Chapter #2

THE CONTRIBUTION OF MORPHOLOGICAL AWARENESS TO READING COMPREHENSION IN ARABIC

Bahaa' Makhoul[1] & Vered Vaknin-Nusbaum[2]
[1]*Department of Education, Oranim Academic College, Israel*
[2]*Education Department and Literacy Education Center, Western Galilee Academic College, Israel;*
The Center for the Study of Society, University of Haifa, Israel

ABSTRACT
This study examined the contribution of morphological awareness (MA) to reading and reading comprehension in Arabic among 3rd and 4th graders. MA tests (inflections and derivations) and reading tests examining phonological decoding, orthographic recognition and reading comprehension, were administered to 50 students whose Arabic is their mother tongue. Furthermore, differences in reading achievements between students with low and high MA were examined. Findings indicate that both inflectional and derivational MA significantly explain reading comprehension. Furthermore, it was found that students with lower MA demonstrate inferiority in phonological decoding and reading comprehension compared to those with high MA. It can be inferred that Arabic readers use MA as a strategy that contributes to their ability to identify words and to comprehend a text as early as in the 3rd and 4th grades.

Keywords: morphological awareness, reading comprehension, Arabic, elementary school students.

1. INTRODUCTION

Morphological awareness (MA) is the understanding of a word's structure and the ability to consciously manipulate that structure to express different meanings (Carlisle, 1995). Individuals with developed MA are aware of simple and complex words and can decompose complex words into sub-linguistic elements (morphemes) to obtain their meaning (Carlisle, 1995; Boudelaa, 2014). They are also sensitive to the way sub-lexical meaning units (such as roots and affixes) join one another to create new words (Taft, 2003; Taft & Ardasinski, 2006).

The ability to compose and decompose new complex forms appears as early as kindergarten and first grade, but it continues to develop throughout the school years (Carlisle, 1995; 2010). The ability to use this information consciously to analyze the morphemic structure of written words appears in the first years of elementary school (Carlisle, 2003). Children use their MA in reading after their reading accuracy and fluency are well developed (Ehri, 2005; Wolf, 2008) and their attention resources can be shifted from grapheme to phoneme decoding to the word's structure to gain meaning (Chall, 1983; Stanovich, 2000; Saiegh-Haddad & Geva, 2008). In Arabic, MA and reading are strongly related to each other due the language's complex morphology and high density (Abu-Rabia & Awwad, 2004; Saiegh-Haddad & Geva, 2008). Nevertheless, most of the studies on the contribution of MA to reading in elementary school were conducted in English, a language with a relatively simple morphology. Because languages differ in morphological structure and in the way they are represented in the orthography, the contribution of MA to reading can shift according to

the distinctive characteristics of each language (Share, 2008; Verhoeven & Perfetti, 2011). The current study seeks to explore the contribution of inflectional and derivational MA to word recognition and reading comprehension among Arabic speaking elementary school students.

2. BACKGROUND

2.1. MA and Reading: A Cross-Language Perspective

MA have a unique contribution to reading (Kirby & Bowers, 2017, 2018; Tibi & Kirby, 2019). It is linked to better accuracy and fluency (Carlisle, 1995) and to reading comprehension in primary grades (Carlisle, 2003; 2007; Kuo & Anderson, 2006; Rispens, McBride-Chang & Reitsma, 2007). Deacon and Kirby (2004) found that the quality of performance in inflectional MA tasks in second grade contributed to word recognition in third to fifth grades and to reading comprehension in fourth and fifth grades, beyond the contribution of verbal and non-verbal abilities and prior reading knowledge. Similar results were found regarding the contribution of MA (inflections and derivations) to reading comprehension among fourth to ninth graders, when the vocabulary was controlled (Nagy, Berninger, & Abbot, 2006).

