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The Effects of Script on Reading Development of Farsi and Arabic Bilinguals

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By

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Abstract

Knowledge of orthographic depth, the degree of letter-sound consistency, is one of the important skills that must be acquired by beginning readers. Vowelized Arabic and Farsi scripts are consistent in terms of grapheme-phoneme mappings and beginning readers should find it easier to read regular and consistent words. However, vowels are removed from Farsi and Arabic texts read by more experienced learners, which make these script forms more challenging for readers. Sixty students who were learning to read Farsi or Arabic (age range of 7-14 years) were tested for reading ability as well as cognitive and phonological processing in two languages: Farsi or Arabic as the first language (L1) and English as the second language (L2). Since there has been no previous study on the effects of including or excluding vowels in Farsi orthography, the first aim was to investigate the performance of Farsi readers in vowelized and unvowelized tasks. It was found that Farsi-English bilinguals performed better on vowelized tasks in comparison to unvowelized tasks. This indicates that including vowels facilitates reading skills of these students. Unexpectedly, vowelization made no differences in reading skills of Arabic-English bilinguals in this study. It was also found that phonological awareness in the L1 was related to phonological awareness in the L2. Finally, phonological and morphological awareness and vocabulary knowledge were strong predictors of word reading in L1 and L2. One practical implication of the present study would be to avoid the elimination of vowels from text for Farsi-English bilinguals.

Keywords: vowelization, reading ability, script consistency, bilinguals, Farsi and Arabic

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This research is especially dedicated to my beloved husband,

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&

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The majority of the reading models explaining skilled reading acquisition are based on studies of English (Frost, 2012). Although the number of studies that have examined literacy learning in languages other than English has grown, there is still a need to investigate reading in other orthographies to confirm universal literacy acquisition theories (Goswami, 2012; Perfetti, Cao & Booth, 2013; Share, 2008; Frost, 2012).

A key factor in differentiating reading development across languages is the level of orthographic transparency (Sadeghi, Everatt, Mcneill & Rezaei, 2014). For instance, children who are learning a transparent orthography with a more consistent mapping of written symbols (letters/graphemes) and language sounds (phonemes), show faster progress in word-level literacy compared to English or a less regular orthography (Everatt, Ocampo, Veii, Nenopoulou, Smythe, Al-Mannai & Elbeheri 2010; Ziegler, Bertrand, Tóth, Csépe, Reis, Faísca, Saine, Lyytinen, Vaessen & Blomert, 2010). English is considered a deep orthography with irregular and inconsistent relations between the letters and sounds (Venezky, 1967). Because of the challenges experienced by these learners, the dominant models/theories of learning were developed for reading English. However, these models have been criticized because they do not apply to more regular, consistent and transparent orthographies (Frost, 2012; Share, 2008). Frost (2012) proposed a motion to a more pervasive model of reading that considers a joint cognitive process involved in orthographic processing in different writing systems. Therefore, research into other orthographies to determine such common processes would be beneficial as part of the development of universal aspects of reading (Sadeghi et.al. 2014). The focus of the present study was to investigate the role of orthographic depth in

reading Farsi and Arabic in bilinguals.

As a Semitic language, Arabic script has unique features in terms of morphological roots and letter-sound relations. Beginning readers learn to read the regular and consistent version of the script, which includes vowels. More experienced readers read the unvowelized version of the script, which results in a deep orthography with inconsistent letter-sound mappings. Both Arabic and Farsi are written using variants of Arabic script which have consistent ways of representing vowels. Different marks are applied to represent short vowel sounds and these vowels are not always included in the script, especially in texts designed for skilled readers. A large number of homographic letter strings in Farsi and Arabic script are derived from eliminating vowels (e.g., ذَهَبَ/ ðahaba/went/ذَهَبْ/ðahab/gold). As a result, when readers of Farsi and Arabic begin to read the unvowelized version of the script, they need to learn how to deduce the pronunciation and meaning from the context. The present study has three objectives. First, to investigate the performance of bilingual Arab-English and Farsi-English students in two different reading tasks: vowelized and unvowelized. Second, to examine the possible relationship between phonological processing skills in Farsi/Arabic (L1) and English (L2). Third, to determine which variables are related to word reading in English, Farsi and Arabic languages.

Roadmap for the Literature Review

In order to better understand reading acquisition, different models of reading and literacy will be discussed. Given that the research questions require an understanding of similarities and differences between Arabic and Farsi, the scripts and linguistic features

will be described. Finally, components of reading such as cognitive and oral language skills will be described.

Models of Word Reading

Ziegler and Goswami (2005) proposed the psycholinguistic grain size theory which states that in order to succeed at reading, the beginning reader must "solve" three problems in relation to his or her script; *availability, consistency* and *granularity*. By solving these "problems" the learner uses the optimal strategies to map phonological units of a given language to the symbol system of that language. Specifically, the *availability problem* refers to the fact that all phonological units are not equally accessible to nonreaders. Syllables are more accessible than onsets and rimes, which are in turn more accessible than phonemes (Cunningham, 2010).

Solving the *consistency problem* is related to the fact that the grapheme-to-phoneme mapping for reading and the phoneme-to-grapheme mapping for spelling are seldom one-to-one mappings. However, in some languages, the grapheme-phoneme mappings tend to be consistent (e.g., voweled Arabic). *Granularity* refers to the fact that the size of the consistent units is related to the number of units to be learned by the reader. For example, in order to read highly consistent languages the learner must acquire only a limited number of grapheme-phoneme mappings. However, for less consistent languages, a larger number of sound-symbol mappings or "rules" must be acquired (e.g., unvowelized Arabic).

In Baron's (1978) path model of reading, word reading is accomplished through linkages between print, sound, and meaning codes. Paths between print and

sound and print and meaning are used in the reading process alone while paths between sound and meaning are used in both speech and reading. Baron (1980) distinguished between two types of paths from print to sound, a *word-specific* path and a *rule* path. In the same vein, Coltheart's (1978) classical dual-route model assumed that words can be read through a lexical route or by letter sound decoding. The word-specific path links whole printed words to whole spoken words (Mohd, 1997). This path is used mainly when exception words are read because rules alone are insufficient for complete decoding. The rule path connects parts of printed words to parts of spoken words. This path is often used when there is a consistency between spelling and sounds (e.g. reading regular words or meaningless words) in unfamiliar words. Baron and Treiman (1980) proposed a question of which mechanism children use when they read. Their results indicated that children who followed the rule path performed better in reading both the pseudowords and regular words, while children who relied on word-specific path were able to read exception words and few pseudowords.

Based on Colthheart's (2005) revised reading model, there are three phases that children from three-years-old to twelve-years-old typically pass through in order to become skilled readers. In the first phase which is called *discrimination-net phase*, children at 5 years of age, are just trying to read aloud, discriminating between the small set of words that they have in their reading sets and children in the discrimination-net phase have a very limited reading ability in this initial phase. They are introduced to the idea that language is not just oral, but it can be displayed visually, on the page. The second phase is the *phonological recoding phase*. Children in this phase are able to read

most unfamiliar printed words, which follow the letter-sound rules. This skill can allow them to recognize unfamiliar words directly – that is, to add new words to their sight vocabularies. Lastly, in order to achieve skilled reading in the *automatic whole word recognition phase*, children must learn how to access entries in their lexicon rapidly and automatically, directly from print rather than indirectly via phonological recoding. It is important to note that not all children pass through all of the phases easily, and some might encounter difficulties. It is possible that, in less transparent orthographies such as unvowelized Arabic, children may encounter more difficulties due to the lack of consistency between oral and printed words and these phases take more time to complete in comparison to transparent orthographies.

Literacy

In order to become literate, the first step is acquisition of the system for mapping distinctive visual symbols onto units of sound. Therefore, the child has to learn the code, which is being used by their culture for representing speech by a series of visual symbols. This procedure of mapping is called phonological recoding and leads to reading ability (Share, 1995). Being able to read, allows the child to access numerous words that are available in their spoken lexicons before gaining reading ability and also to read words that they have heard but never seen before (Share, 1995). As a self-teaching device, phonological recoding is useful, because in most languages the relationship between symbol to sound mapping is systematic and consistent (e.g. the symbol "B" is always pronounced /b/ at the beginning of a word) (Ziegler & Goswami, 2005). However, in some languages like Farsi, the sound to symbol mapping is less consistent. For instance, there are several symbols that represent the same sound (e.g. س، ص are pronounced /s/).

