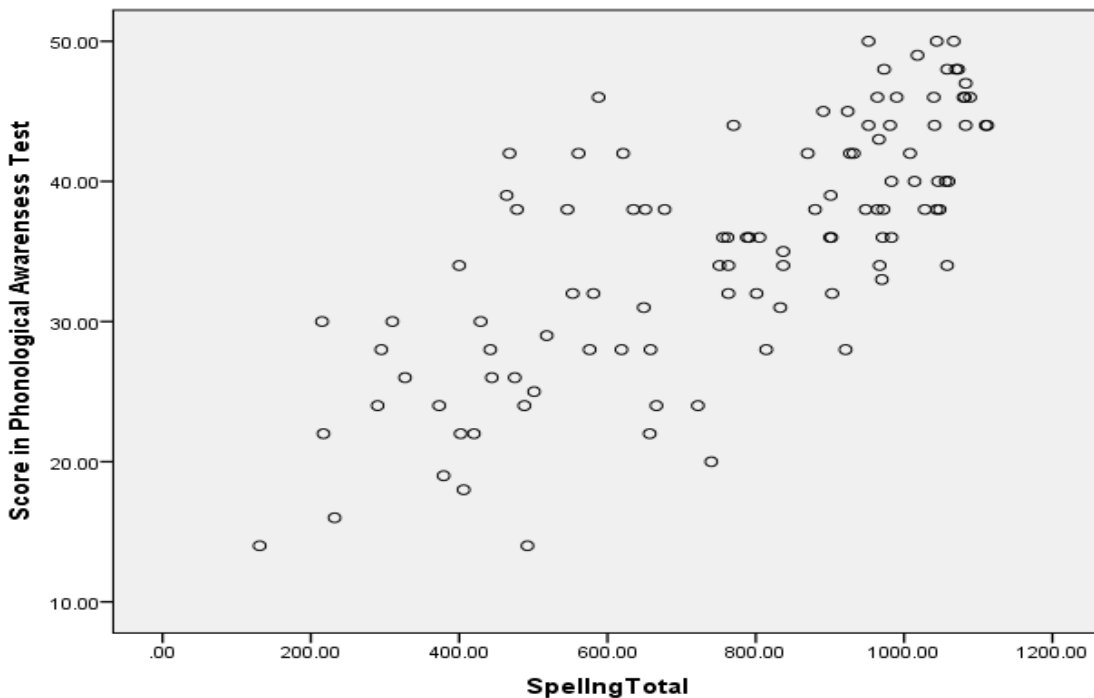


Figure B: A scatterplot summarizes the correlation results between PA and spelling.

With respect to the relationship between MA and PA, a Pearson product-moment correlation coefficient indicated a positive, significant correlation, $r = 0.560$, $n = 105$, $p < 0.000$, as summarized in in figure C.

