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The Linguistic Affiliation Constraint and phoneme recognition in diglossic Arabic*

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ABSTRACT

This study tested the effect of the phoneme's linguistic affiliation (Standard Arabic versus Spoken Arabic) on phoneme recognition among five-year-old Arabic native speaking kindergarteners ($N = 60$). Using a picture selection task of words beginning with the same phoneme, and through careful manipulation of the phonological properties of target phonemes and distractors, the study showed that children's recognition of Standard phonemes was poorer than that of Spoken phonemes. This finding was interpreted as indicating a deficiency in the phonological representations of Standard words. Next, the study tested two hypotheses regarding the specific consequences of under-specified phonological representations: phonological encoding versus phonological processing. These hypotheses were addressed through an analysis of the relative power of distractors. The findings revealed that children's difficulty in accessing Standard Arabic phonemes was due to a difficulty in the phonological encoding of Standard words. We discuss the implications of the findings for language and literacy development in diglossic Arabic.

Research spanning the last three decades has made it clear that phonemic awareness is a universally significant predictor of reading in an alphabetic orthography (for a review, see Adams, 1990; Goswami & Bryant, 1990; Ziegler & Goswami, 2005). Nonetheless, the nature of the construct of

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phonemic awareness remains rather under-researched. For instance, although there has recently been an upsurge in our understanding of the structural factors that affect phonemic awareness task performance (e.g. Saiegh-Haddad, 2007b; Schreuder & van Bon, 1989; Stanovich, Cunningham & Cramer, 1984; Stahl & Murray, 1994; Treiman & Weatherson, 1992; Yopp, 1988), it is not yet clear whether this construct may be better conceived of as a universal cognitive skill, or whether it may be more accurately qualified as a language-specific linguistic skill (Saiegh-Haddad & Geva, 2008; Saiegh-Haddad, Kogan & Walters, in press). This is a central question in the psycholinguistics of reading and it has significant practical implication as well.

Phonemic awareness may be operationally defined as the ability to manipulate the phonemic structure of spoken words. It reasonably follows that phonemic awareness task performance may vary with the identity of the specific phoneme targeted. This is a particularly tenable hypothesis as phonemes differ in their phonological profile and, as a result, in their salience and accessibility. The effect of phoneme identity on phonemic awareness has been investigated by testing children's sensitivity for phonemes that differ in their phonological profile. This research has endorsed a concept-based view of phoneme awareness (Byrne & Fielding-Barnsley, 1990; Thomas & Senechal, 2004). According to this view, phoneme awareness is not merely a mechanical operation, nor is it an all-or-none phenomenon. Rather, it is affected by the identity of the target phoneme that candidates are required to operate on.

The current study aims to test the effect of phoneme identity on phoneme recognition in diglossic Arabic. Phoneme identity is defined in the current study based on whether it is present or absent from the children's specific spoken vernacular, rather than on the basis of the phoneme's phonological profile. The study aims to examine whether children's phoneme recognition will vary as a function of the phoneme's identity: Modern Standard Arabic (hereafter, MSA) phonemes versus Spoken Arabic Vernacular (hereafter, SAV) phonemes. Earlier research has addressed this question using phoneme segmentation tasks, the most widely used tests of phonological awareness. Yet these tasks require phonological production (Saiegh-Haddad, 2003; 2004; 2007a). Thus, even though these studies tested only those children who could accurately articulate the target phonemes, in particular the critical MSA phonemes, the possibility that phonological production at the output phonological stage played a role in the observed difficulty with MSA phonemes was difficult to rule out. In the light of that, the current study aimed to test the effect of phoneme identity (MSA versus SAV) on a phoneme recognition task that does not require phonological production. Two reasons make this examination highly warranted. First, it helps demarcate the phonological processing skills and

operations that are sensitive to differences in phoneme identity. Second, it makes possible the inclusion of all children, rather than testing only those with proper articulation, probably because of high degrees of exposure to MSA. The current study will also test two possible hypotheses regarding the specific source of children's difficulty in accessing MSA phonemes: phonological encoding difficulty versus phonological processing difficulty. In the following section we will describe the diglossic context of Arabic and will review earlier research on the effect of the phonological distance between MSA and SAV on the acquisition of basic phonological processing skills in children.

Diglossia and phonological processing in Arabic native speaking children

Arabic native speaking children are born into a dual linguistic context called DIGLOSSIA (Ferguson, 1959). In diglossic Arabic, children grow up speaking the specific Spoken Arabic Vernacular used by their parents, siblings and peers at home and in the neighborhood. At school they are formally and extensively exposed to another, linguistically related yet remarkably different, linguistic code, Modern Standard Arabic. This code is taught to children within the Arabic language class almost as a foreign language (Ayari, 1996), with focus placed on the literary skills of reading and writing and on grammatical knowledge and linguistic accuracy. Being the only written code, Modern Standard Arabic is also the language of the textbooks used in all school subjects. In contrast, the spoken vernacular is the oral language of school and instruction. Outside the school milieu, too, there is a rather stable co-existence of these two linguistic codes for serving complementary sets of social functions: Spoken Arabic, typically only oral and used for performing informal everyday conversational functions, and Modern Standard Arabic, a modern descendent of CLASSICAL ARABIC, used for writing and for the performance of formal linguistic functions such as religious sermons, speeches, news broadcasts, etc.