The defining factor for consistent orthographies is the reliability of correspondences at small grain sizes. During the early phases of reading acquisition the consistency of grapheme-to- phoneme mapping enhances the development of phonological recoding and phonemic awareness, and has long-lasting effects on the skilled reading system (Ziegler, Perry, Jacobs, & Braun, 2001). Of course, having insufficient language and literacy skills, specifically reading comprehension, can prevent children from fulfilment of graduation requisites and may even result in high school dropout (Murray, Farrington, Sekol & Olsen, 2009). There are studies indicating that some bilingual children begin with lower literacy skills than their monolingual peers, however, with proper instruction the gap between L1 and L2 students' literacy skills can close over time (Gersten, 1996).

Arabic Language

When presented with vowels, Arabic script is an almost consistent letter-sound alphabetical script, with 28 letters (see Appendix A). Short vowels are not part of the alphabet and are represented only by adding diacritics (Abu-Rabia, 1998). Arabic is a Semitic language that is written from right to left with letters changing form depending on their position in the word. Each Arabic letter has different forms depending on whether it is connected to a preceding letter, a following letter, and both preceding and following letters or whether it stands in isolation (Mohd, 1997). Therefore, each letter looks different depending on its occurrence in the word.

There are two types of structures in Arabic morphology: derivational and inflectional. Each derivational word is based on phonological patterns built on roots that are consonantal patterns. Furthermore, most verbs and the majority of nouns are built upon three consonant roots (Abu-Rabia, 2007). For example, the word /læʕb

/لاعب/player/ is derived from the root l-ʕ-b /ب، ع،ل/play/. The root supports the initial lexical access, and the combination of roots and phonological patterns conveys specific semantics (Frost, 1997).

In contrast to the derivational word system, in which the basic elements are roots and word patterns, the inflectional morphological process in Arabic is based on adding prefixes and suffixes to real words (Abu-Rabia, 2006). Generally, intertwining the root and the word pattern is the basis for combining morphological units in Arabic and the word pattern can be constructed upon prefixes, suffixes, and infixes (Abu-Rabia, 2001)

Arabic Script (Abjad)

No vowel signs are presented in most modern written and printed Arabic texts, and the reader has to infer them from previous knowledge and/or context. Reading Arabic script or Abjad (Arabic word for alphabet) without vowels can be a difficult task for poor or beginning readers owing to word similarities (homograph phenomenon) and letter similarities. In Arabic, certain letters are distinguished from each other only by a single stroke or dot: ع /ʕ/, غ /ɣ/, ج /dʒ/, ح /ħ/, خ /x/, or they may be phonologically indistinct in the colloquial variant of spoken Arabic (Mohd, 1997). In the Arabic script, dots are presented in 15 letters, 10 letters have one dot, three have two dots, and two have three dots. These dots are part of the consonant letters. In addition to dots, there are diacritical marks that contribute phonology to the Arabic alphabet (short vowels, /a/َ, /u/ُ, /e/ِ, /sukoon/ْ to indicate silent sounds, /shadda/ّ/- to indicate stressed syllables) (Abu-Rabia, 2001, 2002). Arabic words are a combination of consonants and vowels. Skilled and adult readers are expected to read texts without short vowels, but this skill is very dependent on context and other resources. (Abu-Rabia 2007). In first-grade, students are

introduced to written Arabic, literary Arabic is almost a new language in terms of writing, reading and speaking which indicates the uniqueness of written Arabic (Abu-Rabia, 1998). Reading Arabic demands considerably more than cognitive attention by beginning readers. Being able to recognize the different writing rules of Arabic letters in their different positions, and identifying vowelization below or above the letters, is critical for word identification and word decoding (Abu-Rabia, 1998). In addition, written Arabic is usually a different "dialect" than the oral version that the children speak.

Reading in Semitic scripts

Research on the reading in Semitic languages like Arabic and Hebrew, which are root-based-morphology languages, showed unique word recognition strategies. Abu-Rabia (2001) proposed a triliteral/quadriliteral-root model. According to this model, word identification is based on the identification of word roots for initial lexical access, which later leads the reader to accurate pronunciation. This initial lexical access is derived from different sources of information including lexical and grammatical knowledge, as well as sentence context as a major source of semantic priming (Abu-Rabia, 2001, 2002).

Farsi is an Indo-European language but uses Arabic alphabet. In Farsi, like English, morphemes are stand-alone roots and affixes that identify lexical meaning and grammatical function. However, there are a large number of borrowed Arabic words in Farsi and these words have different morphological rules based on their Semitic background (Mahfoudhi, Elbeheri, Al-Rashidi, & Everatt, 2010). Therefore, morphology differs in Arabic and Farsi based on different linguistic roots. Morphology uses different rules across these languages even though these two languages share the same script.

In a study, Abu Rabia (1997) investigated the effect of Arabic vowels and

Arabic context on reading accuracy of poor and skilled native Arabic readers. The results for both groups (poor vs. skilled readers) illustrate that the presence of context and vowels seems to be very important in reading Arabic regardless of reading level. Vowels significantly influence reading of poor and skilled readers in the different Arabic writing styles.

Hebrew is another Semitic language, which has vowelized and unvowelized versions. Therefore, research conducted using Hebrew can inform research on Arabic. In 1993, Shimron conducted a study, which examined the role of vowels in reading in Hebrew. He pointed out that reading unvowelized words in roots and affixes might become more salient and important, with their identification facilitating the word-recognition process. In reading vowelized words, the vowels contribute phonological information, which, although generally redundant, is sometimes useful (e.g., under "noisy" conditions or when reading aloud). Under optimal conditions (e.g., with context), the reading time of the two kinds of writing may not differ significantly.

Farsi Language

Farsi, also known as Persian, is the most widely spoken member of the Iranian branch of the Indo-Iranian languages, a subfamily of the Indo-European languages (Comrie, 1990; Levy, 1951; Mahootian, 1997). For this study, the word Farsi was chosen to represent this language.

Many non-Arab countries such as Pakistan, Iran and Afghanistan are using Arabic script (Jahani, 1989). Although Farsi is an Indo-European language with different linguistic roots from the Arabic language (Mallory, 1989), written Farsi is based on a modified version of the Arabic script (Jahani, 1989). Khanlari (1979) indicated that with

the transition of Islam into Iran, Iranians adopted the Arabic alphabet for writing Farsi. Farsi has 32 letters (see Appendix B) which include four letters more than Arabic alphabet and these letters do not exist in Arabic: /p/ پ, /tʃ/چ, /ʒ/ ژ , and /g/ گ). As mentioned earlier, there are several symbols that represent the same sound in Farsi script with three graphemes representing /z/(ض ، ظ،ز) three representing /s/ث،س،ص, two representing /t/ ط،ت and two representing /gh/غ،ق (Forozanfar, 1979). This is because many of the original Arabic letters corresponding to these sounds represent distinct sounds in Arabic, which do not exist in Farsi (Khanlari, 1979). These redundant graphemes have remained in the Farsi alphabet, partly due to theological and religious reasons (Forozanfar, 1979). The shape of Arabic based letters (Farsi script) change according to their position in the beginning, middle or end of the word (Forozanfar, 1979; Khanlari, 1979).

Farsi Script

Unlike English, the Farsi orthography, like Arabic is written from right to left. It is cursive and many of the letters appear differently, depending on the position of the letters in the word and their connection to other letters on one or both sides. In order to represent short vowel sounds distinct marks are added to letters. These vowels are not always available in the script, especially in texts designed for skilled readers. At early grade levels, the vowelized version of the script is presented to beginning Farsi readers, which is more transparent. However, when short vowel marks are not included the orthography is relatively deep (Arab- Moghaddam & Sénéchal, 2001). After one year of schooling the unvowelized version of the script is introduced and used for most texts.

Additionally, in recent years, ministry of education in Iran changed the educational system including books with whole sight-reading. Hence Farsi beginning readers are exposed to the unvowelized script from the first grade. Eliminating vowels has led to many homographic letter strings in Farsi and Arabic script. As a result, beginning Farsi and Arab readers need to learn how to deduce pronunciation and meaning from the context. In some languages (e.g., English) vowels are part of the words and words cannot be represented without them (e.g., train) while, in other languages (e.g., Arabic and Farsi), dots and lines around words represent vowels. In the Farsi script, dots are crucial since by adding (one, two, or three) dots, depending on their position (below or above the letters) different letters can be produced from one character (e.g., /b/ب , /p/پ, /t/ت). In total, 13 characters in Farsi alphabet are formed by adding dots to a base character (e.g., /r/ ر /,/z/ ز /,/zh/ ژ/). There are short and long vowels in Farsi script: Short vowels are represented by diacritical marks above or below the letters that contribute phonology to the Farsi alphabet (ُ ِ َ respectively /o/, /e/, /æ). However, after early school grades, short vowels are mostly eliminated in written texts. There are three long vowels (i.e., A/آ , E/ ای and O/او) in written Farsi.