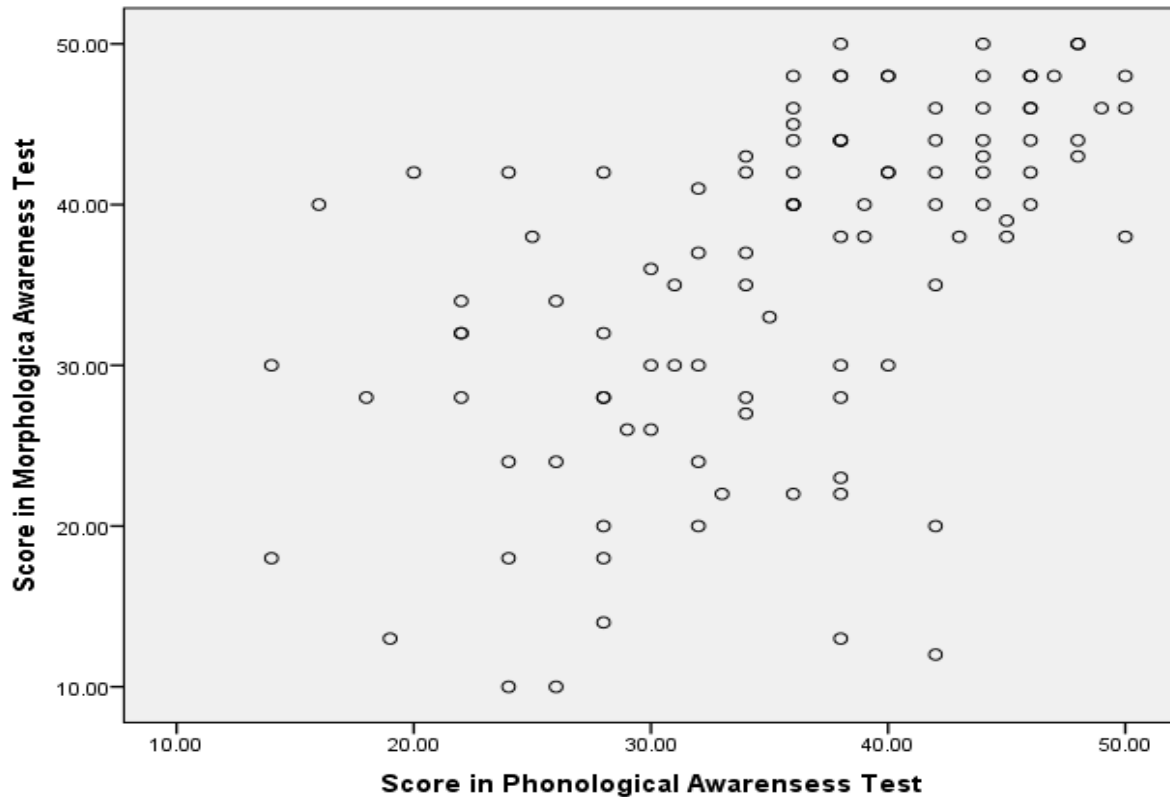


Figure C: A scatterplot summarizes the correlation results between MA and PA. Overall, there was a positive, statistically significant correlation between the three variables of PA, MA, and spelling. In other words, learners who perform well in PA or MA tend to receive higher scores in spelling. Table 3 shows scores of some students in PA, MA and spelling where we can see a clear correlation between PA, MA and spelling.

The results of the Pearson product-moment correlation coefficient suggested that MA and PA consistently and significantly co-vary with the measure of spelling. Similarly, the relationship between PA and MA exhibited a statistically significant correlation with each other.

Table 3: Samples of learners’ scores in PA, MA, and spelling

Student	Grade	PA	M A	Spelling
AA	2	31	30	27
MOH	3	36	40	33
H	4	34	42	32
MH	5	38	48	44
AH	6	34	27	32
IM	8	46	48	45
RU	4	26	10	14
HAN	5	19	13	16
MAL	6	38	28	27
RAG	7	36	40	33

ZE	8	35	33	35
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Since both phonological awareness and morphological awareness tasks exhibited a statistically high significant correlation with spelling performance, a multiple regression analysis was utilized to examine the relative contributions of morphological and phonological awareness to spelling performance among learners.

Multiple linear regression is the most common form of linear regression analysis and functions as a predictive analysis. It is used to predict the relationship between one dependent variable from two or more independent variables (predictors). The regression equation was therefore used to test whether MA and PA (independent variables) were able to significantly predict spelling performance (dependent variable) among young learners. Using the enter method, the significant regression equation indicated that MA and PA accounted for 65.4% (the R^2 value \times 100) of the variance in spelling ($R^2 = .654$, $F(2,102) = 96.538$, $p < .000$). It was found that both MA ($\beta = .376$, $p < .001$) and PA ($\beta = .536$, $p < .001$) significantly predicted spelling competency as shown in the SPSS output in table 4.

Table 4: The descriptive statistics and analysis results of the multiple regression analysis

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.809 ^a	.654	.648	156.37510	1.143

a. Predictors: (Constant), Score in Phonological Awareness Test, Score in Morphological Awareness Test

b. Dependent Variable: Total of Categories

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4721334.784	2	2360667.392	96.538	.000 ^b
	Residual	2494223.445	102	24453.171		
	Total	7215558.229	104			

a. Dependent Variable: Total of Categories

b. Predictors: (Constant), Score in Phonological Awareness Test, Score in Morphological Awareness Test

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	-144.825	67.563		-2.144	.034		
Score in Morphological Awareness Test	9.398	1.755	.376	5.354	.000	.687	1.456
Score in Phonological Awareness Test	16.106	2.111	.536	7.629	.000	.687	1.456

a. Dependent Variable: Total of categories

The two predictors (MA and PA) also exhibited significant positive regression ($b = 9.398$, 16.106 respectively) with spelling, indicating that learners with higher scores in PA and MA tend to

have higher scores in spelling; thus, as MA score increases, spelling score increases; as PA score increases, so spelling increases as well. From the magnitude of the t-statistics we can see that PA ($t(102)= 7.629, p < .001$) had, comparatively, a higher impact on spelling than MA ($t(102)= 5.354, p < .001$). This result may reflect the fact that vowelization (phonological structure) forms an important aspect of the word pattern, which comprises of the consonantal root and the vocalic pattern, and captures the phonological structure of the word (Taha and Saiegh-Haddad, 2017). The results indicated that as MA ($b= 9.398$) increases by one score, total spelling increases by almost 9.4 scores, while as PA ($b=16.106$) increases by one score, total spelling increases by 16.06 points as explained in scatterplots D and E.

