Dyslexia assessment in Arabic

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Introduction

The importance of learning to read specifically, and of literacy and education generally, is recognised by almost all the countries of the world, a fact reflected by the adoption of United Nations’ resolutions 45/199 and 50/143 which state that ‘education is a basic human need and a prerequisite for the achievement of development’ and that ‘entitlement to literacy is considered a basic human right and so reflects the central role of reading and writing in all societies’ (Working Party of the Division of Educational and Child Psychology of the British Psychological Society, 1999). Appropriate literacy development for all has become ‘a global concern as countries attempt to reduce their level of illiteracy’ (Firman, 2000, p. 57), prompting the United Nations to call the current decade we live in the decade of literacy. An appreciation of the importance of literacy resulted in a systematic enquiry of its nature and, in turn, prompted scientific studies of problems associated with or hindering the acquisition of reading. Developmental dyslexia is one of many reading difficulties which has intrigued linguists, neurologists, psychologists and educators over the last century and which has recently received ‘much more attention than at any other time in the past’ (Selikowitz, 1998, p. 10). It is not surprising, therefore, that dyslexia has become an international concern, although the extent to which it actually becomes relevant at the individual, scholastic or policy level will depend upon a number of factors, including the ‘perceived importance of education in the community and the resources available for special educational provision’ (Smythe & Everatt, 2000, p. 12). These advances have culminated in an ever-increasing knowledge concerning the biological, cognitive and behavioural manifestations of developmental dyslexia (Fawcett, 2002; Working Party of the Division of Educational and Child Psychology of the British Psychological Society, 1999). Thanks to such developed awareness and conceptual understanding, dyslexia is now well established as a congenital and developmental condition and its nature is much clearer than it was just over a hundred years ago (Miles & Miles, 1999). The end result is an extensive research field that is continuously growing and constantly benefiting from increased interests and activities from researchers worldwide, particularly those engaged in classroom and clinical practices (Reid, 1998).

However, Smythe and Everatt (2000) note that despite developmental dyslexia being recognised throughout the world, tests to identify the difficulties experienced by individuals with developmental dyslexia exist in relatively few languages. Miles (2000) observes that most research studies concerned with the difficulties of individuals with dyslexia in acquiring literacy and accompanying phonological difficulties were conducted in the American/British vernacular by American, Canadian, Scandinavian or British researchers. The majority of subjects in such studies were monolingual English-speaking participants and assumptions might have been made about the nature of dyslexia ‘which are dependent on the complex features of that language’ (Miles, 2000, p. 193).

When cross-linguistic research on developmental dyslexia started to emerge, it highlighted factors such as the...
consistency between the written form and spoken language as an important aspect in the acquisition of an alphabetic writing system. Goulandris (2003) presents a cross-linguistic comparison that involves a consideration of the nature of the language and the range of skills required for reading in different languages. She argues that in order to identify and appreciate the signs of dyslexia in a particular language, it is necessary to understand the relevant linguistic features of that language. Evidence in support of a linguistic basis of reading difficulties (Catts & Kamhi, 1999) has come from empirical research showing the importance of phonological (e.g., Goswami, 2002; Goswami & Bryant, 1990; Shankweiler & Liberman, 1989; Snowling, 2000; Vellutino, 1987) and orthographic (e.g., Breznitz, 2003; Hultquist, 1997; Miller Guron & Lundberg, 2004) processing for literacy learning. Snowling (2000, p. 206) argues that writing systems differ in the inherent difficulty they pose to young readers, because they differ in the ‘regularity or transparency of their orthographies’. Transparency here refers to the association between written symbols and language sounds. A transparent script has a simple one-to-one relationship, whereas less transparent scripts, such as English, have a much more complex relationship between letters and sounds. Consistent with Snowling’s position, cross-orthographic studies have found that readers of English make more errors on single-word reading and non-word reading tasks than readers of shallower orthographies (e.g., Goswami, 2002; Landerl, 2003; Nikolopoulos, Goulandris & Snowling, 2003; Share, 2003). Wimmer (1993) argues that transparent orthographies such as Italian, Spanish and Greek will pose fewer problems to beginning readers than inconsistent, opaque orthographies such as English and French. The Arabic script (the focus of the present paper) is fairly unusual in its transparency. The use of diacritical markers in beginning readers’ texts makes the script highly transparent (we refer to texts that include diacritics that represent short vowel as vowelised texts). However, these short vowel markers are absent in the majority of more advanced written works (i.e., non-vowelised texts), which produces a highly opaque script with a large number of homographs that can only be pronounced correctly through an appreciation of the context within which they are written. Once the readers have progressed beyond first- or second-grade texts, therefore, they would be expected to be able to process non-vowelised (highly opaque) text. This paper will return to this point in later sections.