A study examining developmental aspects of phonological, orthographic and morphological awareness in elementary school indicated that MA has a significant contribution to the development of reading. The most accelerated development of inflectional MA was identified in the first three years of elementary school, while complex MA, such as derivational awareness, continued to develop in higher grades. The development of awareness to a more complex morphological level is crucial for successful reading of rare, new and complex words. These types of words tend to appear more frequently in fourth grade texts and onward (Berninger, Abbott, Nagy, & Carlisle, 2010).

2.2. MA and Reading among Struggling Readers

Struggling readers with low MA are less sensitive to morphological units and struggle with identifying and manipulating morphemes that can assist them in constructing and understanding new words (Carlisle, 2003; 2010; Fowler & Liberman, 1995), specifically concerning complex forms such as derivations (Tong, Deacon, Kirby, & Parrila, 2011). Difficulties in an efficient morphological analysis of complex words may increase difficulties in reading comprehension (Tong et al., 2011).

Traficante and colleagues (2011) investigated the effects of the word's frequency and length on reading complex words among skilled and dyslexic readers in elementary school. They found that dyslexic readers read pseudowords composed of a root and a derivative affix faster and more accurately than words with simple morphological structure. They seemed to benefit from the transparent morphological structure of words regardless of their frequency. The researchers claimed that familiarity with morphological units is essential to develop fluency in reading, especially among children with reading difficulties.

Results of intervention studies support a causal link between MA and reading skills and indicate that an intervention which includes learning and practice of morphemes, such as composing and decomposing of inflections and derivations or recognition of prefixes and affixes in familiar and unfamiliar words, significantly improves reading achievement in students who struggle with reading. After participating in a morphological enrichment program, third to sixth grade students improved their word reading and spelling achievement (Katz & Carlisle, 2009; Kirk & Gillon, 2009), and fourth graders improved their reading

comprehension (Carlisle, 2007). Similar findings were reported in intervention studies conducted among seven- and eight-year-olds (Nunes, Bryant, & Olsson, 2003).

Overall, the literature shows that with improvement in reading, the use of morphological strategies for word recognition and reading comprehension increases. Considering its importance to reading, there is a need to examine the contribution of inflectional and derivational awareness to reading in languages with complex morphology such as Arabic.

2.3. MA in Arabic

Arabic is characterized by a complex morphological structure and high morphological density. It belongs to the category of languages which often use bound morphemes and attach several morphemes in one word by a linear or non-linear construction. *Linear construction,* which normally characterizes nouns or adjectives, is created when inflectional morphemes are joined to an existing word, such as in plural inflections. *Non-linear construction* is normally characterized by verbs or nouns and created by intertwining the root morpheme with the structure morpheme. The phonological pattern determines the structure of the verb, therefore, different verb patterns with the same root bear a different meaning.

The stability of the root as a permanent sequence of letters, despite the phonological changes that involve its integration in the word pattern, strengthens the reader's perception of an independent morpheme that can produce a general meaning, while a specific meaning can only be achieved after the integration of the root in the pattern (Mahfoudhi, Elbeheri, Al-Rashidi & Everatt, 2010). The morphological complexity of Arabic requires the recognition of various morphemes such as suffixes, roots and patterns (Abu-Rabia, 2007; Mahfoudhi et al., 2010). The knowledge of these representations is a part of the quality of the lexical representation (Perfetti, 2007) of Arabic speakers, who use it to process spoken and written words, both consciously and subconsciously. Therefore, in Arabic, MA serves as an anchor for the reader in the process of word recognition and reading comprehension (Abu-Rabia, 2007; Abu-Rabia, Share & Mansour, 2003; Saiegh-Haddad, 2018).

The morphemic units in Arabic are given prominent expression in the Arabic writing system, especially since it does not represent the vowels inside the word, so that the consonant fluency of the root morpheme is preserved in most cases, turning the morpheme into a prominent and stable verbal unit for readers (Taha, 2013; Vaknin-Nusbaum & Saiegh-Haddad, 2020).