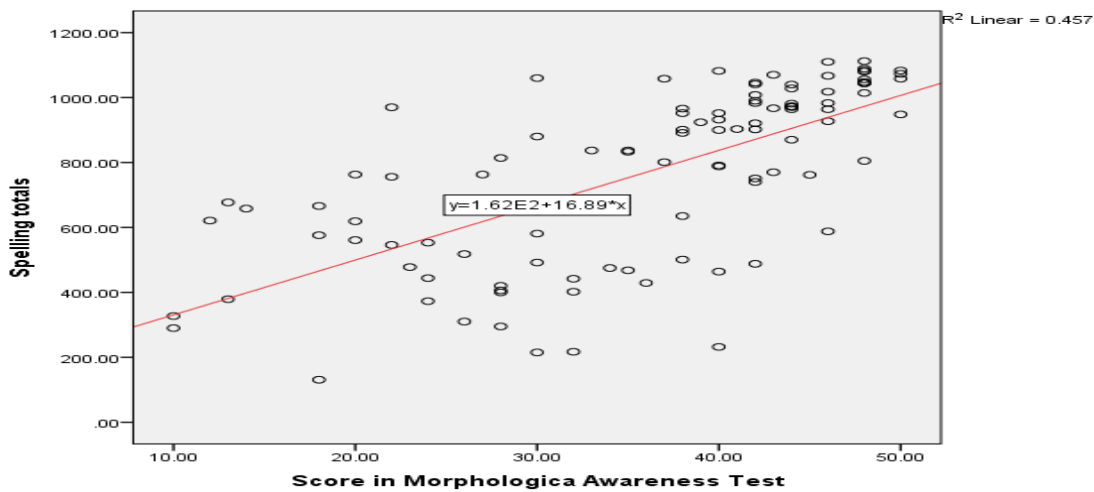


Figure D: A scatter plot summarizes the positive regression between MA and spelling, and is fitted with a linear line indicating the positive relationship

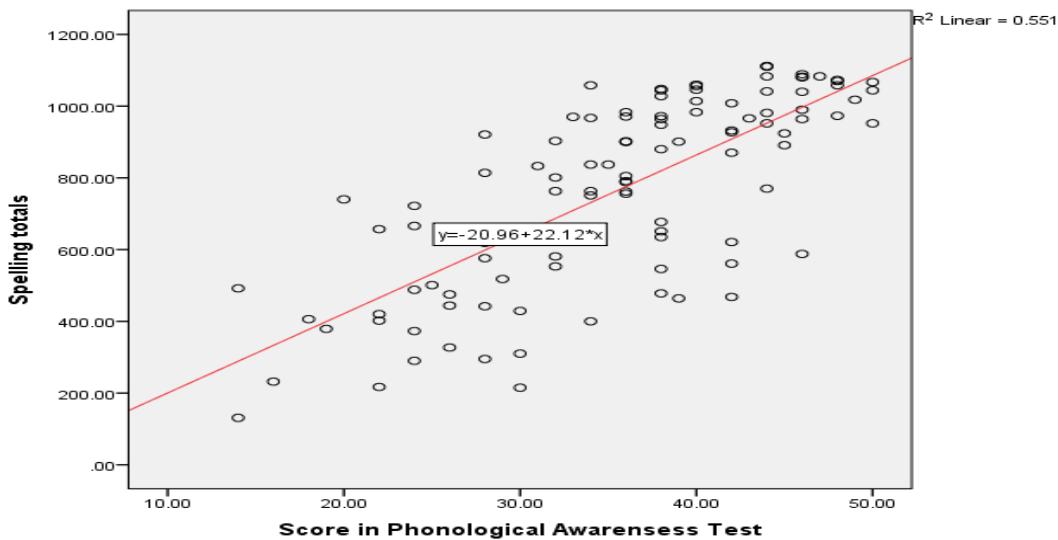


Figure E: A scatter plot summarizes the positive regression between PA and spelling, and is fitted with a linear line indicating the positive relationship

Discussion

The outcomes of the current study have shown that PA and MA exhibited significant correlation with spelling. In other words, PA and MA are suggested to play an important role in developing spelling abilities in Arabic. In the meantime, PA and MA exhibited a reciprocal relationship with each other; the performance of PA can predict the MA skills and vice versa.