Notwithstanding the fact that extensive exposure to MSA begins with the inception of formal schooling and reading instruction in the first grade, it is a common misconception to think that diglossia surfaces practically only when children enter school and that preliterate children are exposed to the spoken variety only. Arabic native speaking children are born within this dual linguistic context, and their language ability develops in the context of this linguistically complex reality. The language they are surrounded by is primarily Spoken Arabic. Yet they hear their parents pray only in Standard Arabic and their siblings do their homework and study for their exams largely in Standard Arabic too. They watch some TV programs and dubbed series in Standard Arabic. And, if they are fortunate enough and have parents who are literate and who realize the importance of exposing their

children to the language of literacy, they will be read stories to in Standard Arabic. Hence, even though the oral discussions that children may engage in about concepts or topics that have been delivered to them in MSA (e.g. texts they read, programs they watched, exams they took, etc.) will be in Spoken Arabic, especially phonologically and morphosyntactically, children will also integrate MSA words. Such a code-mixed variety combining the lexicon of Standard Arabic with the phonology and the morphosyntax of Spoken Arabic is typical of literacy-based oral speech in Arabic, especially as literacy-based MSA words do not have corresponding spoken vernacular words.

MSA is a predominantly uniform code (Holes, 2004). In contrast, spoken Arabic vernaculars are mainly regional varieties and they vary from one country to another and from one city, town or village to another. Despite the vast linguistic differences between the different spoken Arabic vernaculars, all spoken vernaculars are structurally related to Standard Arabic. At the same time, a contrastive linguistic analysis of SAV and MSA always reveals differences in all domains of language, including the phonological, morphosyntactic and lexical–semantic domains.

Given the linguistic distance between Spoken and Standard Arabic, it is possible to affiliate a given linguistic structure in Arabic with either (a) SAV only, (b) MSA only or (c) MSA-and-SAV. This classification may be applied to all domains of language. In the domain of phonology, in particular, Arabic phonemes may be Spoken-only, Standard-only or Spoken-and-Standard. Spoken-only phonemes are used in a specific vernacular but are not within the phonemic inventory of Modern Standard Arabic (such as /ʃ/ in some rural vernaculars). Standard-only phonemes are the phonemes that are within Modern Standard Arabic but which are not within a given SAV. These phonemes will be termed, in this study, 'Standard' phonemes; Spoken-and-Standard phonemes are the Spoken vernacular phonemes that are also within Standard Arabic. These phonemes will be termed 'Spoken' phonemes. Both Standard-only and Spoken-and-Standard phonemes have conventional letters that represent them in Arabic orthography. In contrast, Spoken-only phonemes do not have corresponding letters in the Arabic alphabet. It is noteworthy that membership in the categories outlined above is SAV-specific and may vary from one vernacular to another. Yet all three categories occur in all vernaculars. This is because, although Standard and Spoken Arabic varieties share a large number of phonemes, no SAV has exactly the same set of phonemes as MSA (Maamouri, 1998).

The phonological distance between MSA and SAV implies that Standard phonemes may not be familiar to children when they embark upon the acquisition of reading in the first grade. Hence, initial reading acquisition might require the acquisition of the phonological representation of these

phonemes as well as their orthographic representation. Three factors may contribute to making this a formidable task. The first is that the acquisition of Standard phonemes requires the construction of novel phonemic categories not existent in the young child's phonological system. The second is that Standard phonemic categories are usually marked, like inter-dental and emphatic phonemes, and are phonetically very similar to other unmarked phonemes in the system. Finally, Spoken and Standard phonemes have distinct letters that represent them in the Arabic alphabet and, as a result, inaccurate phonological representation of Standard phonemes might result in children confusing Standard phonemes with Spoken phonemes, and in difficulty linking the different phonemes with the specific letters that represent them.

The direct effect of the phonological distance between Standard and Spoken Arabic on the acquisition of basic language and literacy skills has only recently begun to attract attention. Saiegh-Haddad (2003) tested kindergarten (five-year-old) and first-grade (six-year-old) children's phonemic awareness (using an initial and final phoneme isolation task) of Spoken phonemes as against Standard phonemes. It was hypothesized that, due to reduced exposure and practice with Standard Arabic phonemes, children would find Standard phonemes more difficult to isolate than Spoken phonemes. It was also hypothesized that phonemes embedded within Standard word syllabic structure would be more difficult to access than those embedded within Spoken syllabic structure. These predictions were expected to hold even after children's production of Standard phonemes has normalized and even when they do not demonstrate any difficulty articulating Standard phonemes (Thomas & Senechal, 2004). Because it was necessary to control for articulation difficulties, the study tested those children who showed no difficulty articulating Standard phonemes when presented in isolation. The results showed that, despite proper articulation of Standard phonemes, kindergarteners had more difficulty isolating Standard than Spoken phonemes from within pseudo-words. Also, phonemes embedded within a Standard syllabic structure were more difficult than those embedded within a Spoken syllabic structure. It was also found that first-grade children had more difficulty decoding pseudo-words embodying MSA than SAV phonemes.