Arabic and Farsi similarities and differences: As mentioned earlier, Arabic and Farsi use the same Arabic-based orthography, but Farsi has Indo-European linguistic roots. Arabic and Farsi orthographies written text are cursive (i.e., a letter connects to other letters around it within a word) and many letters change their shape when written in text compared to when they are presented in isolation. In contrast to languages written using the Roman alphabet, Arabic and Farsi are written from right to left. Beginning Arabic and Farsi readers need to learn how to infer pronunciation and meaning from the context.

Therefore, the acquisition of reading comprehension skills may need to support the acquisition of word identification at a very early age for most Farsi and Arabic children (Sadeghi et al., 2014).

Cognitive and Phonological Processing Skills

Phonological Awareness: According to Goswami (2008), phonological awareness is the process of learning about each sound and the combination of sounds, to read words. The development of phonological processing starts from the first year of age with oral language comprehension and extends to the sixth year of age with phonemic awareness. Phonological awareness has been defined as "…awareness of sounds in spoken (not written) words that is revealed by such abilities as rhyming, matching initial consonants, and counting the number of phonemes in spoken words" (Stahl & Murray, 1994, p.221). To assess the level of phonological awareness, different techniques can be used. Isolating one single letter, recognizing the rhyme, deleting a phoneme, and blending are some common ways to measure the level of phonological awareness in children and adults (Stahl & Murray, 1994).

There is a strong correlation between phonological awareness and reading performance as well as reading comprehension. For example, in a longitudinal study, Lafrance and Gottardo (2005) found that the level of phonological awareness was the same in English and French. Many studies support the claim that phonological awareness is highly correlated in two different languages in bilinguals (Branum-Martin, Mehta, Fletcher, Carlson, Ortiz, Carlo, & Francis, 2006), and even can be transferred across the two languages (Durgunoglu, 2002; Cho & McBride-Chang, 2005).

Working Memory: It is well established that bilingualism provides an advantage for cognitive skills and working memory when the same skills are compared to the performance of monolinguals (Bialystok, 2008). Working memory (WM) is an important mental mechanism, which allows limited information to be stored in a temporarily accessible state during cognitive processing (Cowan, Nugent, Elliott, Ponomarev, & Saults, 1999). Based on Baddeley (1983), working memory is comprised of three different components: Executive processing, the phonological loop, and visual-spatial sketch pad. Storage of information, organizing operations, shifting, and retrieving from long term memory are main functions of Executive processing. Visual-spatial sketch pad saves and manages the information temporally, while the phonological loop deals with phonological processing (Baddeley, 1983). There is also evidence that executive function control (e.g., shifting and switching) develops earlier in bilingual children relative to their monolingual counterparts (Carlson & Meltzoff, 2008)**.** Research on WM in monolingual children has suggested that during development, considerable changes occur in performance on all tasks that evaluate WM components, particularly the three basic components.

Universal components Related to Reading

Word Reading: According to Seidenberg and Seidenberg & McClelland's (1989) triangle model, the mappings among orthography, phonology and semantics are crucial in word reading. Two different approaches are defined for word reading: a phonological approach, which maps orthography to phonology, and a semantic approach, which is related to orthography, semantics, and phonology. Links between orthography, phonology and semantics varies based on the orthographic transparency (Ziegler &

Goswami, 2005). Therefore, the differential patterns of these mappings in learning different scripts are essential for reading across scripts.

Reading Comprehension: Reading comprehension is a critical skill for school success because eventually new information must be learned independently. Specifically, Chall (1986) describes later stages of reading acquisition as "reading to learn". Reading comprehension is a dynamic process where features of the text and characteristics of the reader (e.g., proficiencies and goals) interact during the process of interpretation (Rapp & van den Broek, 2005; van den Broek, Rapp, & Kendeou, 2005). Reader characteristics include basic reading and linguistic skills, higher-level comprehension skills, and general cognitive skills (e.g., decoding, background knowledge, nonverbal reasoning; Kendeou, Broek, Whit, & Lynch, 2009; Broek, Tzeng, Risden, Trabasso, & Basche, 2001). Research has shown that the developmental patterns of underlying skills that contribute to reading comprehension are similar in L1 and L2 readers. Decoding and language comprehension are important components of reading comprehension (Gough & Tunmer, 1986; Perfetti & Hart, 2001). Reading comprehension in young children is more reliant on decoding (Catts, Adlof, & Weismer, 2005), whereas reading comprehension in older children and adolescents is more reliant on vocabulary knowledge (Braze, Tabor, Shnkweiler and Mencl , 2007; Protopapas, Sideridis, Muzaki and Simos, 2007). Although word reading is the focus of the study for the Farsi and Arabic measures, reading comprehension is relevant for the English measures in the current study.

Oral Language Skills

Vocabulary Knowledge: Findings regarding vocabulary demonstrate that vocabulary knowledge plays a critical role in explaining individual differences in reading

comprehension. Furthermore, the influence of vocabulary knowledge on reading comprehension performance increases throughout the elementary and early adolescent years (Catts et al., 2005; Lervag & Aukrust, 2010; Protopapas et al., 2007). Lee (2011) in a longitudinal study investigated 1,073 infants at the age of 24 months and indicated the importance of early oral language development at age 2 on later language and literacy skills from ages 3 through 11. As readers mature, word recognition becomes more automatic and less predictive of individual differences in reading comprehension ability. Simultaneously, the linguistic demands of text increase, forcing readers to rely more on vocabulary knowledge to comprehend text (Perfetti, 2007; Perfetti & Hart, 2001; Verhoeven & Van Leeuwe, 2008).

Morphological Awareness: Morphological awareness refers to **"**children**'** s conscious awareness of the morphemic structure of words and their ability to reflect on and manipulate that structure**"** (Carlisle, 1995, p. 194). Morphemes are the smallest units of meaning in words; for example, "farmer" is made up of two morphemes: the root "farm" and the suffix –"er". Awareness of structure is significantly related to the ability to define morphologically complex words (Compton & Carlisle, 2000). Previous researchers suggest that children in kindergarten and first grade show some competence with simple derivations that do not require phonological shifts (Clark & Cohen, 1984; Jones 1991). In contrast, older children by about the fourth grade display more skills to identify complex derivational relations, such as between "profit" and "profitable" or derivations that result in phonological changes to the word such as "sign" to "signal" (Carlisle, 1988; Tyler & Nagy, 1989).

The role of phonological and morphological awareness in three aspects of reading

development, pseudoword reading, single word reading and reading comprehension, was determined in a 4-year longitudinal study by Deacon and Kirby (2004). They found that morphological awareness contributed significantly to pseudoword reading and reading comprehension when controlling for prior measures of reading ability, verbal and nonverbal intelligence, and phonological awareness. Their findings provide evidence that morphological awareness plays an important role in reading development, one that extends beyond phonological awareness in English. Therefore, examining morphology is necessary in other languages, given that the Farsi morphology is relatively complex and involves a large number of borrowed words from Arabic.

Second Language Acquisition

Research has revealed that for bilingual children, many skills developed in their L1 are positively related to reading acquisition in their L2 (Genesee & Geva, 2006; Dressler & Kamil, 2006; Gottardo, 2002). Although these resources, such as phonological awareness and verbal working memory, are first acquired in bilingual children's L1, they are important for developing reading skills in any language and are thereby considered script universal (Genesee et.al 2006). Evidence has also shown that fluent and accurate phonological processing abilities play a critical role in reading skills of L2 learners (Gottardo, Yan, Siegel, & Wade- Woolley, 2001).

Script and linguistic features of the L1 and L2, age of arrival (i.e. when children immigrate to a new country) and literacy in the L1 are important factors that impact on relations across languages (San Francisco, Carlo, August, & Snow, 2006). Characteristics related to the direction of cross language relations of literacy skills include bilingual students' relative proficiency in their L1 and L2 and the typology and script of each

language (Pasquarella, Chen, Gottardo & Geva, 2014). According to Durgunoğlu (2002), the nature of L1 script across general oral language skills, L1 proficiency and specific linguistic skills are variables that have been found to contribute to L2 proficiency. Although some basic language skills could be transferred across languages, not all skills transfer. For instance, Durgunoglu (2002) stated that many domains such as syntactic awareness, knowledge of genres, phonological awareness, and meaning making strategies transferred across languages. However, oral language proficiency, i.e. grammatical knowledge and vocabulary knowledge in L1 and L2 are not often highly correlated (Gottardo & Mueller 2009). Knowledge of letter-sound correspondences required to deduce the alphabetic principle is likely related when the scripts are similar (e.g., English & Spanish). However, the extent that inferring the alphabetic principle is related across different scripts is not clear.