The purpose of the study was to obtain more information regarding the morphological awareness abilities of learners, compare those abilities with PA, and determine whether the morphological awareness abilities of learners explain their performance on spelling task. This was examined using two tasks for phonological and morphological awareness which comprised 25 items for each. Our finding revealed a positive, significant correlation between the MA, PA, and spelling. PA and MA exhibited significant positive regression with spelling, indicating that learners with higher scores in PA and MA tend to have higher scores in spelling.

These results extended previous findings of the contribution of PA and MA to spelling performance and development (e.g., Carlisle, 1988; Deacon et al., 2009; Nunes & Bryant, 2006; Nunes et al., 2003). The findings confirm that the predictive value of spelling performance is related to PA and MA effect. Overall, research investigating the impact of MA on spelling is relatively new (Carlisle, 2000, 2003; Deacon & Kirby, 2004); therefore, these findings add further support to previous studies linking MA to spelling among learners (e.g., Wolter, Wood and D'zatko, Treiman & Cassar, 1996).

One interesting result that emerged from the current study indicated that PA had, comparatively, a greater impact on spelling than MA which is consistent with the majority of spelling studies (e.g., Ehri et al., 2001; Caravolas, 2004; Bird et al., 1995). Such a finding is not surprising since morphological operations in Arabic, and mainly the word pattern, are based on phonological patterns built onto consonantal roots.

Theoretically, such findings, which imply the reciprocal relation between MA and PA from early on and their high tight correlation with their spelling development, pose a challenge to late models (stage or phase theories) of spelling development (e.g., Ehri, 1986; Gentry, 1982; Henderson, 1985). These theories propose that MA only contributes to spelling development late in the process and, therefore, it is not considered as an important factor in early spelling development and it suggests that spelling development goes through hierarchical stages.

In sum, this study argued further for the crucial contribution that morphological and phonological awareness make towards the general spelling abilities among beginner learners (see Carlisle, 2000, 1996; Bourassa et al., 2006) and provide additional evidence for the non-linear growth of morphological knowledge in spelling.

Conclusion

It was apparent from the study that both MA and PA make a significant contribution to spelling performance in Arabic. A positive correlation was found between MA, PA, and spelling performance which confirms previous findings (e.g., Carlisle, 1988;

Deacon et. al., 2009; Nunes & Bryant, 2006; Nunes et. al., 2003) and contributes to our understanding of the significant role of MA on Arabic spelling. In addition, the reciprocal relation between MA and PA and their role in spelling performance argued further for the non-linear growth of morphological knowledge in spelling where learners access and use morphological knowledge from early on and across all developmental stages. In addition, this study suggests to incorporate morphological awareness from early on in the educational curriculum of young learners to improve their spelling abilities.

References

- Abu- Rabia, S. and Haitham Taha. (2004). "Reading and spelling error analysis of native Arabic dyslexic readers." Reading and Writing: An Interdisciplinary Journal: 651–689.
- Abu -Rabia, Salim and Haitham Taha.(2006). "Phonological Errors Predominate in Arabic Spelling Across Grades 1–9." Journal of Psycholinguistic Research 35: 167-188.
- Apel, Kenn and Jessika Lawrence. (2011). "Contributions of Morphological Awareness Skills to Word-Level Reading and Spelling in First-Grade Children With and Without Speech Sound Disorder ." Journal of Speech, Language, and Hearing Research: 1312–1327 .
- Berninger, Virginia W, et al. (2010). "Growth in Phonological, Orthographic, and Morphological Awareness in Grades 1 to 6." Psycholinguist Res: 141–163 .
- Bird, J., D. Bishop and N. Freeman. (1995). "Phonological awareness and literacy development in children with expressive phonological impairments." Journal of Speech and Hearing Research: 446-462.
- Bourassa, Derrick, Rebecca Treiman and Brett Kessler. (2006). "Use of morphology in spelling by children with dyslexia and typically developing children." Memory and Cognition 34.3: 703-714.
- Bourassa, D. C. and R. Treiman. (2001). "Spelling development and disability: The importance of linguistic factors." Language, Speech, and Hearing Services in the schools 32: 172-181.
- Caravolas, M. (2004). "Spelling development in alphabetic writing systems: A cross linguistic perspective." European Psychologist: 3-14.
- Carlisle, J. (1996). " An exploratory study of morphological errors in children's written stories. ." Reading and Writing: An Interdisciplinary Journal 8: 61-72 .
- Carlisle, J. (1987). " The Use of Morphological Knowledge in Spelling Derived Forms by Learning-Disabled and Normal Students. ." Annals of Dyslexia 37.1: 90-108.
- Carlisle, J. (2000). "Awareness of the structure and meaning of morphologically complex words: Impact on reading." Reading and Writing: An Interdisciplinary Journal 12: 169–190.