As explicated above, some Standard words may be composed of Spoken phonemes only, in which case linguistic affiliation with MSA is based on the lexical representation of the word only. That is, on whether the word is considered to be an SAV word or an MSA word. For example, the word /ħaṭ/ 'he put' is the spoken form of the Standard verb /waḍaʔa/, yet both words are composed of Spoken phonemes. Alternatively, a given MSA word may encode Standard phonemes as well as Spoken phonemes. In this case, even though a cognate word may exist in Spoken Arabic, the linguistic

affiliation of the word with MSA will be based on the phonological structure of the word, such as on the presence of a Standard phoneme in the word. For instance, the word 'gold' in Arabic has two cognate forms: Standard /ðahab/ and Spoken /dahab/. The two forms vary only in the initial phoneme: Standard /ð/ versus Spoken /d/. This unique characteristic, in which affiliation with MSA or SAV is not based only on the lexical representation of the word but also on its phonological structure, allows a linguistic unpacking of word familiarity, or word knowledge, in Arabic. In other words, unfamiliarity with a specific word can be traced back to at least three sources: (a) lack of familiarity with the lexical representation of the word (this usually coincides with lack of familiarity with the full phonological representation of the word as well); (b) lack of familiarity with the phonological representation of the word; or (c) lack of familiarity with both the lexical and the phonological structure of the word.

Saiegh-Haddad (2004) tested the role of the lexical status of the stimulus word: Spoken word, Standard word and pseudo-word on Standard and Spoken phoneme isolation among kindergarten (five-year-old) and first grade (six-year-old) children. All words were equated on phonemic length and syllable structure. The Spoken words were high-familiarity words that had identical forms in Spoken and Standard Arabic. The Standard words had cognate forms in the spoken vernacular and were derived from the first-grade reading primer. The pseudo-words were nonce words that were constructed according to the phonotactic (syllable structure) rules of Standard Arabic and by changing one or two phonemes within real words. The results of the study showed no effect of the lexical status on phoneme isolation when the target phoneme was a Spoken Arabic phoneme. However, when Standard and Spoken phonemes were compared, it was found that all children had more difficulty isolating Standard than Spoken phonemes, and kindergarten children had more difficulty isolating Standard phonemes embedded within Standard words than Standard phonemes embedded within pseudo-words. This finding was unexpected and gave rise to the hypothesis that the problem children might have in accessing Standard phonemes may be interference from the phonological representation of Standard words in the children's spoken vernacular. Because pseudo-words do not have competing cognate forms in the children's vernacular, they were easier to operate on than Standard words. This hypothesis is directly tested in the present study.

As previous studies were conducted within the same Spoken Arabic vernacular, the external validity of the finding that Standard phonemes are more difficult to access than Spoken phonemes could not be fully demonstrated. To test the cross-dialectal validity of this finding, Saiegh-Haddad (2007a) compared the phoneme isolation performance of first-, second- and third-grade children speaking two regionally different

Spoken Arabic vernaculars. One was the vernacular that had been targeted by earlier research and in which four Standard phonemes (three inter-dental fricatives: voiced, voiceless and emphatic, and one uvular) were not spoken phonemes. Yet all the same four phonemes were within the second vernacular tested. The results showed that the same phoneme may be associated with different degrees of difficulty, depending on whether it is or it is not within the child's spoken vernacular. This factor, formalized as the LINGUISTIC AFFILIATION CONSTRAINT, was found to reliably predict children's phoneme isolation performance between kindergarten and the second grade. Yet it fell below satisfactory levels of statistical significance in the third grade.

Hence, children were shown to manifest greater difficulty isolating Standard phonemes as against Spoken phonemes, especially when embedded within Standard syllables and Standard words. These findings imply a deficiency in the phonological representations of Standard words and in their segmental organization and accuracy. According to the PHONOLOGICAL REPRESENTATIONS HYPOTHESIS (Elbro, 1996; 1998; Fowler, 1991; Goswami, 2000; Swan & Goswami, 1997a; 1997b), phonological processing depends on the accuracy of the underlying phonological representations of words and on the segmental organization of those representations; fuzzy and under-specified representation disrupts phonological processing. As the accuracy and the segmental organization of phonological representations is word-specific and depends on familiarity and experience with words (Perfetti, 2007; Walley, Metsala & Garlock, 2003), it logically follows that, given the limited exposure, practice and active use of Standard words, the phonological representation of Standard words may be less crystallized than the phonological representation of Spoken words. If this is so, and if inaccurate phonological representation is to blame for the observed difficulty in isolating Standard phonemes, it follows that Standard phonemes should be less accessible in a recognition task, too, and even when no phonological production is required. One objective of the current study is to test this hypothesis.