Tibi and Kirby (2019) found that in Arabic speaking third graders, MA was the biggest predictor compared to the other underlying mechanisms of reading (vocabulary, phonological awareness, rapid automatized naming, and orthographic processing). Abu-Rabia (2007) found that MA predicted reading accuracy, word recognition and reading comprehension in both typical and dyslexic children and adolescents. Findings indicated that recognition and production of words based on the root is a crucial factor in determining the reading level of all examined ages.

2.4. The Current Study

Multiple studies examined the contribution of MA to word recognition and/or reading comprehension; however, only a few separated between inflectional and derivational awareness and their unique contributions to word recognition and reading comprehension (e.g., Tibi & Kirby, 2019). Additionally, research conducted in Arabic is relatively sparse (Mahfoudhi et al., 2010).

Since alphabetic orthographies vary in the ways they represent the morpho-phonemic structure of the spoken language and in the level of their morphological transparency, the contribution of MA to reading may differ between languages based on their morphological density and complexity (Verhoeven & Perfetti, 2011). The unique structure of morphology in Arabic and students' awareness of this structure may affect the reading process both in elementary school students and in adult readers (Abu-Rabia et al., 2003; Abu-Rabia, 2007; Abu-Rabia & Taha, 2004, 2006; Schiff & Saiegh-Haddad, 2018).

Arabic is characterized by diglossia –two varieties of the language, one for speech and the other for writing, which is expressed in language structure, phonological, morphological and syntactic characteristics (Saiegh-Haddad, 2005; Khamis-Dakwar & Froud, 2007; Saiegh-Haddad & Henkin-Roitfarb, 2014), as well as lexical and morpho-lexical aspects (Tibi & Kirby, 2019). Readers may lean on MA in reading to overcome the linguistic gap between the languages (Vaknin-Nusbaum & Saiegh-Haddad, 2020).

This study examined the contribution of inflectional and derivational awareness to word recognition and reading comprehension among Arabic native speakers in third and fourth grades. We also investigated the differences in reading achievement between students with low and high MA. The following questions were examined:

1) Do inflectional and derivational morphology correlate with word recognition and reading comprehension in Arabic among third and fourth graders?
2) Are there differences in reading between students with low MA and students with high MA?

Hypotheses were as follows:

1) Based on previous studies conducted on young readers in Arabic (Vaknin-Nusbaum & Saiegh-Haddad, 2020), both awareness to inflections and derivations would contribute to word reading and reading comprehension in Arabic.
2) Students with low MA would exhibit inferiority in their word reading and in reading comprehension achievement compared to students with high MA.

3. METHOD

3.1. Participants

Participants were 50 students from an elementary school in Northern Israel whose mother tongue is Arabic: 27 third graders and 23 fourth graders. The sample included 29 males (58.0%) and 21 females (42.0%), 15 males and 12 females in the third grade and 14 males and 9 females in the fourth grade. The gender differences according to grades were not significant ($\chi^2(1) = 0.14$, $p = .704$). These grades were chosen since readers in the third and fourth grades have already acquired the basic skills of reading and thus direct much of their attention to reading comprehension.

3.2. Tools
3.2.1. Word Recognition and Reading Comprehension Tests

Sub-tasks of the Arabic version of the Elul assessment battery (Shatil, Nevo, & Breznitz, 2007) were used to test phonological decoding and reading comprehension. The Arabic Elul battery was developmentally designed, with age-appropriate versions from first to ninth grade, to identify low-achieving readers. It was validated on a large random sample of children and includes national norms. For the phonological decoding test, Elul was developed and validated on 596 Arabic-speaking second graders and for the comprehension test on 553 students. All tests were presented in the fully vowelized Arabic orthography and were timed according to battery instructions.

3.2.2. Orthographic Word Recognition Test

The test contained fifteen questions. Each question contained three words from which the student was requested to select the one with the correct orthographic representation. The time allocated to this test was 10 minutes.