- Carlisle, J. (1988). "Knowledge of derivational morphology and spelling ability in fourth, sixth, and eighth graders." Applied Psycholinguistics: 247-266.
- Carlisle, J. (1995). "Morphological awareness and early reading achievement." (Ed.), Feldman L. Morphological aspects of language processing. Hillsdale, NJ: Erlbaum: 189- 209.
- Carlisle, J. (2003). "Morphology Matters in Learning to Read." Reading Psychology: 291-322.
- Casalís, S., S. Deacon and S. Pacton. (2011). "How specific is the connection between morphological awareness and spelling? A study of French children." Applied psycholinguistics 32: 499-511.
- Critten, Sarah, Karen Pine and David Messer. (2013). "Revealing children's implicit spelling representations." British Journal of Developmental Psychology Vol 31, Issue 2: 198-211.
- Deacon, S., J. Kirby and M. Casselman-Bel. (2009). "How Robust is the Contribution of Morphological Awareness to General Spelling Outcomes?" Reading Psychology: 301-318.
- Deacon, S. H. and P. Bryant. (2006). "This turnip's not for turning: Children's morphological awareness and their use of root morphemes in spelling." British Journal of Developmental Psychology 24: 567- 575.
- Ehri, L. (1986). "Source of difficulty in learning to spell and read." Routh, M. L. Advances in developmental and behavioral pediatrics. Greenwich: Conn: Jai Press: 121-195.
- Ehri, L., et al. (2001). "Phonemic awareness instruction helps children learn to read: Evidence from the National Reading Panel's metaanalysis." Reading Research Quarterly 36: 250-287.
- Field, A. P. (2009). Discovering Statistics Using SPSS. London: SAGE.
- Gentry, J. (1982). "An analysis of developmental spelling in GNYS at WRK." The Reading Teacher: 192-200.
- Gliem, Joseph A. and Rosemary R. Gliem. (2003). "Calculating, Interpreting, and Reporting Cronbach's Alpha Reliability Coefficient for Likert-Type Scales." Midwest Research to Practice Conference in Adult, Continuing, and Community Education. Columbus, OH, USA: The Ohio State University: 82-88.
- Goswami, U and P. Bryant. (1990). "Phonological skills and learning to read". East Sussex: Erlbaum.
- Goswami, U. (2000). "Phonological representations, reading development and dyslexia: Towards a cross-linguistic theoretical." Dyslexia: 133-151.
- Green, L., et al. (2003). "Morphological Development in Children's Writing." Educational Psychology 95: 752-761.
- Henderson, E. (1985). "Teaching spelling". Boston: Houghton Mifflin.

- Konza, Deslea. (2011). "Research into practice". 24 June 2016 <https://www.ecu.edu.au/__data/assets/pdf_file/0011/663698/SA-DECS-Phon-Awareness-doc.pdf>.
- Levin, I., D Ravid and S. Rapaport. (2001). "Morphology and spelling among Hebrew-speaking children: from kindergarten to first grade." Journal of Child language: 741-772.
- Nagy, W., et al. (2003). "Relationship of morphology and other language skills to literacy skills in at-risk second graders and at-risk fourth grade writers. ." Journal of Educational Psychology: 730–742.
- Nagy, W., V. Berninger and R. Abbott. (2006). "Contributions of morphology beyond phonology to literacy outcomes of upper elementary and middle school students." Educational Psychology: 134– 147.
- Nation, Kate and Charles Hulme.(1997). "Phonemic Segmentation, Not Onset-Rime Segmentation, Predicts Early Reading and Spelling Skills." Reading Research Quarterly 32.2: 154-167.
- Nunes, T. and P Bryant. (2006). Improving literacy by teaching morphemes. New York, NY: Routledge
- Nunes, T., P. Bryant and J. Olsson. (2003). "Learning Morphological and Phonological Spelling Rules: An Intervention Study." Scientific Studies of Reading: 289–307 .
- Rispens, J. E.C. (2008). "Morphological awareness and early and advanced word recognition and spelling in Dutch." Reading and Writing 21: 587–607
- Schiff, R and D. Ravid. (2007). "Morphological Analogies in Hebrew-Speaking University Students with Dyslexia Compared with Typically Developing Gradeschoolers." Psycholinguist Res.: 237–253.
- Stanovich, K. E. (1988). "Explaining the differences between the dyslexic and the garden variety poor reader: The phonological-core variable difference model": 590–604.
- Taha, Haitham and E. Saiegh-Haddad. (2017). "Morphology and Spelling in Arabic: Development and interface." Journal of Psycholinguistic Research: 27-38.
- Taha, Haitham and Elinor Saiegh-Haddad. (2016). "The Role of Phonological versus Morphological Skills in the Development of Arabic Spelling: An Intervention Study." Psycholinguist Res 45: 507- 535.
- Treiman, R. and M. Cassar. (1996). "Effects of morphology on children's spelling of final consonant clusters." Experimental Child Psychology 63: 141-170.
- Tyler, A and W Nagy. (1989). "The Acquisition of English Derivational Morphology." Memory and Language: 649 -667.
- Wolter, Julie A., Alexis Wood and Kim W. D'zatko. (2009). "The Influence of Morphological Awareness on the Literacy Development of First-Grade Children." Language, Speech, and