A second objective of the study is to examine two hypotheses regarding the specific processing consequences of a deficient phonological representation. The first is the PHONOLOGICAL ENCODING DIFFICULTY HYPOTHESIS, according to which the difficulty lies in the encoding of the full segmental phonological representations of Standard words in long-term memory. If this hypothesis is valid, children are expected to find Standard phonemes harder to recognize when they are presented with phonetically neighboring Spoken phonemes. The second hypothesis is the PHONOLOGICAL PROCESSING INTERFERENCE HYPOTHESIS, according to which the difficulty lies in the re-activation of a fully specified phonological representation and occurs as a result of interference from the Spoken representation of the word. If this hypothesis is correct, phonetically neighboring phonemes should

not undermine the recognition of Standard phonemes, especially as no phonological production is required. Instead, cognate phonemes – the specific phonemes that usually correspond to the Standard phonemes in the specific Spoken vernacular – should be more powerful distractors. Although difficulties in both encoding and processing are logically possible, they are still distinct (Katz, 1986). This distinctness may be tapped in the testing of phonemic awareness in Arabic. This is because, as already explicated, the two hypotheses make different predictions about the various phonemes' relative power of distraction.

METHOD

Participants

The sample of the study consisted of 60 Arabic native speaking kindergarten children (28 boys and 32 girls; age range: 4;6–5;8). Half of the children ($N = 30$) came from an Arab village in the north of Israel and the other half ($N = 30$) came from a mixed Arab–Jewish town in the center of the country. The phonemic inventories of the two vernaculars spoken by the two groups of children are identical. No child in the sample was reported to have had language delay or any other cognitive, emotional or behavioral problems. All children came from a low socioeconomic background.

Material

The study tested phonemic awareness using a phoneme recognition task. Children were presented with triplets of pictures, a target at the top and two options at the bottom, which represented line drawings of highly familiar objects. The task required children to point to the picture at the bottom which represented a word beginning with the same sound as the target picture at the top. The words that the target pictures in the testing triplets used were all familiar in their Spoken form and were of two types: (a) words that began with a Spoken phoneme and (b) words that began with a Standard phoneme. The two options in the first category of items, the words beginning with Spoken phonemes, were of two types: a word that began with the same Spoken phoneme as the target word (correct response), and a distractor word that began with a phonetically neighboring phoneme within the child's spoken vernacular. As recognition of phonemes that were within the spoken vernacular of children was expected to be rather easy, a very close phonetic neighbor distractor was selected that was similar to the target Spoken phoneme in both place and manner of articulation but which was different from it only in voicing (e.g. target word /**z**ʊʒæːʒə/ 'bottle', correct response /**z**araːfi/ 'giraffe' and distractor /**s**ayyaːrə/ 'car').

The second set of items employed target words that began with an MSA phoneme, and which had otherwise identical phonological representations

in both Spoken and Standard Arabic. There were two types of triplets within this set. The first consisted of a target word that began with a Standard phoneme followed by two options: one beginning with the same Standard phoneme as the target word (correct response), and a distractor word that began with the Spoken cognate phoneme (e.g. target word /**ð**ɪʔib/ 'wolf', correct response /**ð**anab/ 'tail' and distractor /**d**araʒ/ 'stairs'). The second set consisted of a target word that began with a Standard phoneme followed by two options: one beginning with the same Standard phoneme as the target word (correct response), and a distractor word that began with the closest phonetic neighbor to the Standard target phoneme, which is within the child's spoken vernacular, but which is not the Spoken cognate phoneme (e.g. target word /**θ**aʕlab/ 'fox', correct response /**θ**ʊʕbæːn/ 'snake' and distractor /**s**ɪnʒæːb/ 'squirrel'. All Spoken phonetic neighbors in this category were the alveolar equivalents of the inter-dental Standard phonemes which were equated with them on the features of voicing, manner of articulation and post-velar articulation. No other phonetic neighbors within the front articulation region were available. It is noteworthy that the choice of phonetic neighbors was largely imposed by the phonological system of Arabic. Hence, it was not possible to equate the type of phonetic neighbors presented with Spoken versus Standard phonemes. For example, while in the case of Spoken phonemes it was possible to employ the closest phonetic neighbor that varied only in voicing (e.g. /**s**/ and /**z**/), it was not possible to do the same in the case of Standard phonemes. This is because, in the case of Standard phonemes, the voiceless phonetic neighbor equivalent to the voiced inter-dental fricative /**ð**/ is also a Standard phoneme /**θ**/. Similarly, the voiced dental phonetic neighbor of it is the Spoken cognate phoneme /**d**/. This leaves the voicing equivalent alveolar fricative of Standard phonemes the only remaining phonetic neighbor (see Appendix).