Objectives

There are many studies on the effects of vowelization in reading development in Hebrew and Arabic languages in students living in countries in the Middle East. However there has been no previous research on the effects of including or excluding vowels in Farsi orthography, which is written in Arabic script but has Indo-European linguistic roots. In Farsi and Arabic orthographies vowels are eliminated for skilled readers. Therefore, the first objective of this study was to investigate the performance of Farsi and Arabic readers in vowelized and unvowelized tasks. The second objective was to find if there is a relationship between phonological processing skill in Farsi/Arabic (L1) and English (L2). Finally, to explore variables predicting word reading in English, Farsi and Arabic languages.

The Present Study

In this study, the Arabic-English participants attended weekend Islamic school to fulfill their Islamic education requirements. They learn Arabic as a subject in order to read and understand the Quran (The Holy book) of Muslims. These children speak Arabic at home as their first language. Farsi-English bilinguals were recruited from international language school, which is also held on weekends. These students learn Farsi in order to be able to read and write in Farsi.

This study has three main hypotheses. It was hypothesized that:

1. There is a main effect of vowelization across participants' reading ability. This hypothesis has 2 sub-predictions.
    a. Readers in both groups (Farsi, Arabic speakers) will perform better on vowelized tasks compared to unvowelized tasks.
    b. Arab readers will benefit more from vowelization compared to Farsi readers.
2. There is a relationship between phonological processing skills in Farsi/Arabic (L1) and English (L2).
3. Phonological awareness, vocabulary knowledge and morphological awareness predict word reading in English, Farsi and Arabic.

Method

Participants

A total of 60 students from Kitchener-Waterloo and Greater Toronto area were recruited for this study. Informed consents from parents were collected, and children gave assent before starting the testing session. Participants' parents were asked to complete a demographic questionnaire. In this demographic questionnaire, the percentage of usage of

L1 (Farsi/Arabic) at home, in the country of origin, and background information from participants' parents was asked.

Farsi Speakers**:** Thirty students who were learning to read Farsi (7-12 year old) participated in this study. Due to large age range of participants and the related variability in educational and developmental experiences, the results should be interpreted with caution. Participants were recruited from international languages schools, which are held on Saturdays for bilingual students to practice their native language. Farsi speakers (average age of 96 months; *SD* = 12.83, range from 84 to 144) were studying in grades one through seven. There are sixteen female and fourteen male in this group (see Table 2 for details). Students reported they use English and Farsi to communicate with their parents. In addition, 40% of participants only spoke English with their siblings. Almost half of the students were born in Canada and half were new immigrants whom have experience of going to school in Iran. Most of the students spent more time watching English programs at home compared to Farsi programs and they allocated more time in reading English books than Farsi books. Results of the family language questionnaire show that the majority of the families (89%) belonged to middle socio-economic class. According to Hollingshead Four-Factor Index of Socioeconomic Status (Hollingshead, 1975), particularly the education scale and occupation scales, the highest reported education and the reported occupations of the parents were coded. On both of these coding scheme scales, a lower number indicated a lower SES and a higher number on the scale indicates a higher SES (Hollingshead, 1975). Specifically, parental education was coded on a 7-point scale with a value assigned to the highest grade completed (e.g., 7 = graduate/ professional training, 6 = standard college or university graduation, 4 = high

school graduate, 2 = junior high school, including 9th grade). Parental occupational was coded on a 9-point scale with 9 = higher executive, proprietor of large businesses, major professional, 8 = administrators, lesser professionals, proprietor of medium-sized business, 7 = smaller business owners, farm owners, managers, minor professionals, 6 = technicians, semi-professionals, small business owners, 5 = clerical and sales workers, small farm and business owners and 3 = machine operators and semi-skilled workers.

Arabic Speakers: A sample of thirty students (8 – 14 year old) Arabic-speaking children were recruited from two different weekend Schools; an Islamic School and an international languages school and were in the range of grade 2 to 4 in their public school participated in this study. The average age of the children was 97 months (range from 96 to 156; SD = 16.62). There were fourteen female and sixteen male in this group (see Table 2 for details). Approximately, 80 percent of the students in this group only spoke English and Arabic at their home, and other 20 percent use French as their third language and majority of them (65%) only spoke English with their siblings. In addition, out of the total of 30 participants, 17 of them were born in Canada and 13 of them were immigrants and from these immigrants 8 of them had experience of going school in other countries. Parents in the questionnaire were also asked whether their children watch TV programs in their Arabic language. Only 10 families reported that their children watch programs on TV in their native language. They also spent more time in reading English books in comparison to Arabic books. Results of the family language questionnaire showed that the majority of the families (82%) belonged to middle socio-economic class.

Measures

A battery of Farsi/Arabic and English measures was administrated to each participant to assess the following areas: word reading, reading comprehension, vocabulary knowledge, oral language skills and working memory. All of the English measures were standardized tests and exhibited high reliability and validity. The Farsi and Arabic tasks have been used extensively in research studies.

Farsi/Arabic tasks

There are seven different tasks described in this section: phonological awareness, word reading, text reading, vocabulary, morphology, rapid digit naming and oral naming fluency.

Phonological Awareness

Farsi: The segmentation task first edition -form A- (Sadeghi et al., 2014) is comprised of two-practice items and 15 test words (see Appendix C). These words are very common in Farsi and are used in grade school textbooks. The experimenter read the words aloud one by one, and participant was required to repeat the words and say them one sound at a time (e.g., — the word *tala* is segmented as t", "a", "l", "a" [gold]). Participants were informed that this task was timed and each word worth one mark.

Arabic: This task is similar to the phonological awareness test in Farsi. The segmenting subtest assesses the child's ability to segment words. The subtest was adapted from a segmentation task developed by Saiegh-Haddad and Geva (2008) and consisted of two practice items and 20 target items that progressed in length and phonological complexity. The examiner orally presented each word and student was asked to pronounce a set of individual phonemes and segment the speech (e.g., — the word *bayt* is

segmented as b", "a", "y", "t" [house]). A score of 0 was given for incorrect or partially correct responses and a 1 for correct responses. Answers were scored as the child was saying the word. A sample of this test is available in Appendix D.

Word Reading

Farsi: Participants were asked to read a list of 30 vowelized words (see Appendix E) and a list of 30 unvowelized words (see Appendix F). A score of one was given to each correct response.

Arabic: Students were asked to read a list of 30 vowelized words (see Appendix G) and a list of 30 unvowelized words (see Appendix H). A score of 0 was given for incorrect or partially correct responses and a 1 for correct responses. Raw scores were computed based on correct responses on this subtest. A copy of the vowelized word reading subtest and a copy of the unvowelized word reading subtest are presented in Appendix F.

Text Reading Task: Participants were required to read two versions of the text reading task, a vowelized and unvowelized version. There were two short passages of approximately 120 words followed by two simple recall questions at the end of each passage to ensure that students were on-task when they were reading. The passages were taken from textbooks used to teach students in their language classes. The length and level of difficulty of the passages were the same as Iranian grade two school text books and peer reviewed by two primary school teachers in Canada to ensure the texts were appropriate for children from age 8-11. The vowelized and unvowelized versions were administrated on separate weeks. For the vowelized (see Appendix I & G) and

unvowelized (see Appendix K & L) text reading, the number of errors and the time taken to read the text were calculated.

Vocabulary Test: To measure vocabulary knowledge the Expressive One Word Picture Vocabulary Test (EOWPVT-SBE, Brownell, 2000) was used in which children were shown the pictures and they asked to name them. There are 170 pictures for this test; easy items include the first seventy pictures (e.g., cat, fish, and wheel) and difficult items include the rest of the 100 pictures (trellis, mammals). The EOWPVT has been translated into Farsi and Arabic. Since this measure was not standard, the tester did not stop participants at any particular number of errors. However, for difficult items in one page, participants were asked to name the pictures if they know in a given time of five seconds before moving to the next set of pictures. Because this test had 170 items, this procedure was used to avoid the frustration. 10 to 15 minutes is required to administer this task. According to the manual (EOWPVT-SBE, Brownell, 2000), participants were scored with a full mark for labeling the picture correctly.