3.2.3. Phonological Decoding Test

This test presented fifteen sentences with one missing word in each sentence. The student was required to select the missing word out of two options: both words had an identical sequence of letters but with different vowels below or above the letters. The punctuated words appeared in parentheses at the end of the sentence. The words included commonly occurring speech segments, such as nouns, verbs, and adjectives. The test was limited to 13 minutes. The score in the orthographic recognition and phonological decoding was defined as percentages out of a total of 100.

3.2.4. Reading Comprehension Test

This test examined the child's reading comprehension ability using two narrative texts. Each text was followed by multiple choice questions. The first text contained 84 words followed by six questions with three distractors for each item. The second text contained 94 words followed by ten questions with three distractors for each item. The time allocated for each text was 13 minutes. Reading tests were identical for both the third and fourth grades. Comprehension scores were the percentage of correct answers. The correlation between the reading comprehension tests was found to be positive, high and significant in both the third grade (r = .55; p=.007) and fourth grade (r = .55; p=.009); therefore, a general score was given according to the achievement level in each age group.

3.2.5. Morphological Awareness Test

Morphological awareness (MA) was examined using a test which was developed based on a previous test conducted with Hebrew readers (Vaknin-Nusbaum, Sarid, & Shimron, 2016; Vaknin-Nusbaum, 2018). The Arabic version of the inflectional and derivational sections of the test was used in research carried out by Vaknin-Nusbaum and Saiegh-Haddad (2020). The items were all based on common and familiar standard Arabic words which appear frequently in children's textbooks. Students were presented with the instructions before completing sample test items and then were asked to complete the task. The test had no time limit. Because morphological forms differ in complexity, separate scores were calculated for each MA task. Both grade levels received the same tests.

Inflections. This part included 18 items, half for plural and half for possessive. *Plural inflections* included four regular nouns and five non-concatenated plurals (also called broken plural). *Possessive inflections* included nine possessive pronouns (e.g., mine, theirs). In both sections, distractors were wrongly inflected words created by attaching an incorrect suffix. In the plural formation section, students were presented with a singular target noun followed by the correct plural and a distractor and were asked to choose the correct one. In the possessives section, students were presented with a singular target noun and a possessive pronoun. Next to the noun and the possessive pronoun appeared three complex possessive. Students were asked to choose the correct possessive form. The morphological awareness score was the percent of correct answers out of the total number of items in each subtest. Cronbach's α was 0.93.

Derivations. The test included 12 items, half of which were root extraction tasks requiring participants to find the common root of the presented words. The rest of the items included derivations by analogy tasks, all involving deverbal nouns. Students were presented with a pair of words that included the default third person singular perfective form and its transformation to deverbal noun using the correct derivational nominal pattern. Then they were presented with another new perfective verb form and were asked by analogy to identify the right deverbal form out of three given options (note that in Arabic this transformation is a derivation). To identify the correct derivation, the child had to analyze the morphological root-and-pattern structure of the example pair, locate and extract the root from within the new word, and weave it into the derivational pattern introduced in the example. Distractors included words with the same root as the root source but with different nominal patterns. The score was the percent of correct answers out of the total number of items. Cronbach's α for this task was 0.86.

Construct formation. This section of the test included six items. Students were asked to choose the correct construct formation out of two given options. The score was a percentage score of accuracy. The morphological test was presented to all readers with diacritics. Reliability was α = 0.64.

The MA test sequences can be assembled according to morphology type: linear morphology (plural inflections and possessive), non-linear (determining roots and derive a word by analogy) and construct formation. The correlation between the plural inflections and the possessive was not significant ($r = .16$, $p=.260$), as was the correlation between root extraction and analogy derivations ($r = .08$, p=.567). Therefore, the scores in the five test sequences were separated.

3.3. Procedure

Tests were administered to the whole group in the classroom by two research assistants. The reading tests were administered according to the 'ELUL kit' in the following order: word perception (orthographic, phonological) and reading comprehension. The MA test was administered last. At the beginning of each test the research assistants read the instructions together with the students and solved examples. Tests were administered in the second trimester of the school year.