All words within the triplets had a similar syllabic structure (monosyllabic CVC or bisyllabic CVCVC/CVCCVC) and employed the same prosodic template. In order to preempt floor (or chance) levels of performance, and in order to produce sufficient variability in the performance of children, in half of the items the vowel that followed the target phoneme was the same in all three words within the triplet. In the other half, this vowel was different in the target word from the corresponding vowel in the two options.

Procedure

Children were presented with triplets of pictures that represented line drawings of highly familiar objects that all children were familiar with from their spoken vernacular. Familiarity with the objects in the pictures was verified in a pre-test with the children. The three pictures were presented

TABLE 1. *Children's phoneme recognition by item category; one-sample* t*-test analysis*

Item category	Mean	*SD*	50% *t*-test
Spoken phoneme – Spoken phonetic neighbor distractor	78·33	(25·81)	8·50*
Standard phoneme – Spoken phonetic neighbor distractor	57·22	(19·49)	2·86*
Standard phoneme – Spoken cognate distractor	67·22	(19·26)	7·03*

* $p < .001$

in a triangular form on a 4×4 panel. The target picture was placed at the top of the panel and two additional pictures were placed at the bottom. The experimenter named the three objects represented in the three pictures allowing a two-second interval between adjacent words, and beginning with the target word at the top and followed by the other two at the bottom, from right to left. Then candidates were asked, for each triplet, to point to the picture at the bottom that represented a word beginning with the same sound as the word represented in the target picture at the top. Pictures were used in order to support the maintenance of the phonological representation of words in working memory during phonological processing. No phonological production was required on the part of children.

The children were tested individually in a separate room annexed to the classroom, in a quiet atmosphere. Two female graduate students in education, who spoke the same Arabic vernacular as the children tested, functioned as experimenters. Testing was carried out in one session that lasted for approximately 15 minutes. Each child was given two practice trials using Spoken Arabic phonemes in the target words and distractors beginning with phonetically distant Spoken Arabic phonemes. All children completed all 15 experimental trials (5 trials per item category, see Appendix), intermixed and administered in the same order for all children.

RESULTS

The performance of children on the three types of items was converted into percent correct scores. Table 1 presents means and standard deviations of the performance of children on the phoneme recognition task by item category: (a) Spoken target phoneme – Spoken phonetic neighbor distractor; (b) Standard target phoneme – Spoken phonetic neighbor distractor; and (c) Standard target phoneme – Spoken cognate phoneme distractor. Table 1 also summarizes the results obtained from a series of one-sample *t*-test analyses testing whether the means were significantly different from the 50% level of guessing.

As the study tested children in two data collection sites who spoke phonemically similar spoken Arabic vernacular, the first analysis addressed the null hypothesis regarding differences in the general level of phoneme recognition between the two groups. Univariate analysis of variance showed no significant difference between the two groups. Hence, the following analyses will be conducted on the total sample of children.

The next analysis compared children's performance ($N=60$) on the first category of items, which required children to recognize Spoken phonemes only, as against the second and third categories combined, which required children to recognize Standard phonemes. An ANOVA with repeated measures on items category, Spoken versus Standard phonemes, showed a main effect of item category ($F(1, 59)=22{\cdot}39$, $p<{\cdot}001$), with the recognition of Standard phonemes being significantly more difficult for children than the recognition of Spoken phonemes ($x=62{\cdot}36$, $SD=15{\cdot}60$ and $x=78{\cdot}33$, $SD=25{\cdot}81$, respectively).

In the next analysis we probed whether there were differences in phoneme recognition for Spoken versus Standard phonemes when both were presented with phonetic neighbor distractors. This analysis compared the items in the first category with the items in the second category. An ANOVA with repeated measures on item type (Spoken target phoneme – Spoken phonetic neighbor distractor versus Standard target phoneme – Spoken phonetic neighbor distractor) showed a main effect of item category ($F(1, 59)=32{\cdot}88$, $p<{\cdot}001$), again with Standard phonemes more difficult to recognize than Spoken phonemes ($x=57{\cdot}22$, $SD=19{\cdot}49$ versus $x=78{\cdot}33$, $SD=25{\cdot}81$, respectively).

The last analysis probed whether Standard phoneme recognition was variably affected by two types of distractor: Spoken phonetic neighbor distractor versus Spoken cognate distractor. This analysis compared the items in the second category with the items in the third category. An ANOVA with repeated measures on item-distractor type showed a main effect of distractor type ($F(1, 59)=12{\cdot}00$, $p<{\cdot}001$), with Spoken phonetic neighbor distractors yielding significantly lower phoneme recognition scores than Spoken cognate distractors ($x=57{\cdot}22$, $SD=19{\cdot}49$ and $x=67{\cdot}50$, $SD=19{\cdot}26$, respectively).

