Brief Report

Does visual letter similarity modulate form priming in young readers of Arabic?

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A R T I C L E   I N F O

A B S T R A C T

We carried out a masked priming lexical decision experiment to study whether visual letter similarity plays a role during the initial phases of word processing in young readers of Arabic (fifth graders). Arabic is ideally suited to test these effects because most Arabic letters share their basic shape with at least one other letter and differ only in the number/position of diacritical points (e.g., ض - ص ;ظ - ط ;غ - ع ;ث - ت - ن ب ;ذ - د ;خ - ح - ج ;ق - ف ;ش - س ;ز - ر). We created two one-letter-different priming conditions for each target word, in which a letter from the consonantal root was substituted by another letter that did or did not keep the same shape (e.g., خدمة - فدمة vs. خدمة - حدمة). Another goal of the current experiment was to test the presence of masked orthographic priming effects, which are thought to be unreliable in Semitic languages. To that end, we included an unrelated priming condition. We found a sizable masked orthographic priming effect relative to the unrelated condition regardless of visual letter similarity, thereby revealing that young readers are able to quickly process the diacritical points of Arabic letters. Furthermore, the presence of masked orthographic priming effects in Arabic suggests that the word identification stream in Indo-European and Semitic languages is more similar than previously thought.

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Introduction

Most theorists would agree that, in a mature reading system, the abstract letter units that drive the process of lexical access are activated during the initial phases of processing (see Grainger, Dufau, & Ziegler, 2016). Indeed, in the masked priming paradigm, a visually dissimilar lowercase–uppercase identical pair such as arte–ARTE produces as much masked repetition priming—relative to an unrelated control—as a visually similar lowercase–uppercase identical pair such as kiss–KISS (Bowers, Vigliocco, & Haan, 1998; see also Jacobs, Grainger, & Ferrand, 1995). Importantly, the mapping from visual letter forms to abstract letter representations also appears to occur early in processing with developing readers (see Perea, Jiménez, & Gómez, 2015, for a replication of the Bowers et al. (1998) and Jacobs et al. (1995) experiments with Grade 5 children). However, most developmental research on visual word recognition and letter processing has been conducted in English or other Indo-European languages that employ the Roman alphabet (e.g., Grainger, Lété, Bertrand, Dufau, & Ziegler, 2012; Nation, 2009). In the current study, we examined the role of visual letter similarity during the initial stages of word processing—using the masked priming technique—in young readers of an underrepresented language (namely, Arabic) that has two distinctive characteristics in terms of morphology and visual features.

First, as in other Semitic languages (e.g., Hebrew), words in Arabic are typically created by putting together a three-letter consonantal root that denotes the general meaning and a word pattern that indicates the specific inflectional/derived form. For instance, the consonantal root سبح, which means to swim (the Buckwalter transliteration is sbH), can be used to form a number of different words such as سباحة (swimming [sbAHp]; word pattern: CCACp, where the Cs denote the consonants from the root), سباح (swimmer [sbAH]; word pattern: CCAC), and مسبح (swimming pool [msbH]; word pattern: mCCC). The consonantal root appears to play a prevalent role during lexical access in Semitic languages. In fact, it has been claimed that lexical space in Semitic languages is organized morphologically, whereas it is organized orthographically in Indo-European languages (Frost, 2009). A key finding supporting this dissociation is that whereas masked morphological priming in lexical decision is sizable in Hebrew or Arabic adult readers (e.g., جميل - جمال [gmyl–gmAl] lovely–beauty; the root is جمل [gml] in both cases), masked orthographic priming effects with word/nonword primes tend to be null or minimal (as in the word pair خيمة - غيمة [xymp–gymp] tent–cloud; the roots are خيم [xym] and غيم [gym]) (see Frost, Kugler, Deutsch, & Forster, 2005, for evidence in Hebrew and Arabic; see also Velan & Frost, 2009). In contrast, masked orthographic priming is a highly replicable finding in Indo-European languages (Forster, Davis, Schoknecht, & Carter, 1987; see also Castles, Davis, Cavalot, & Forster, 2007, and Comesaña, Soares, Marcet, & Perea, 2016, for evidence with young readers). Nonetheless, recent studies with adult Arabic readers reported significant masked orthographic effects in Arabic under some circumstances (e.g., using the go/no-go variant of the lexical decision task; see Perea, Abu Mallouh, et al., 2013).

Second, Arabic is written in a right-to-left semicursive script in which some letters may be connected to the previous letter, thereby forming subwords (e.g., the word راحة [comfort; rAHp] is composed of three subwords: [r-A-Hp]). Importantly, most Arabic letters share their basic shape with at least one other letter and differ only in the number/position of diacritical points diacritical points (e.g., ض - ص؛ ظ - ط؛ غ - ع؛ ث - ت - ن - ب؛ ذ - د؛ خ - ح - ج؛ ق - ف؛ ش - س؛ز - ر). As a result, many Arabic words look physically the same except for the presence/location of diacritical points (e.g., بحار [sailor; bHAr], بخار [steam; bxAr]). The evidence concerning the role of the visual similarity effect during the early stages of word processing with young readers in Arabic is very scarce. Perea, Abu Mallouh, et al. (2013) examined whether the ligation pattern of Arabic words plays a role during the early moments of word recognition with Grade 3 and Grade 6 children. They employed a masked priming lexical decision task in which the target words could be preceded by a morphologically related substituted-letter prime that kept the same ligation pattern (e.g.,كتزب - كتاب [ktzb–ktAb]) or not (e.g., كتاب – كتخب [ktxb–ktAb]). As a further control, an unrelated condition was also included (e.g., طيلر - كتاب [Tylr–ktAb]). Results showed slower word identification times in the unrelated condition than in the morphologically related conditions, but there were no differences due to the ligation pat-