Hearing Services in Schools: 286–

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Appendix A: Test of morphological awareness**Test of Morphological Awareness Skills**

اسم الطالب/ة: _____ الجنس: () ذكر () أنثى الصف: _____
 Student: _____ Sex: M () F () Grade: _____

تاريخ الميلاد: _____ المدرسة: _____
 DOB: _____ School Name: _____

العلامة: (2) للإجابة الصحيحة, (1) للإجابة المفهومة مع بعض الأخطاء (تقدير الفاحص), (0) للإجابة الخاطئة
 Score: (2) correct response, (1) Understood but with some errors, (0) Incorrect

العلامة Score	الإجابة Response	المهارة Skill	الرقم No.
		Practice : مثال (مزرعة) يعمل خالي ----- (مزارعا) (mazraça 'farm')- My uncle works as a----- muzaariç 'a farmer'	
		(ساعد) تقدم أختي ---- (المساعدة) (saaçada 'helped')- My sister offered a ----- musaaçada 'a help'	1
		دفي- يختار الجاكيت لأنه----- (دافي) (dif? 'warmth')- He chooses the jacket because it is ----- daafi? 'warm'	2
		(يدرس- كان يعمل ----- (مدرسا) (yadrus 'study')- He worked as a ---- mударisan 'teacher'	3
		(يأذن)- من أجل المغادرة, نحتاج للحصول على ---- (إذن) (ya?ðan 'permit')- You need a work-----to leave early ?iðn 'permit'.	4
		(ربح)- بيع العصائر في الصيف يعد عملا ---- (مربحا) (rib h 'profit')- Selling drinks in summer is a ----- work murbihan 'profitable'	5
		(أربعة) أنا في الصف ---- (الرابع) (?arbaça 'four')- I am in the----- -grade ?alraabiç 'fourth'	6
		(عدالة)- من مميزات الحاكم المسلم ----- (العدل) (çadaalah 'justice') One of the principles of Muslim rulers is ?alçadl 'justice'	7

		(سبح- أحمد----- بارع (سباح) (sabaħa 'swam')- Ahmad is a skillful sabbaaħ 'a swimmer'	8
		أنتج- يجب على المشتري الانتباه الى تاريخ انتهاء (المنتج) (?antaza 'produced')- The customer should give attention to the expiry date of the..... ?almuntaz 'product'	9
		مدرسة- ---- سامي في جامعة اليرموك (درس) (madrasa 'a school')- Sami at Yarmouk university. darasa 'studied'	10
		مشهور- يبذل الفنانون الكثير من الجهد من أجل الوصول (الى عالم-----الشهرة) (mařhuur 'reputed')- Artists do a lot of efforts to reach ?alfuhra 'reputation'	11
		اتفق- تناقش الطرفان لساعات طويلة من أجل الوصول الى (اتفاق)----- (?ittafaqa/ agree)- Both parties have discussed for long hours in order to reach an ?itifaaq 'agreement'	12
		نمي- يحتاج الطفل الى الرضاعة لمدة عامين حتى ---- (ينمو) (nama/grew)- Infant needs two years of breastfeeding to yanmuu 'grow'	13
		قرر- اختيار التخصص المناسب في الجامعة هو----- (شخصي) قرار (Qarrarad'ecided')- Choosing the right specialization at the university is a personal Qaraar 'decision'	14
		(حسن- يحتاج المزارعون الى البذار -----)(المحسنة) (ħassana 'improve')- Farmers need seeds. ?almuħassana 'improved'	15
		قبل- من شروط الزواج الصحيح الموافقة و----- (القبول) (qabila 'accept')- Terms of proper marriage is agreement and ?alqubuul 'acceptance'	16