DISCUSSION

The first objective of the study was to test whether phoneme recognition in Arabic was affected by the linguistic affiliation of the target phoneme (Standard versus Spoken). It was found that Standard phonemes were more difficult for children to recognize than Spoken phonemes. This finding consolidates and extends the results obtained from earlier research using phoneme production tasks (Saiegh-Haddad, 2003; 2004) and endorses the

external validity of the Linguistic Affiliation Constraint (Saiegh-Haddad, 2007a) in predicting phoneme awareness in diglossic Arabic. According to the Linguistic Affiliation Constraint, the same phoneme may be associated with variable degrees of awareness depending on whether it is absent from or present in the specific spoken vernacular of children. It is noteworthy in this respect that, while the specific identities of Standard phonemes, defined as those phonemes which are not within the specific spoken vernacular of children, may be different in different groups speaking different spoken Arabic vernaculars (because they live in different regions, countries, etc.), earlier research has demonstrated the external cross-dialectal validity of this constraint (Saiegh-Haddad, 2007a).

The results obtained from this study, as well as from earlier studies, point to a possible deficiency in Arabic native speaking children's phonological representations for Standard words and for Standard sublexical phonological units. According to the phonological representations hypothesis (Elbro, 1996; 1998; Goswami, 2000; Swan & Goswami, 1997a; 1997b), phonological processing depends on the accuracy of the underlying phonological representations of words and on their segmental organization. As the quality of the segmental organization of phonological representations is word-specific and depends on familiarity and experience with words (Walley *et al.*, 2003; Perfetti, 2007), it logically follows that the phonological representations of Standard words may be deficient and less crystallized than the phonological representations of spoken words. The results are in accordance with this hypothesis.

Further evidence in support of the phonological representations deficiency hypothesis comes from a comparison of MSA versus SAV phonemes when presented with equally strong phoneme distractors. We hypothesized that if children's difficulty in accessing MSA phonemes was due to phonological representational quality, not only will children find MSA phonemes harder to access than SAV phonemes, as we have already demonstrated, but they will find MSA phonemes harder than SAV phonemes also when both are presented with equally distracting phonetic neighbor distractor phonemes. Phonetic neighbor distractor phonemes, which are very close in articulation to the target phoneme, should make phoneme recognition more difficult. We assumed that phonetic neighbors would be more distracting when the representational accuracy and stability of the target phoneme is deficient: the higher the representational quality of the target phoneme the weaker the effect of the phonetic neighbor distractor. The results of the study showed that, even when both phonemes were presented with equally distracting phonetic neighbors, Standard phoneme recognition was poorer than Spoken phoneme recognition. This finding converges in supporting a low-quality representation of Standard phonemes and Standard words (Elbro, 1996; 1998; Goswami, 2000; Thomas & Senechal, 2004).

It is important to note that the above conclusion is based on the assumption that the three primary phonetic features of articulation – voicing, place of articulation and manner of articulation – have the same level of representational salience, and hence that the number, rather than the type of feature shared by phonemes, determines the proximity of phonetic neighbors from the target phoneme, and hence their power of distraction. In our case, Spoken phonemes were presented with phonetic neighbors that shared with the target phoneme two phonological features – place and manner of articulation – and which were different from them only in voicing (e.g. /t/ vs. /d/). Standard phonemes were also presented with phonetic neighbor distractors that shared two phonological features – manner of articulation and voicing – but which were different only in place of articulation (e.g. /θ/ versus /s/); these were the only choices possible in the case of the specific spoken Arabic vernacular tested. In line with earlier studies, we assumed that phonetic distractors that were different from the target phoneme in only one phonological feature, and regardless of what that phonological feature might be, may be regarded as comparable phonetic neighbors and equally strong distractors (Gerken, Murphy & Aslin, 1995).

While the phonological representations hypothesis appears to be a viable account of the results reported thus far, the second research question addressed two hypotheses regarding the specific processing consequences of a low-quality phonological representation. These two consequences were tested directly through the manipulation of distractors. According to the first hypothesis, children find MSA words (or MSA phonemes within words) harder to access because of difficulty in the phonological encoding and the laying-out of Standard words and sub-word phonological units in long-term memory. If this hypothesis is correct, children's recognition of MSA phonemes should be equally disrupted by any phonetically neighboring phoneme and regardless of its status with respect to their spoken vernacular. This hypothesis makes different predictions from those that the second hypothesis makes, the phonological processing hypothesis. According to the phonological processing hypothesis, children's difficulty does not lie in the quality of the representation of phonological structures but in the re-activation and processing of fully specified representational structures. This hypothesis predicts that children's MSA phoneme recognition would be more disrupted by the spoken cognate phoneme, the phoneme that corresponds to the target MSA phoneme in their spoken vernacular, than by any other phonetically neighboring phoneme. This is because we assumed that processing Standard words would involve an automatic activation of the corresponding cognate word in their spoken vernacular. As the cognate word's SAV phonological structure was different from the target word in the initial phoneme only, it was expected to compete with the cognate word's Standard phonological structure, resulting in interference. In contrast

with this latter prediction, the results of the study showed that spoken cognate phonemes interfered less with the children's MSA phoneme recognition than phonetically neighboring phonemes. This finding implies that children's difficulty in accessing MSA phonemes is primarily due to a difficulty in the phonological encoding of Standard words than it is due to processing interference from the phonological representation of the words in the children's Spoken vernacular.