4. RESULTS

Table 1 shows means and standard deviation for the study variables according to age group. Significant age differences were found for orthographic word recognition, with achievements of fourth graders higher than those of third graders. No age differences were found in reading comprehension and MA, except for derivational awareness, where achievements of fourth graders were better than those of third graders.

Table 1.
Means, standard deviations and differences in the study variables according to age group
(N = 50).

Variable	Sample M (SD)	Third grade M (SD)	Fourth grade M (SD)	t(48)
Reading comprehension	63.87 (20.32)	64.12 (21.69)	63.57 (19.05)	-0.10
Orthographic word recognition	66.67 (21.72)	55.80 (19.84)	79.42 (16.44)	4.53***
Phonological decoding	82.53 (22.49)	75.56 (24.60)	90.72 (16.79)	2.50*
MA				
Plural inflections	90.89 (9.96)	88.48 (11.32)	93.72 (7.36)	1.90
Possessive inflections	94.22 (13.51)	91.77 (15.89)	97.10 (9.60)	1.40
Root extraction	85.20 (25.49)	83.70 (24.83)	86.96 (26.70)	0.45
Analogy derivations	65.50 (33.46)	49.07 (32.88)	84.78 (22.28)	4.41***
Construct formation	96.00 (12.12)	96.30 (11.15)	95.65 (13.43)	-0.19

*$p<.05$, **$p<.01$, ***$p<.001$

Table 2 shows correlations between the study variables. Positive significant correlations were found between word recognition and reading comprehension. Achievements in the test's morphological parts were not linked to one another, except for plural inflections with the root extraction. Positive correlations were found between the scores in the morphological variables (possessive inflections, root recognition and analogy derivations). They were not significant for construct formation.

Table 2.
Correlations between the study variables (N = 50).

	WR	PD	Plural	Posse-ssive	RE	AD	Construct Formation
Reading comprehension	.37**	.56***	.20	.38**	.34*	.23	.05
Word recognition (WR)		.61***	.36*	.28*	.33*	.38**	.19
Phonological decoding (PD)			.27	.42**	.34*	.33*	-.09

	WR	PD	Plural	Posse-ssive	RE	AD	Construct Formation
Plural inflections				.16	.37**	.21	-.05
Possessive inflections					.25	.20	-.14
Root extraction (RE)						.08	-.04
Analogy derivations (AD)							.03

*p<.05, **p<.01, ***p<.001

4.1. The Contribution of MA to Reading

The first hypothesis assumed a positive correlation between MA and word recognition and reading comprehension in both grade levels. Three multiple regressions, where the dependent variables were reading comprehension, orthographic recognition and phonological decoding, were conducted (Table 3). In the first stage, the age group was entered, and in the second stage, the MA measures were entered.

Table 3.
Multiple regressions of word perception and reading comprehension on the age group and MA (N = 50).

	Reading comprehension			Orthographic recognition			Phonological decoding		
	B	SE	β	B	SE	β	B	SE	β
Step1									
Age group	1.98	5.86	.05	23.29	5.32	.54***	13.03	5.71	.32*
Adj.R^2		.001			.27***			.08*	
Step2									
Age group	-7.88	5.93	-.20	17.94	5.85	.41**	6.88	6.20	.17
Plural	0.14	0.28	.07	0.26	0.27	.12	0.12	0.29	.06
Possessive	0.48	0.19	.33*	0.18	0.19	.11	0.45	0.20	.29*
Root	0.22	0.11	.28*	0.25	0.11	.27*	0.24	0.11	.29*
Derivations	0.19	0.09	.31*	0.05	0.09	.08	0.07	0.09	.10
construct formation	0.20	0.20	.12	0.39	0.20	.22	-0.04	0.21	-.02
Adj.ΔR^2		.27**			.13*			.17*	
Model	Adj.R^2 = .27, F(6, 43) = 3.90, p = .004			Adj.R^2 = .40, F(6, 43) = 6.43, p < .001			Adj.R^2 = .25, F(6, 43) = 3.72, p = .005		