		<p>(شجّع- يقال بأن الكثرة تغلب----- (الشجاعة (faʒzaʕa ‘encouraged’)- It is said that abundance overcomes ?alfazaʕa ‘courage’).</p>	17
		<p>Practice : مثال ما الكلمة الناتجة من الجذر (درس) والمبنى (فعالة)؟ فان الكلمة الناتجة هي دراسة What is the word that is derived from the root [drs] ‘to study’ and follows the pattern /fiqaala/? The resulted word is /diraasa/ ‘a study’ أكل -فِعُول (أَكول) ركض -فَعِيل (رَكِض)</p>	
		<p>ما الكلمة الناتجة من الجذر (ظهر) والمبنى (يفعل) فان (الكلمة الناتجة هي ----- (يظهر) What is the word that is derived from the root [ḍhr] ‘appear’ and follows the pattern yafḥalu//? yaḍharu</p>	18
		<p>ما الكلمة الناتجة من الجذر (زلزل) والمبنى (فعلال)؟ الكلمة الناتجة هي (زلزال) What is the word that is derived from the root [zlz] ‘convulse’ and follows the pattern /fiqlaal/? Zilzaal ‘earthquake’</p>	19
		<p>ما الكلمة الناتجة من الجذر (قبل) والمبنى (فِعُول)؟ الكلمة الناتجة هي (قبول) What is the word that is derived from the root [qbl] ‘accept’ and follows the pattern /fuquul/? qubuul</p>	20
		<p>ما صيغة الجمع لكلمة (محاسب)؟ محاسبون What is the plural form of muḥaasib ‘accountant’? Muḥaasibuun</p>	21
		<p>ما صيغة الجمع لكلمة (طفلة)؟ طفلات What is the plural of ṭifla ‘a female child’ ? ṭiflaatl</p>	22
		<p>ما صيغة الجمع لكلمة (أفعى)؟ أفاعي What is the plural of ?afḥa ‘a snake’? ?afaʕi</p>	23
		<p>ما صيغة الجمع لكلمة (ورقة)؟ أوراق What is the plural of waraqa ‘a paper’? ?awraaq</p>	24
		<p>ما صيغة الجمع لكلمة (فرن)؟ أفران What is the plural of furun ‘oven’? ?afraan</p>	25
Total			

Appendix B: Test of phonological awareness skills

Test of Phonological Awareness Skills

اسم الطالب/ة: _____ الجنس: () ذكر () أنثى الصف: _____

Student: _____ Sex: M () F () Grade: _____

تاريخ الميلاد: _____ المدرسة: _____

DOB: _____ School Name: _____

العلامة: (2) للإجابة الصحيحة , (1) للإجابة المفهومة مع بعض الأخطاء (تقدير الفاحص), (0) للإجابة الخاطئة
Score:)2(for correct response, (1) Correct with some errors, (0) Incorrect

العلامة Score	الإجابة Response	المهارة Skill	الرقم No.
		Practice مثال (الصوت الأول في كلمة طائرة ط) (الصوت الأخير في كلب ب) (قل ماعز بدون ما عز) (قل طبق بدون ق طب)	
		1- "ما الصوت الأول في كلمة "سيارة" Say the initial sound of the word sayyaara 'car'. /s/	
		2- "قل كلمة "أستاذ" بدون "أس" Say ?ustaað 'a teacher' without initial /?us/ taað	
		3- "ما الصوت الأخير في كلمة "جرش" What is the final sound of zarař (Jerash- a city in Jordan). /f/	
		4- قل كلمة "معلقة" بدون قاف Say maçlaqa 'a spoon' without /q/. maçlaa	
		5- (قل كلمة "معلمات" بدون (ات) Say muçalimaat 'female teachers' without /aat/. muçalim	
		Practice مثال (ما الكلمة المختلفة صوتيا (نار, فار, خبز) which word is different in rhyme when I say naar 'fire', faar 'a mouse', xubz 'bread. xubz	
		6- (ما الكلمة المختلفة صوتيا (طائرة, باص, سيارة) Which word is different in rhyme when I say řayyaara 'plane', baař 'bus', sayyaara 'car'. baař	
		7- (ما الكلمة المختلفة صوتيا (صخر, صامد, صقر) Which word is different in rhyme when I say řaxr 'rock', řaamid 'immovable , řaqr 'falcon'. řaamid	
		8- (ما الكلمة المختلفة صوتيا (نور, خاب, خاف) Which word is different in rhyme when I say noor 'light', xaab 'disappointed', xaaf 'fear. noor	