It is important to treat this latter conclusion with caution, however. This is because it is based on the assumption that all children can readily make the link between the Spoken words presented to them and their Standard forms. In the present study, we ensured that all stimuli words were familiar to children in their SAV form, and that they differed from their MSA form only in the initial phoneme. Despite that, the possibility that some children could not identify the two cognate forms as representing the same word, and hence not activate the cognate word's SAV form, cannot be ruled out (Saiegh-Haddad, 2008). This is a tenable assumption because the children tested in this study all came from a low socioeconomic background. If the amount of exposure to Standard Arabic is associated with the child's socioeconomic and socio-educational background, it is reasonable to find very low levels of exposure to the language of literacy in this group, and hence low levels of awareness of the linguistic relatedness of cognate words. To glean insight into this possibility, the study should be replicated among children with high levels of exposure to MSA, and among older children and adults.

Hence, the results of the study support the hypothesis that Arabic native speaking children have a genuine difficulty in the phonological encoding of Standard words in long-term memory and in their segmental organization and accuracy. Such fuzzy and under-specified phonological representations disrupt phonological analysis and surface even in tasks that do not require phonological production. This finding has very important implications for language development in Arabic and for reading acquisition and instruction. The results indicate that the kind of natural exposure that Arabic native speaking children have, severely limited and primarily passive, may not be sufficient for allowing the construction of high-quality phonological representations for MSA words. Constructing accurate and stable phonological representations enhances word learning and facilitates the acquisition of reading (Perfetti, 2007). Also, establishing high quality phonological representations for Standard words, and for cognate words in particular, should help children become aware of the lexical relatedness between cognate words. It also enables them to utilize the lexical knowledge that they have already developed in Spoken Arabic for literacy development in the Standard language. Cognate words (or paired lexical items) are a predominant linguistic phenomenon in Arabic and they were used by Ferguson (1959) as a defining criterion of a diglossic context. Also, they

have been recently shown to constitute about 40 percent of the lexicon of five-year-old children (Saiegh-Haddad & Ali, in prep.). This highlights the importance of children becoming aware of the linguistic relatedness of cognate words, a skill they may only achieve if they develop high levels of familiarity with the cognate word's phonological and meaning representations in both Standard and Spoken Arabic. Earlier research has shown that such lexical awareness does not develop very early or easily among Arabic native speaking children; four- and five-year-olds were shown to have very low levels of awareness of the linguistic relatedness between the two forms of cognate words, and even when the phonological distance between the two forms constituted a single phoneme, as in /ðahab/ versus /dahab/ 'gold'. It was also found that linguistic awareness of cognates correlated with children's phonological representation accuracy (word repetition) and word retrieval (picture naming) in Standard Arabic (Saiegh-Haddad, forthcoming).

If natural exposure to MSA through TV programs and literacy activities is not sufficient and does not enable children to develop proper levels of the linguistic and metalinguistic processing skills required for reading and language development in the Standard code, it follows that there is a need for structured and explicit intervention. This intervention should involve training in the phonological representations of Standard words, as well as mediation and awareness-raising of the linguistic relatedness between cognate words in MSA and SAV in particular, and between the linguistic system of MSA and SAV in general. Feitelson, Goldstein, Iraqi & Share (1993) demonstrated the positive effect of exposure to MSA in kindergarten, through storybook oral reading, on literary language development in children. Similarly, Abu-Rabia (2000) showed that early exposure to MSA in kindergarten correlated with reading comprehension in the second grade. These studies were the first to provide empirical evidence in support of the role of exposure to MSA in enhancing children's familiarity with, and comprehension of, the language of print. Ye, they did not target specific features of the linguistic distance between MSA and SAV. Neither did they test the relative contribution of implicit exposure versus explicit training to the acquisition of various linguistic skills in MSA. These questions are for future research to explore.

The lexicon of Arabic native speaking children does not consist of MSA–SAV cognates only. It also comprises words that have unique representations in SAV that are remarkably different from the words that correspond to them in MSA. Unique words have been found to make up another 40% of the lexicon of children, leaving only 20% of the words in their lexicon with an identical form (excluding the inflectional endings and case markers which attach to all words in MSA) in SAV and MSA (Saiegh-Haddad & Ali, in prep.). MSA unique words have a phonological

structure that abides by the phonological rules of MSA. A deficiency in the phonological representation of Standard linguistic structures (e.g. syllables, phonemes, etc.) implies that children will have difficulty representing unique MSA words too. Low-quality phonological representations should exert a detrimental effect on the acquisition of high-quality lexical identity and on the acquisition of reading and vocabulary acquisition in MSA (Perfetti, 2007). This is a hypothesis for future research to verify.