Translating the vocabulary task is a challenging procedure due to cultural differences. This challenge was faced in this study in translating the vocabulary test into Farsi and Arabic language. There were some items, which did not have a translated word in Farsi and the English words are used like “Cactus”, Penguin” and “Aquarium”. In addition, there were some items that do not exist in Farsi vocabulary such as the picture of “Banjo”. These cultural differences could be avoided if there were standardized tests available for the Farsi and Arabic languages.

Morphology

Farsi: This measure was administered to assess students' ability to create derived words based on the presented suffix or prefix. There are 20 test items and there is one practice item before each test item. In each item one suffix or prefix was presented and participants were required to choose a word from the available options in order to create a derived word which is meaningful and correct (e.g., — the suffix تر [er] can create بلند + تر [High+ er = Higher]). A score of 0 was given for incorrect or partially correct responses and a 1 for correct responses. In order to make the task comparable across Arabic and Farsi, 8 items was removed from the original Farsi task.

Arabic: A list of 5 words was presented to students (see Appendix N). For each word, participants were required to create 4 words that were meaningful and had the same root as the presented word (e.g., — the root of *Madresa* [school] is *D"R"S*). Each correct word was given a score of one. Five minutes was required to administer this test.

Oral Naming Fluency: The Oral Naming Fluency Task (adapted from Gollan, Montoya, & Werner, 2002) was used as a measure of verbal fluency. This test was administrated in Farsi or Arabic and English. Children were required to list as many items in a given category as they could in one minute. There were a total of six categories in English, and the same categories were completed in Farsi or Arabic. The six categories for this task comprising of animals, clothing, colours, fruits and vegetables, sports, and things with wheels. The responses by participants were recorded as audio files and transcribed by the tester later on. The scores included the total number of all correct items (excluding repeated items).

English Tasks

Word Reading: The Test of Word Reading Efficiency–Second Edition (TOWRE–2) was used as a measure of an individual's ability to pronounce printed words (Sight Word Efficiency) and phonemically regular words (Phonemic Decoding Efficiency) accurately and fluently. The test provides an efficient means of monitoring growth word reading skill and it can be administered very quickly. The Sight Word Efficiency (SWE) subtest assesses the number of real words printed in vertical lists that an individual can accurately identify within 45 seconds. The internal consistency of this measure was calculated and it was .95.

Vocabulary Test: To measure vocabulary knowledge the Expressive One Word Picture Vocabulary Test (EOWPVT-SBE, Brownell, 2000) was used in which children were shown the pictures and they will be asked to name them. There are 170 pictures for this test; easy items include first seventy pictures (e.g., cat, fish, and wheel) and difficult items include the rest of the 100 pictures (trellis, mammals). The Cronbach's alpha of this measure in this sample was .93.

Reading Comprehension: The Gray Oral Reading Test-4 (GORT-4) was administrated to measure English reading comprehension ability. It is a norm-referenced, reliable and valid test of oral reading rate, accuracy, fluency and comprehension. This test has two forms; form A and B. Only Form A was used in this study, which has 14 stories (Park, Surprise present etc.). Five multiple-choice questions follow each of these stories. The internal consistency of this measure was calculated and it was .96.

Morphology: This measure was selected to assess students' awareness of the relations between base and derived forms of words (Carlisle, 2000). This task contains

two practice item and 20 test items. The task required the production of a derived word in order to finish a sentence. Suffixes included in this task were judged to be familiar to the age range of the study participants; these included -th (e.g., growth), -ance/ence (e.g., performance), -er (e.g., teacher), -ity (e.g., equality), -tion/sion (e.g., description), -ous (e.g., famous). A score of zero was given for incorrect or partially correct responses and one for correct responses. In order to make the task consistent with Arabic and Farsi morphology tasks, 8 items was removed from the original version of the task. .89 was the Chronbach's alpha for this Task.

The Rapid Digit Naming subtest: The subtest of Rapid Digit Naming from the Comprehensive Test of Phonological Processing (CTOPP; Wagner, Torgesen, & Rashotte, 1999) was selected. Students were required to read rows of numbers as quickly and accurately as possible (Wagner et al., 1999). Participants were shown 6 practice items before beginning the actual test and they were required to complete both Form A and B. Children were timed and the number of errors was recorded. The raw score was calculated as the amount of time (in seconds) taken to complete each form, meaning that higher scores showed weaker performance. The task was administrated in English and Arabic or Farsi.

Phonological Awareness: This task is a standardized subtest of the Comprehensive Test of Phonological Processing (CTOPP; Wagner, Torgesen, & Rashotte, 1999). It was used to measure phonological awareness skills in English. There are three practice items and 20 test items. The experimenter read the words aloud one by one, and participant was required to say the word and detect all the phonemes in each word (e.g., — the word *man* is segmented as m", "a", "n"). Participants were informed

that this task was not timed and each word worth one mark. The internal consistency of this measure was calculated and it was .93.

Demographics

Demographic/ Family Language Questionnaire: This questionnaire was given to the parents along with the consent form in order to collect background information from participants' parents. The questionnaire was used in conjunction with the data in order to examine general trends between certain demographic information and child reading ability. In this questionnaire, parents were required to answer some questions regarding the time of their immigration to Canada, and other countries that they lived in. They were also asked to provide information about their reading, writing, listening and speaking ability in both languages (English, Farsi or Arabic) on a 10-point Likert-scale. Lastly, they were asked to report their occupation and educational level in order to estimate their socio-economic status (see Appendix P).

Procedure

60 students who were learning to read Farsi or Arabic, as their first language were invited to participate in two sessions of approximately 1 ½ hours each, separated by one week. There were 30 students from each of the language groups (Farsi and Arabic). A copy of the consent form was given to the participants' parents with a brief explanation provided for them when they came to pick up their children from international languages school or Islamic weekend school. If parents and students both agreed to participate in the study, the students were return signed consent form. In each session, participants were asked to complete measures. Two native Arabic speakers assisted the researcher in

testing Arab participants. There was a $10 compensation upon completion of the tasks for each participant. Measures were consistent of reading in Farsi or Arabic as well as in English. All measures were administrated in the same order. One session was allocated to vowelized Farsi or Arabic tasks with English measures and the second session was designed for unvowelized tasks. Some participants, who completed the tasks quickly or who were recruited from relatively further away, were tested in one session. Table 1 illustrates the tests administered based on the sample groups.

Results

This study examined the reading ability of Farsi-English and Arabic-English bilinguals on different types of tasks (vowelized versus unvowelized). It was expected that participants in both language groups (Farsi and Arabic) would show a better performance on vowelized tasks compared to unvowelized tasks. Furthermore, since participants were literate in English, it was expected that phonological processing skills would be correlated between Farsi/Arabic (L1) and English (L2). Based on the literature, it has been shown that phonological processing skills are related across languages.

Using raw data, correlations, t-tests and regression analysis are reported herein. Reliability analyses were also conducted to ensure the internal consistency of the Farsi and Arabic tasks.

Reliability Analysis

It is crucial to know the reliability of tasks because it ensures the consistency of results across items. Since the researcher developed word reading and reading comprehension of Farsi and Arabic tasks and also reliability of other experimental Farsi

and Arabic tasks were not available, reliability analysis was carried out herein. The reliability of tasks using Cronbach's alpha are presented in Tables 10 and 11.

Farsi measures: The translation of EOWPVT in Farsi showed highest reliability (α = .96) amongst Farsi measures. Farsi vowelized and unvowelized word reading had reliabilities of (α = .70) and (α = .89), respectively. Furthermore, vowelized and unvowelized reading comprehension in Farsi had low reliability of (α = .5). The small number of questions in the task can explain the present reliability in Farsi and Arabic. In this task, there were only two questions after each passage. These questions were given to ensure that participants understood what they were reading and that they were paying attention. The more important parts of the task were word reading and the reading fluency components. Therefore additional analyses represent word reading and reading fluency. Phonological and morphological awareness in Farsi had internal consistencies of (α = .92) and (α = .72), respectively.

Arabic measures: EOWPVT was translated into the Arabic for this study and the reliability of this task was high (α = .98). The reliabilities of vowelized and unvowelized word reading in Arabic were the same (α = .84). Like Farsi reading comprehension, vowelized and unvowelized reading comprehension in Arabic had low reliability of (α = .4). Arabic phonological awareness also showed high reliability (α = .85) and the last task was Arabic morphology with the reliability of (α = .84).

Descriptive Statistics

Means and standard deviations of Farsi and Arabic measures are displayed in Table 3. Table 4 represents performance of both groups on the English measures.