		<p>(ما الكلمة المختلفة صوتيا (ضيف, طيف, طائر</p> <p>Which word is different in rhyme when I say ḍaif ‘guest), ṭaif ‘spectrum’, ṭaaer ‘bird’. ṭaaer</p>	9-
		<p>(ما الكلمة المختلفة صوتيا (مازن, ضار, حار</p> <p>Which word is different in rhyme when I say Maazin ‘a proper name’, ḍaar ‘hurtful’, haar ‘hot’. Maazin</p>	10-
		<p>مثال: Practice (قل كلمة: بيت لحم: الآن قلها ثانية دون أن تلفظ (بيت</p> <p>Example: Say the word: Bayt Laḥim (a Palestinian city): Now say it without (bayt). Laḥim</p>	
		<p>(قل كلمة: جمال: الآن قلها ثانية دون أن تلفظ (ج</p> <p>Say zamaal ‘a proper name’: Now say it without /z/. maal</p>	11-
		<p>(قل كلمة: أناشيد: الآن قلها ثانية دون أن تلفظ (شيد</p> <p>Say ṭanaasheed ‘songs’: Now say it without (sheed). ṭanaa</p>	12-
		<p>(قل كلمة: سفرجل: الآن قلها ثانية دون أن تلفظ (سفر</p> <p>Say safar-zal ‘a kind of flowers’: Now say it without (safar). zal</p>	13-
		<p>(قل كلمة: نعام: الآن قلها ثانية دون أن تلفظ (ع</p> <p>Say the word naḥaam ‘ostrich’: Now say it without /ḥ/. naaam</p>	14-
		<p>قل كلمة: صدف: الآن قلها ثانية دون أن تلفظ (د)</p> <p>Say the word ṣadaf ‘seashell’: Now say it without /d/. ṣaaf</p>	15-
		<p>مثال: Practice قسم كلمة /قطار/ إلى مقاطعها الصوتية /قـ/, /طار/ Example: Segment the word qitaar ‘a train’) into sound syllables . /qi- ṭaar/</p>	
		<p>قسم كلمة /مسمار/ إلى مقاطعها الصوتية</p> <p>Segment the word mismaar ‘nail’ into sound syllables. Mis-maar</p>	16-
		<p>قسم كلمة /انعطاف/ إلى مقاطعها الصوتية</p> <p>Segment the word ṭinḥiṭaaf ‘turning’ into sound syllables . ṭin-ḥi-ṭaaf</p>	17-
		<p>مثال: Practice (كوّن كلمة من الأصوات التالية: بَ, ط, طا (بطاطا</p> <p>Example: Blend the sounds: ba, ṭa, ṭa to form a word. baṭaṭa ‘potatoes’</p>	

		18- (كوّن كلمة من الأصوات التالية: من, ت, صر (منتصر) Blend the sounds: mun- ta- şir to form a word. muntaşir 'a winner'	
		19- كوّن كلمة من الأصوات التالية: تف, فا, حة Blend the sounds: tuf- faa- ħa to form a word. tuffaaha 'an apple'	
		20- كوّن كلمة من الأصوات التالية: مس, ت, طيل Blend the sounds: mus-ta- ṭiil to form a word. mustaṭiil 'rectangle'	
		مثال: Practice: (أعط كلمة مماثلة في الصوت لكلمة (رئان) Example: Give a word that rhymes with rannan 'sonorous'	
		21- (أعط كلمة مماثلة في الصوت لكلمة (غانم) : Give a word that rhymes with yaaʔim 'cloudy'	
		22- (أعط كلمة مماثلة في الصوت لكلمة (جمل) : Give a word that rhymes with zamal 'camel'	
		مثال: Practice: قل كتاب دون حرف التاء: كاب Example: say kitaab 'a book' without pronouncing taa. kaab	
		23- (قل تجارة بدون (أ) Say tiʒaara 'trade' without aa- tiʒra	
		24- (قل صحافة بدون (ح) Say şahaafa 'journalism' without ħ - şaafa	
		25- (قل منسوجات بدون (ت) Say mansooʒaat 'textiles' without t- mansooʒaa	
Total			