The important role of the phonological distance between MSA and SAV on the phonological encoding of Standard words has important ramification for a general theory of reading. It also sheds light on the possible sources of reading failure in different languages and different linguistic contexts. It is agreed that literacy acquisition is grounded in proper phonological representations and in high-quality lexical identity. High-quality lexical identity includes well-specified and partly redundant representations of form (orthography and phonology) and flexible representations of meaning (Perfetti, 2007). These representations are acquired and are restructured on a one-by-one basis and are enhanced by repeated exposure and experience (Walley *et al.*, 2003). Lexical identity, however, does not develop at the same rate or route in different languages. This is because literacy acquisition is embedded in different sociolinguistic and socio-cultural contexts in different languages. In Arabic, literacy acquisition occurs in a language that is remarkably different from the language that children naturally acquire as a mother tongue. Hence, literacy acquisition requires the acquisition of a novel linguistic system (phonological, lexical and morphosyntactic) alongside the orthographic system that maps it. The lexical identity of Standard words is acquired and develops mostly through literacy activities and not through natural vocabulary growth in everyday interactions. If low-quality lexical identity affects the acquisition of higher-order literacy processes, it may constitute one important source of reading failure in Arabic, at least when reading the shallow-voweled Arabic script (Saiegh-Haddad, 2005). Difficulties in the development of high-quality lexical identity may also explain the reading difficulties encountered by children in other dual-language contexts, like bilingual children or dialect speakers, such as speakers of African American Vernacular English (Craig & Washington, 2006).

To sum up, there is little research on the direct consequences of diglossia on the acquisition of reading in the Standard code. Little research is also available on the educational consequences of learning to read first in a language that you do not speak. The current study is one step in this direction. It attempts to study the effect of the linguistic distance between Standard and Spoken Arabic on phonological processing as a key process in the acquisition of reading. This study accords with earlier research in demonstrating that the phonological distance between Standard and Spoken

Arabic does not support the natural acquisition of basic language and literacy processes in MSA. This is because reading acquisition in this context requires the acquisition of novel linguistic categories. This problem is compounded by the socio-functional complementarity between the two varieties, with Spoken Arabic used predominantly for everyday speech functions, with Standard Arabic restricted to literacy-based activities. This severely restricts the opportunities for practice and use of the language of literacy and results in little acquaintance with the linguistic system of the language encoded in print. This together with the remarkable linguistic gulf between the linguistic systems of the spoken and the written language does not contribute to a smooth or easy acquisition of initial literacy in Arabic. In order to contribute to a more natural transition from the oral world of the vernacular to the literate world of Standard Arabic, explicit, systematic and sustained exposure to the linguistic system of the language of literacy is warranted.

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APPENDIX

EXAMPLES OF THE ITEM CATEGORIES USED IN THE STUDY

Item Category #1

Target word beginning with a Spoken phoneme.
Distractor word beginning with a Spoken phonetic neighbor.

/**ʈ**aːʒ/ 'crown'
Spoken target phoneme
/**ʈ**uːʈ/ 'strawberries' /**d**uːd/ 'worms'
Correct response Spoken phonetic neighbor distractor

/**z**ʊʒæːʒə/ 'bottle'
Spoken target phoneme
/**z**araːfɨ/ 'giraffe' /**s**ayyaːrə/ 'car'
Correct response Spoken phonetic neighbor distractor

Item Category #2

Target word beginning with a Standard phoneme.
Distractor word beginning with a Spoken phonetic neighbor that is the not the Spoken cognate phoneme.

/**ð**anəb/ 'tail'
Standard target phoneme
/**ð**ahəb/ 'gold' /**z**aʕəl/ 'sadness'
Correct response Spoken phonetic neighbor distractor

/**θ**aʕlab/ 'fox'
Standard target phoneme
/**θ**ʊʕbæːn/ 'snake' /**s**ɪnʒæːb/ 'squirrel'
Correct response Spoken phonetic neighbor distractor

Item Category #3

Target word beginning with a Standard phoneme.
Distractor word beginning with the Spoken cognate phoneme.

/**θ**æːʔər/ 'revolutionary, proper name'
Standard target phoneme
/**θ**æːmən/ 'eighth' /**t**æːʔəb/ 'remorseful, proper name'
Correct response Spoken cognate distractor

/**ð**iʔɨb/ 'wolf'
Standard target phoneme
/**ð**ahəb/ 'gold' /**d**arəʒ/ 'stairs'
Correct response Spoken cognate distractor

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