Comparison between participants' performance on L1 measures for the two groups is not possible due to the different language groups and therefore the different measures in this study. Comparisons were conducted for the English measures. A Bonferroni correction resulted in a *p*-value of .035. However, this stringent criterion did not change the results as no significant differences were found, smallest *p*-value .096. However, descriptive information of some measures are reported in this part to allow the reader to see if there were floor or ceiling effects as well as the degree of variability for each measure. No floor or ceiling effects were found in this sample for all the measures. For the measure of word reading in L1, out of 30 items in this task, Farsi-English bilinguals had a mean score of $M = 26.90.10$, $SD = 2.92$ while the Arabic-English bilinguals had scores of $M = 20.33.10$, $SD = 5.71$. However, as can be seen in Table 4 no significant difference was found between Farsi-English bilinguals and Arabic-English bilinguals on the English measures. Large standard deviation on some tasks indicated high variability in performance of participants. Having wide range of age in this study is one of the reasons of large standard deviations. In addition, as mentioned earlier, almost half of the participants were born in Canada and half of them were immigrants. It is clear that that first language (Farsi and Arabic) tasks were easier for immigrant students while, students who were born in Canada found these tasks more difficult.

Correlational Analysis

In order to find the associations between variables, correlational analyses were conducted and shown in Tables 5 and 6 for Farsi and Arabic languages, respectively. Table 7 shows the correlations of the English tasks for all participants. This part is divided into five subsections and correlations are reported. In addition to significant

correlations, some non-significant correlations are reported because it is important to examine and consider them in the final discussion.

Word Reading: The correlations of word reading in English, Farsi and Arabic are presented separately in this part.

English: The Test of Word Reading Efficiency (TOWRE) showed significant correlations with age in month $r(58) = .52$, $p < .001$ as well as Expressive One Word Vocabulary Test (EOWPVT) $r(58) = .49$, $p < .001$. Rapid Digit Naming (RAN) was negatively correlated to word reading $r(58) = -.44$, $p < .001$. In addition, the Grey Oral Reading Test (GORT) $r(58) = -.81$, $p < .001$ and English morphology task $r(58) = -.66$, $p < .001$ were highly correlated to word reading. Interestingly, an association between TOWRE and phonological awareness in English was not found in this sample. Word reading in English was not correlated with any measures in Farsi and Arabic.

Farsi: There were some variables that had significant correlations with word reading in Farsi. For example vowelized word reading is significantly correlated with unvowelized word reading, $r(28) = .78$, $p < .001$, as well as vowelized $r(28) = .74$, $p < .001$ and unvowelized $r(28) = .46$, $p < .001$ reading comprehension. Morphology in Farsi was significantly related to word reading in Farsi $r(28) = .67$, $p < .001$. In addition, there was a significant negative correlation between word reading and RAN in Farsi, $r(28) = -.74$, $p < .001$. As it would be expected because the more proficient in word reading the child was the less time took him/her to name digits.

Arabic: Vowelized word reading was significantly correlated with unvowelized word reading, $r(28) = .77$, $p < .001$. Furthermore, moderate negative correlation exists

between word reading and oral naming fluency in English, $r(28) = -.36$, $p < .001$. As shown in Table 7, there was a significant relationship between phonological awareness in Arabic and vowelized word reading, $r(28) = .51$, $p < .001$, and also moderate correlation with unvowelized word reading, $r(28) = .37$, $p = .044$

Vocabulary Knowledge

English: As mentioned earlier, vocabulary knowledge in English was correlated with English word reading. This task was also significantly correlated with the morphology task in English, $r(28) = .417$, $p < .001$. It was found that English Oral Naming Fluency (ONF) was negatively correlated with RAN in English, $r(28) = -.613$, $p < .001$. In addition, EOWVT was highly correlated with two of the English measures: positively with oral naming fluency task and negatively with rapid digit naming, $r(28) = -.53$, $p < .001$, $r(28) = -.40$, $p < .001$ respectively. Additionally, there was a strong relationship between English morphology task and oral naming fluency, $r(28) = -.56$, $p < .001$ (See Table 7).

Farsi: The Farsi EOWPVT was significantly correlated to phonological awareness in Farsi, $r(28) = .69$, $p < .001$. The Farsi EOWPVT was also significantly correlated to English EOWPVT, $r(28) = -.49$, $p < .001$. Furthermore, Farsi vocabulary knowledge was negatively correlated with vocabulary knowledge in English, $r(28) = -.49$, $p < .001$, and positively with Farsi RAN, $r(28) = .54$, $p < .001$.

Arabic: Arabic ONF was positively correlated with Arabic EOWPVT, $r(28) =.70$, $p < .001$.What is interesting about this measure is that there was no correlation between the vocabulary knowledge tasks and any of the Arabic measures, whereas in Farsi it is not

the case. As mentioned above, Farsi vocabulary knowledge is negatively correlated with vocabulary knowledge in English, and positively with Farsi RAN.

Reading Comprehension: Three variables illustrated significant relationships with the reading comprehension task (GORT) in English. As highlighted in the word reading section, a correlation was found between word reading and reading comprehension task. Phonological awareness task was also moderately correlated with reading comprehension in English, $r(58) = .27$, $p = .034$. Moreover, students who had higher scores in oral naming fluency task had higher scores on English reading comprehension, $r(28) = -.36$, $p < .001$. Moreover, GORT was moderately correlated with Farsi phonological awareness, $r(28) = -.37$, $p = .001$. Finally, no correlations were found between English reading comprehension and any of Arabic measures in Arabic-English bilinguals.

Vowelized Farsi reading comprehension was negatively correlated to Farsi rapid digit naming, $r(28) = -.77$, $p < .001$, and positively to Farsi oral naming fluency, $r(28) = .53$, $p < .001$. No correlation exists between Arabic reading comprehension and any of Arabic measures.

Phonological Awareness: Morphology in English showed a significant correlation with English phonological awareness, $r(28) = -.49$, $p < .001$. In addition, Farsi phonological awareness was moderately correlated to phonological awareness in English, $r(28) = -.36$, $p = .005$. It was also found that Arabic phonological awareness was moderately correlated to English phonological awareness, $r(28) = -.31$, p = .005

Key Research Questions:

Research question 1: **Participants in both groups (Farsi, Arabic speakers) perform better on vowelized tasks compared to unvowelized tasks**

The first research question explored the differences in participants' reading ability on vowelized and unvowelized tasks. To answer this question, a paired samples t-test was conducted for each language group. The results indicated a significant difference in the performance of Farsi-English bilinguals on vowelized word reading *(M*=26.90*, SD*=2.92*)* and unvowelized word reading *(M*=23.83*, SD*=5.64*)* tasks; *t(29)*=4.40*, p* >.001 (see table 8). In this group, vowelization made a significant difference in reading comprehension task. As shown in Table 8, vowelized reading comprehension *(M*=1.57*, SD*=0.62*)* differs significantly from unvowelized reading comprehension *(M*=1.23*, SD*=0.67*)* tasks; *t(29)*=-2.56*, p* =.016. Surprisingly, There was no significant difference in the performance of Arabic English bilinguals for vowelized (*M*=20.33, *SD*=5.71) and unvowelized word reading (*M*=20.77, *SD*=5.02) tasks; *t*(29)=.623, *P* = .519 (See Table 9).

Research Question 2: Phonological awareness in Farsi or Arabic were expected to be correlated with phonological awareness in English

The second research question of this study examined the relationship between phonological awareness in Arabic and Farsi (L1) and English (L2). To answer this question, correlational analyses were conducted between Farsi and Arabic phonological awareness and phonological awareness in English measures. Results of the Farsi and Arabic languages indicated significant correlation between phonological awareness in

English and Farsi $r(28) = .36$, $p = .005$, as well as English and Arabic $r(28) = .31$, $p = .045$.

Research question 3: Which variables predicting word reading in English, Farsi and Arabic

Multiple regression analyses were performed to explore variables related to word reading in each language. Due to the exploratory nature of the analyses, linear regression analyses were chosen. Three sets of regression analyses were conducted one for each of the languages (Farsi, Arabic and English). Although the regressions did not control for age, the results of the current regressions are the same as those conducted controlling for age. Given the number of participants, age was excluded to be able to examine the effects of other more interesting variables. The regressions are described for each language separately as follow.