*p<.05, **p<.01, ***p<.001

All regression models were found to be distinctive. 27% of the variance in reading comprehension, 40% of the variance in orthographic recognition and 25% of the variance in word phonological decoding were explained by age group and MA. Possessive inflection, root extraction and analogy derivations were found to significantly predict reading comprehension. Age group and root extraction significantly predicted the score in the orthographic word recognition, indicating that for fourth graders, the higher the score in root extraction, the better the orthographic word recognition. Furthermore, possessive inflections and root extraction significantly predicted phonological decoding, indicating that as possessive inflection and root extraction enhance, the phonological decoding improves.

4.2. Reading Achievements of Readers with High and Low MA

A K-Means Cluster Analysis was conducted to classify the students by high and low MA. Students were divided into low MA (n = 21) and high MA (n = 20). Table 4 shows group differences in the five morphological tests, corroborating group classifications. Groups significantly differed on plural, possessive, root extraction and analogy derivations, but not in construct formation.

Table 4.
Means, standard deviations and t test values for the morphological test sequences by group (N=50).

Variable	Low MA M (SD)	High MA M (SD)	Variance T(48)
Plural	84.66 (10.82)	95.40 (6.31)	4.08***
Possessive	87.83 (18.56)	98.85 (4.55)	2.66*
Root extraction	72.38 (33.75)	94.48 (10.55)	2.90**
Analogy derivations	36.90 (23.21)	86.21 (22.74)	7.50***
Construct formation	97.14 (9.56)	95.17 (13.79)	0.56

**p<.05, **p<.01, ***p<.001*

In the third grade 59.3% of the students (*n* = 16) have low MA and 40.7% *(n* = 11) have high MA. In the fourth grade 21.7% (*n* = 5) have low MA, and 78.3% (*n* = 18) have high MA ($p = .007$, $\chi^2(1) = 7.18$). Differences in reading achievements between the groups were examined by using a MACNOVA analysis according to the MA classification group, with age group as a covariate variable (Table 5).

Table 5.
Means, standard deviations and F values for the perception of the word and reading comprehension, according to MA classification (N = 50).

Variable	Low MA	High MA	Variance
	M	*M*	$F(1, 47)$
	(*SD*)	(*SD*)	(η^2)
Reading comprehension	55.32	70.05	8.76**
	(20.38)	(18.20)	(.157)
Orthographic recognition	56.83	73.79	2.75
	(21.97)	(18.85)	(.055)
Phonological decoding	70.16	91.49	8.72**
	(28.25)	(10.82)	(.156)

*p<.05, **p<.01

Results were significant ($p = .019$,$\eta^2 = .196$). Reading comprehension and word phonological decoding of students with high MA were better than those with lower MA. No significant differences were found for orthographic recognition.

5. DISCUSSION

The current study examined the contribution of MA to reading (orthographic recognition and phonological decoding) and reading comprehension among third and fourth graders while also examining whether this contribution changes by MA levels. Findings indicate that possessive inflections, root extraction and analogy derivations significantly predict reading comprehension. Root extraction also significantly predict orthographic recognition among fourth graders. MA also helped in phonological decoding, suggesting that the use of a morphological unit also stimulates phonological knowledge (Abu-Rabia, 2007; Taha, 2013).

Findings are in line with previous studies conducted in other languages (Carlisle, 2003; Carlisle & Fleming, 2003; Gonter-Gaustad & Kelly, 2004; Kirk & Gillon, 2009; Kuo & Anderson, 2006; Rispens et al., 2007) and in Arabic (Abu-Rabia, 2007; Vaknin-Nusbaum & Saiegh-Haddad, 2020), indicating that MA has an important role in reading. The current study elaborates that MA contributes to reading in Arabic at different levels: orthographic recognition, word decoding and reading comprehension. It can be assumed that the morphological complexity of Arabic and its shallow representation in print encourage the reader to lean on morphemes while reading (Abu-Rabia et al., 2003; Abu-Rabia & Taha, 2004, 2006; Saiegh-Haddad & Taha, 2017; Saiegh-Haddad, 2018; Vaknin-Nusbaum & Saiegh-Haddad, 2020). By decomposing words into their morphemes, the reader can retrieve a word's meaning. This strategy can also be effective along the process of decoding unfamiliar words which are composed of familiar morphemes. Because the root provides the core meaning of the word, a process of morphological decomposition can encourage access to orthographic, phonological and semantic knowledge that provides the meaning of the word