Farsi: The first regression analyses examined the relationships between vowelized word reading, as a dependent variable, and phonological and morphological awareness, vocabulary knowledge, as predictors $R^2 = 61$, F (3, 26) = 13.32, $p <. 001$. Sixty one percent of the variance in vowelized word reading was accounted for by phonological awareness, vocabulary knowledge $\beta =. 065$, t (26) = 3.033, $p = .006$ and morphological awareness in Farsi (See Table 12). The same regression analyses were conducted for unvowelized word reading as dependent variable, and phonological awareness, vocabulary knowledge and morphological awareness in Farsi, as predictors. Vocabulary knowledge and phonological awareness also explain significant proportion of variance in unvowelized Farsi word reading, $R^2 = .70$, $F(3, 26) = 20.35$, $p<.001$ (see Table

13). Farsi morphological awareness, β =.434, t (26) = 2.52, p = .018, and Farsi vocabulary knowledge, β =.101, t (26) = 2.74, p = .011, significantly predicted unvowelized word reading in Farsi. On the other hand, the t statistic for Phonological awareness did not predict Farsi word reading among this group, β =.166, t (26) = 1.17, p = .275

Arabic: For the Arabic language, two similar regression analyses were conducted examining variables related to vowelized and unvowelized word reading. The first regression analyses examined the predictors of vowelized word reading in Arabic. In this regression, vowelized word reading was considered as a dependent variable, and phonological awareness, vocabulary knowledge and morphological awareness in Arabic predictors, R^2= .31, F(3, 26) = 4.89, p =.020. Arabic phonological awareness significantly predicted vowelized word reading, β = .657, t (26) = 3.34, p = .003 (see Table 14). The next regression explained the significant relationships between unvowelized word reading as a dependent variable and phonological awareness, vocabulary knowledge and morphological awareness in Arabic were considered as predictors, F(3, 26) = 3, p =.050. Arabic phonological awareness β = .451, t (26) = 2.49, p = .019 and vocabulary knowledge β = .068, t (26) = 2.31, p = .029 significantly predicted unvowelized word reading, It is concluded from the equation that there is a significant linear relationship between unvowelized word reading in Arabic and phonological awareness, vocabulary knowledge as well as morphological awareness in Arabic (See Table15).

English: To determine the predictors of English word reading another regression analysis was performed. This regression analyses investigated the relationship between

English word reading, as a dependent variable, and the three independent variables: phonological awareness, vocabulary knowledge and morphological awareness in English for all participants in both groups. Phonological awareness, vocabulary knowledge and morphological awareness explained significant proportion of variance in English word reading, $R^2 = .55$, $F(3, 56) = 22.78$, $p < .001$. English phonological awareness, $\beta = -1.03$, $t(26) = -2.68$, $p = .009$, morphological awareness $b = 1.80$, $t(26) = 6.13$, $p < .001$ and vocabulary knowledge, $\beta = .177$, $t(26) = 2.18$, $p = .033$, were significantly related to English word reading, (see Table 16).

Discussion

As indicated earlier, there has been no previous research on the effects of including or excluding vowels in Farsi orthography, which is written in Arabic script but has Indo-European linguistic roots. Moreover, many studies have been conducted to examine the effects of vowelization in reading development in Hebrew and Arabic languages in students living in some countries in the Middle East. This study was conducted with the aim of assessing the importance of including vowels in reading skills in Farsi and Arabic scripts for bilingual students and relations between Farsi or Arabic and English variables. This discussion includes a description of the associations between variables and their relation to the past research based on the two research questions as well as considering the limitations of this study and suggestions for future studies. Finally, key findings are reviewed in the conclusion.

Relations Among Variables

The correlational analyses are important because, cross-linguistic comparisons are essential to generalize the models of literacy acquisition developed for English to other languages (Caravolas, 1993). Unlike many attempts to understand how English-speaking children become literate, there are still deficiencies in understanding of how other children become literate (Arab-Moghaddam & Senechal, 2001). Studies with alphabetic scripts have compared similar scripts (e.g., English, French, or Spanish); however, there are few studies about learning to read and write in two languages for which the alphabetic scripts shown a remarkable difference (e.g. Arabic and English) (Arab-Moghaddam & Senechal, 2001).

Farsi-English Bilinguals: Findings indicated that the more proficient in vocabulary the participant was, the better he/she could read words in Farsi. Moreover, unvowelized word reading in Farsi is highly related to phonological awareness in Farsi whereas this association was not found in vowelized word reading. This finding suggests that proficiency in phonological awareness enables readers to read unvowelized (more difficult) words. Word reading, morphology and vocabulary knowledge are significant predictors of reading comprehension in Farsi.

The same association between vocabulary knowledge and word reading was also found in English measures in this group. This result is in agreement with Share (1995) where the author showed the ability to translate unfamiliar printed words into spoken equivalents ‘‘phonological recoding’’ or simply ‘‘decoding’’ as the central means to acquire orthographic representations is entered to the self-teaching hypothesis. This indicates that ability to successfully read a new word is an opportunity to acquire the word specific orthographic information, which is the basis of skilled visual word recognition.

Morphological awareness shows a significant role in Farsi word reading, which can be explained by the result of past research that showed evidence of a relationship between morphological awareness and reading in the early school years (Carlisle 1995; Carlisle & Nomanbhoy 1993; Champion 1997; Fowler & Liberman 1995).

Another point worth noting is that English reading comprehension and Farsi phonological awareness are correlated. This result can be explained by the findings of Gass and Selinker (1983) that bilingual children usually transfer prior linguistic knowledge for acquiring reading skills in second language. Many studies have shown that bilinguals benefit from phonological awareness skills in their first language to facilitate development in their second language, and phonological awareness levels are related between languages as well as correlated with word recognition across languages (e.g., Comeau, Cormier, Grandmaison, & Lacroix, 1999; Durgunoglu, 1998; Gottardo, Yan, Siegel, & Wade-Woolley, 2001; Durgunoglu, 2002).

Arabic-English Bilinguals: Word reading in Arabic (vowelized and unvowelized) is correlated with phonological awareness in Arabic. It has been suggested that phonological awareness is a strong predictor of word recognition tests both within and across languages (Durgunoglu, Nagy, & Hancin-Bhatt, 1993). In both groups (Farsi and Arabic languages), the results indicate no significant correlation between phonological processing in Farsi or Arabic (L1) and word reading in English (L2). This finding can be explained by script differences between the two languages. In English script, vowels are part of the words and cannot be presented without them, while in Farsi and Arabic scripts short vowels are represented by adding diacritics above or below letters. Therefore, phonological awareness is more important for reading these more

difficult words. The fact that phonological processing is positively related to word reading in Farsi or Arabic (L1) but not in English (L2) shows that within-language relations exist but between-language relations are not found in this study.

Relations among measures in English for all participants: Measures of vocabulary knowledge, English morphology and reading comprehension are considered to be powerful predictors of word reading in English. These results are in agreement with past research. Unexpectedly, in this sample, relations between phonological awareness and English word reading were not found. This finding supports the argument that phonological development does not fully explain the development of reading abilities outside the primarily grades (Scarborough, 2005). The differences across language are likely because the children in this study were better at reading English (the dominant societal language) and can be considered beginner readers in Farsi and Arabic.

Based on past research, bilingual children often lose their first language skills when they learn English as their second language (Fillmore-Wong, 1991). A change in the language of communication at home and a loss of fluency in the native language are two main reasons for "first language loss" among bilinguals (Crawford, 1996). As noted by Fillmore (1991) almost 51 percent of families reported changes in the home language after their children entered English-only schools. Forgetting the L1 is a result of more exposure to the L2 (Fillmore, 1991). In a study conducted by Dunn and Fox Tree (2009), they found that children by the time of schooling often use their L2 and preferred to use their L2 with their peers and in big groups for communication. In some areas, based on the size of the group children feel embarrassed to communicate in their first language. Exposure to English-only environment in school and communicating in L2 with their

peers has lead participants in this study less proficient in their L1. As mentioned in introduction, Frost (2012) proposed a more pervasive model of reading that considers a joint cognitive process involved in orthographic processing in different writing systems. Therefore, research into other orthographies to determine such common underlying processes is beneficial to the development of universal theories of reading. The present study provides a preliminary contribution to a universal reading model proposed by Frost (2012) by finding common factors related to reading in three different languages.

Research question 1: Participants in both groups (Farsi speakers, Arabic speakers) were expected to perform better on vowelized tasks compared to unvowelized tasks: No significant difference was found between vowelized and unvowelized tasks for Arab participants. On the other hand, a significant difference was found for Farsi readers. Two possible explanations for the different patterns of results across groups are the amount of time and type of curriculum to which they were exposed. Most of the Arabic-English participants in this study were recruited from an Islamic school. In the Islamic school, extensive programs of Islamic studies and especially reading Quran (the holy Book of Islam) exist in a more organized and purposeful manner compared to the classes attended by the Farsi speakers. In addition, Arabic-English bilinguals attended Islamic school an average of 6 hours weekly while Farsi speakers attended classes in the International Language School for only 3 hours per week and mostly with the focus of reading an Iranian textbook based on the current school's curriculum in Iran.