(Abu-Rabia, 2007; Taha, 2013). As a result, the process of reading words is facilitated (Carlisle, 2003; 2010; Carlisle & Fleming, 2003; Carlisle & Stone, 2005; Gonter-Gaustad & Kelly, 2004; Kuo & Anderson, 2006; Nagy et al, 2006; Ravid & Malenky, 2001).

Another explanation for the contribution of MA to reading is that morphemes are more consistent and easier to remember than orthographic units (Carlisle, 2003; Tong et al., 2011). The current study indicated that 40% of the variance in orthographic recognition and 25% of the variance in phonological decoding are explained by MA and age group. Awareness of possessive inflections as well as awareness of the root morpheme and analogy derivations were found to have a significant positive correlation with word recognition. MA contributed to reading comprehension, explaining 27% of the variance in reading comprehension. Possessive inflections, root extraction and analogy derivations significantly predicted reading comprehension. Although most previous studies did not examine different types of MA, current findings are in line with findings obtained in European languages (Carlisle, 2000; Deacon & Kirby, 2004; Kieffer & Lesaux, 2008; Gilbert, Goodwin, Compton, & Kearns, 2014) and in Arabic (Abu-Rabia et al., 2003; Abu-Rabia, 2002, 2007; Mahfoudhi et al., 2010). It appears that students use their MA to better comprehend the text they read. The fact that different types of MA predicted success in reading comprehension may indicate that reading comprehension is a complex task that requires diversified reading of morphologically complex words. This is especially relevant due to the tendency of Arabic to be morphologically dense and unite several grammatical and syntactic morphemes into a single word. It seems that for the purpose of reading comprehension, third and fourth grade readers employ different and varied types of MA.

With the improvement in reading fluency, readers' attention resources are shifted to words' morphological structures, and they use morphology to retrieve their meanings (Bar-on & Ravid, 2011; Gonter-Gaustad & Kelly, 2004). When the phonological decoding becomes automatic, readers can divert their reading resources to the morphemic structure of the written word and thus develop their MA further. While in other languages the contribution of complex MA to reading comprehension is mostly evident in the higher elementary school grades and middle school (Verhoeven & Perfetti, 2011), in Arabic, its contribution is evident earlier (Vaknin-Nusbaum & Saiegh-Haddad, 2020).

5.1. Low MA and Reading Difficulties

The current study examined differences in reading skills between students with low and high MA. The main difference was observed in derivations, which is considered more complex than inflections. In derivations, in addition to identifying morphemes, the reader must manipulate and build a new form, while extracting the root and placing it into a different phonological pattern. Inflections, on the other hand, are formed by a simpler linear formation.

Students with low MA demonstrated weaker abilities in phonological decoding and reading comprehension than readers with high MA. These findings support the hypothesis that MA in Arabic is a key factor in reading in elementary school students (Abu-Rabia et al., 2003; Abu-Rabia & Taha, 2004, 2006). Thus, MA can also be used as a differentiating factor between typical and struggling readers. These findings are in line with findings from other languages showing a correlation between poor reading achievement and difficulties in identifying morphemes and manipulating them (Fowler & Liberman, 1995; Kirk & Gillon, 2009; Tong et al., 2011).

It seems that students with high morphological ability are more skilled at identifying morphemes in morphologically complex words. These morphemes also encourage the phonological and semantic knowledge of the word, leading to the production of the meaning of words in the text, and ultimately to understanding. When the morphemes contained in the word are more familiar and frequently used, the written words are identified more quickly (Carlisle, 2000; Fowler & Liberman, 1995; Taha, 2013).

6. CONCLUSION

Findings of the current study support the hypothesis that third and fourth grade Arabic readers lean on morphological strategy when reading and likely develop awareness of the morphemic structure of the written word, parallel to the development of reading and improvement in fluency. In this study, the derivational awareness score doubled between the third and fourth grade. This sensitivity is made possible because as the grapheme-phonemic decoding is automated, attentive resources can be assigned to identifying meaningful morphemes (Bar-on & Ravid, 2011). The experience in identifying and dismantling complex words into morphological units that compose them helps in decoding and learning new and complex words, and ultimately contributes to the quantity and quality of the lexical representation of written words (Verhoeven & Perffeti, 2011) and to improvement in reading fluency (Mahfoudhi et al., 2010).

The contribution of MA to reading can be affected by the language's morphological complexity (Abu-Rabia et al., 2003; Abu-Rabia, 2007; Abu-Rabia & Taha, 2004, 2006) and the characteristics of the writing system (Verhoeven & Perfetti, 2011). Third and fourth grade Arabic speakers read non-voweled orthography; therefore, it is possible that they require MA to compensate for the missing phonological representation in print. Another possibility is that the transparency of morphemes in the Arabic writing system encourages the reader to use MA in reading (Vaknin-Nusbaum & Saiegh-Haddad, 2020). Finally, the fact that Arabic morphology is considered complex and that children are exposed to it at an early age can also strengthen the awareness of morphemes and their use in the reading process as early as in elementary school. Future studies might examine developmental aspects of the contribution of MA to inflections, derivations and reading comprehension in Arabic in higher grades of elementary school, as well as the effectivity of intervention programs aimed to improve reading by developing MA and its various aspects.

Some limitations to this research should be noted. First, to better understand the unique contribution of each morphological aspect of reading, a larger group of participants is needed. Second, verbal variables such as vocabulary should be taken into consideration since there is a link between MA and vocabulary knowledge.

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AUTHORS' INFORMATION

Full name: Bahaa' Makhoul
Institutional affiliation: Oranim Academic College of Education
Institutional address: Oranim College of Education, Tivon 3600600, Israel
Biographical sketch: Dr. Baha Makhoul is a senior lecturer and researcher at Oranim Academic College, and senior researcher in Edmond J. Safra Brain Research Centre for the Study of Learning Disabilities at Haifa University. Until 2020 She served as a senior academic consultant at the NCJW (Research Institute for Innovation in Education). Since 2007, she is the head for the Arabic language section at the Centre for Educational technology (CET). Recently, she became an affiliated Faculty Member of the Media Education Lab at the Harrington School of Communication and Media, University of Rhode Island. Dr. Makhoul is currently cooperating with both national and international leading researchers in the field of literacy, Digital Media Literacy and education.

Full name: Vered Vaknin-Nusbaum
Institutional affiliation: Western Galilee Academic College; University of Haifa.
Institutional address: Western Galilee Academic College, Akko 2412101, Israel; Abba Houshi Bvd 199, Haifa 3498838, Israel.
Biographical sketch: Prof. Vaknin-Nusbaum is an associate professor in the Department of Education, Western Galilee College, and a research associate at the University of Haifa. She is the head of the Education Department and the head of the Literacy Center for Education. She teaches undergraduate and graduate students in topics related to reading, reading acquisition, and learning disabilities. Over two decades, she systematically studied the processing of written language and the way specific characteristics of the Hebrew orthography and morphology modify the reading process. In the past 6 years, she collaborated with international researchers to investigate the communicative strategies of effective elementary teachers. This research was accepted as a WERA International Research Network. Her areas of interest are reading acquisition; reading comprehension; literacy and emergent literacy; poor readers; morphological awareness; attitudes towards language; and communicative strategies in class.