The greater effect of vowelization on reading ability of Farsi speakers makes sense because the unvowelized version of Farsi orthography is more arbitrary in Farsi. As

mentioned earlier, novice Farsi readers are exposed to vowelized version of orthography, which is visually dense but more transparent in comparison to unvowelized version. After one year of schooling, the less transparent form of the orthography (unvowelized) is most often used. An increasing number of homographs is a result of eliminating vowels in Farsi which use of context is necessary to support written word processing (Sadeghi et.al; 2014).

Rahbari and Sénéchal (2009) evaluated the importance of lexical and nonlexical processes in skilled reading and spelling of Farsi among the Iranian high school students. They found that transparent (consistent grapheme-phoneme) words were read faster than opaque (unvowelized) words. Furthermore, skilled readers in Farsi relied more on lexical processes when reading unvowelized text. This suggests that readers of transparent orthographies (e.g. vowelizd Farsi) rely on grapheme-phoneme mappings rules, while in less transparent orthographies readers rely more on graphemic representations of whole-word reading as part of their word recognition process (Wimmer & Goswami, 1994). Taken together, previous findings suggest that lexical processing is crucial in reading Farsi, especially in the unvowelized version. Considering that the participants in this study were bilingual and living in an English-speaking environment, this factor might affect lexical processing and influence their reading ability as well.

The differential results for reading vowelized and unvowelized texts across groups also can be explained by the small sample size in this study. Recruiting more participants is crucial in order to generalize the findings and draw an accurate conclusion.

As mentioned earlier, most of the participants in Arabic-English speaking group were recruited from Islamic school while, Farsi-English speaking were recruited from international language school. Therefore, participants had different language experiences in their L1 in terms of amount of time and the type of curriculum delivered in their school. For example, Islamic school provides wide programs of Islamic studies and reading Quran. In addition, children are encouraged to memorize various verses from the Quran.

Wagner and Spratt (1989) proposed the question of whether teaching the Quran in preschools facilitate literacy acquisition among Moroccan children in primary school. Interestingly, they found that Quranic preschool experience provided an advantage for children who attend the traditional Quranic preschool. In return, children who did not attend Quranic preschool had lower achievement in primary school. It suggests that teaching of the Quran in preschool provided an early opportunity for many children to improve their oral and written Arabic skills. It is possible that reading skills of Arabic-English bilinguals in the present study were influenced by reading Quran and that it provided an advantage for them.

Research question2: Phonological awareness in Farsi/Arabic were expected to be correlated with phonological awareness in English: This research question examines whether phonological awareness in Arabic or Farsi (L1) predicts phonological awareness in English (L2). Although significant correlation between Arabic and English phonological awareness was found in one tailed condition, it is reliable since it has been proven based on the literature. In a study by Saeigh-Haddad and Geva (2007), they tested 43 Arabic-English bilinguals and results showed significant correlation between

phonological awareness in English and Arabic. The results of this study confirm the ideas of Durgunoglu (2002), who suggested that many domains such as syntactic awareness, knowledge of genres and phonological awareness and meaning making strategies transferred across languages. A variety of research findings suggest that phonological awareness is highly correlated with word recognition and spelling (Adams, 1990; Goswami & Bryant, 1990).

Limitations

The small number of participants in both groups is a limitation of this study. To generalize the findings it is important to have more students. Moreover, since all of the participants in this study were bilinguals, recruiting bilinguals was not an easy task. In addition, because the Islamic or international language school is held once a week, testing procedures were slow and parents were not willing to have their child be pulled out of the classroom. Additionally, having participants from both language groups enrolled in similar programs would have been ideal.

Another challenge was creating Arabic word reading and reading comprehension task. For this study these tasks were created based on Saudi Arabic School's curriculum and since Arab participants in this study were from different Arab countries and have different accents and cultural backgrounds, some of the words were unfamiliar and challenging for some of the children

Moreover, it might be important to follow these children in a longitudinal study and assess the relations among variables across languages in different times. This way, the development of reading skills in different tasks would be tracked. It is possible that

with time skills would change or that vowels would be still an important factor for Farsi speakers.

Another important challenge was translating vocabulary test to Farsi and Arabic. There were some items in this task that there is no accurate translation of the picture in Farsi such as (Banjo, Boomerang). Access to standardized tests is important because it helps to avoid cultural differences.

Future studies

This study is unique in many ways: first, it is the first study to assess bilingual Arabic-English children on vowelized and unvowelized task outside an Arabic language country and examine their reading skills in these tasks and compare to English measures. Second, there are no previous attempts on the importance of including or excluding vowels in Farsi language. It would be interesting to conduct this research in Iran or other Farsi countries to find the possible differences in the results. Further work needs to be done to compare these students to their native peers. In addition, it would be interesting to consider poor and good readers in bilinguals in both languages and then testing them on the tasks and compare the result.

Conclusion

To summarize the major findings briefly: Including vowels was an important factor in reading skills for Farsi-English bilinguals. These bilinguals students performed better on vowelized tasks in comparison to unvowelized tasks. Another key finding is that

vowelization made no difference in reading skills of Arabic-English bilinguals in this study, these bilinguals in this sample did not perform differently on vowelized versus unvowelized tasks. Moreover, as it was expected, phonological awareness in the L1 was related to phonological awareness in the L2. Finally, phonological and morphological awareness and vocabulary knowledge were strong predictors of word reading in L1 (Farsi or Arabic) and L2 (English).

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Table 1

Measures and tasks in Farsi/Arabic and English Language

Measures	English	Arabic/Farsi
Word reading	TOWRE	Vowelized/Unvowelized word reading
Vocabulary Test	EOWPVT/ONF	Translated EOWPVT/ONF
Phonological Processing	CTOPP segmenting words/RAN	Segmenting words/RAN
Reading comprehension	GORT	UN/V Text reading comprehension
Morphology	Production of new words	Production of new words

1. TOWRE = Test of Word Reading Efficiency

2. EOWPVT = Expressive One Word Picture Vocabulary Test

3. CTOPP = Comprehensive Test of Phonological Awareness

4. GORT = Grey Oral Reading Test

Table 2

Farsi and Arabic speakers demographic

Participants	Gender	Age (month)		
		Mean	*SD*	*N of participants*
Farsi	M	129.50	20.71	14
	F	127.00	21.32	16
Arabic	M	115.41	14.94	16
	F	128.47	19.83	14

Table 3a

Descriptive data from Farsi measures in Farsi speakers

Measures	Mean	SD
Vowelized Word Reading	26.90	2.92
Unvowelized Word Reading	23.83	5.64
Vowelized Reading Comprehension	1.57	0.62
Unvowelized Reading Comprehension	1.23	0.67
Phonological Awareness Farsi	15.48	4.77
RAN Farsi	50.90	23.40
ONF Farsi	54.67	20.86
Morphology Farsi	18.00	2.22
EOWPVT Farsi	53.87	25.54

Note: No ceiling or floor effect was found in this sample

Table 3b

Descriptive data from Arabic measures in Arabic speakers

Measures	Mean	SD
Vowelized Word Reading	20.33	5.71
Unvowelized Word Reading	20.77	5.02
Vowelized Reading Comprehension	1.40	0.62
Unvowelized Reading Comprehension	1.43	0.67
Phonological Awareness Arabic	12.60	4.81
RAN Arabic	128.03	58.79
ONF Arabic	28.03	11.57
Morphology Arabic	18.00	2.85
EOWPVT Arabic	27.17	29.69

Note: No ceiling or floor effect was found in this sample

Table 4

Descriptive data and two-way comparison from English measures in Farsi and Arabic speakers group

Measures	**Group**									
	FE				**AE**					
	Mean	SD	Min	Max	Mean	SD	Min	Max	F	Sig
Vocabulary Knowledge	77.90	19.27	48	120	86.67	20.86	44	120	2.85	.096
Word Reading	67.23	16.77	32	91	70.10	16.40	32	95	.448	.506
Phonological Awareness	12.20	4.23	2	18	12.53	3.90	4	18	.100	.752
Morphological Awareness	11.40	6.32	0	20	12.10	5.37	0	19	.213	.646
Reading Comprehension	24.13	7.10	4	38	23.80	6.22	5	35	.037	.847
RAN	32.93	7.9	27	54	33.93	9.40	20	55	.216	.644

Note: FE: Farsi-English bilinguals; AE: Arabic-English Bilinguals.