Van der Leij (2004) has argued that as reading is basically a mapping process between phonemes and graphemes, it is essential that, in order to understand the origins of dyslexia and develop instruments and methods for identification and treatment, we determine the processes and systems necessary for this learnt mapping processes. For the present discussion, the question that emerges is whether the cognitive prerequisites of learning how to read and spell are universal, that is, independent of environmental factors such as language, writing system, orthography, school and home factors. Van der Leij (2004) argues that although the view that the cognitive prerequisites of learning how to read and spell are universal has been assumed to be the case for a long time, cross-linguistic evidence to support this assumption has been found only recently. For example, Paulesu, Demonet, Fazio, McCrory, Chanoine, Brunswick, Cappa, Cosssu, Habib, Frith & Frith (2001) conducted a cross-linguistic study of dyslexia and compared the brain activity of Italian-, French- and English-speaking individuals with dyslexia while they were reading. Their study has two major findings. First, the reading and phonological skills of all dyslexic groups were impaired compared to control groups. Second, when they employed Positron Emission Tomography (PET) scan technology, they found reduced activity in the same brain region for all three dyslexic groups. However, differences in the reading performance of the three groups were reported, with the Italians with dyslexia attaining, on average, higher levels of accuracy on single-word reading and non-word reading than the French and English individuals with dyslexia. The researchers concluded that although a similar neuro-cognitive basis underlies dyslexia in all three groups, differences in the orthographies of the languages involved in the study influence the severity of the reading, spelling and phonological deficits. Hence, even if it is concluded that the same underlying factor is responsible for dyslexia across all languages, the way the learning difficulty manifests at a behavioural level (i.e., the level at which assessment practices operate) seems to vary across languages. As Miles and Miles (1999, p. 44) observe ‘in this new situation it is beginning to be appreciated that the ways in which dyslexia manifests itself are different in different languages’. Given the perceived importance of dyslexia assessment, intervention, support and policy throughout the world, Smythe and Everatt (2000) highlight the need for systematic research in order to identify the similarities and differences across countries and language contexts. They conclude that this would ultimately help in the development of culture and language-appropriate diagnostic strategies. Reid and Fawcett (2004) observe that one of the areas which has gained momentum in recent years has been the acknowledgement of the need to ‘promote appropriate and effective practices both in the assessment and in the intervention for students whose first language is not English’ (Reid & Fawcett, 2004, p. 13). The practice of cross-linguistic and cross-orthographic studies of dyslexia is important in explaining the nature of the condition and how it is manifested in different orthographies, which in turn assists in furthering an understanding of the relevant and subsequent areas of interventions, policies and practices. An appreciation of language-specific factors is critical because ‘in many countries there are as yet few test instruments available to assess and identify children with specific learning difficulties’ (Goulandris, 2003, p. 13).

This section highlights the need for theoretical models of literacy learning that apply to the individual language under consideration, as well as assessment and intervention planning that considers the context and the culture that predominates for those being identified for educational support. This underlines the importance of an assessment framework and particularly the rationale for that framework,
as well as developing identification procedures that are specific to the language and the culture of the child being assessed. A framework can take cultural and contextual factors into account. This means that commercially developed instruments standardised in other countries can provide only part of the overall assessment picture. This underlines the importance of developing and customising assessment instruments that are specific to the language and the country where they are to be used. The development of a framework is the focus of this paper, which seeks to provide a rationale as well as criteria for the development of instruments that are specifically focused on children using the Arabic script.

A framework for dyslexia assessment

The research discussed in this paper has mainly focused on the importance of linguistic factors in relation to the complexities in Arabic script. However, in order to provide guidance for teachers, educational psychologists and other professionals in assessment and intervention it is necessary to view dyslexia from a broader perspective indicating that dyslexia may involve more than literacy (Nicolson, 2002). It is important, therefore, to ensure that those who are involved in the assessment process are aware of these broader issues, as well as the role of contextual factors. One method of ensuring this is through the use of an assessment framework within which the linguistic and literacy-related aspects would play a prominent role. Such a framework would include environmental and classroom-related factors, as well as data on the individual’s learning and information processing. It is crucial to develop assessments that can be used in the specific context that represents the students learning environment. Therefore such a framework might include cultural as well as learning preferences. This is particularly relevant as many of the difficulties incurred in the assessment of children who are in a bilingual or multilingual situation relate to the lack of culture-fair assessment (Working Party of the Division of Educational and Child Psychology of the British Psychological Society, 1999).

The nature of assessment

To assess is to evaluate, that is, to estimate the worth or extent of something. An assessment therefore needs to be an information-gathering procedure, with different assessment tools, or tests, providing the means to gather the information (Friedenberg, 1995). Friedenberg argues that although tests are a specific type of assessment used to gather information about individuals, this information is eventually used in an evaluative manner; in other words, the data produced by this information are used to assist in making decisions regarding rating, placement, selection and/or diagnosis (Friedenberg, 1995). This implies that a degree of clinical judgement must still be employed by the assessor. A test is an objective and standardised measure of a sample of behaviour (Thomson, 2001), a definition which refers to two very important characteristics a psychological test should represent. First, an objective test is a test that yields the same result if re-administered. Second, a test is objective because it is not based upon someone’s subjective judgement of an individual’s underlying personal abilities. A test is also standardised if re-administered using the same techniques every time and if it has been originally administered on a large sample of individuals. Thomson (2001) argues that the notion of a sample of behaviour is critical as it is only a sample of the participant’s behaviour at the time when the test is administered and that there are other factors that can influence such behaviour either positively or negatively. That is why there will always be a ‘built-in error of measurement in any given test’ (Thomson, 2001, p. 18). Therefore, identification should be seen as a process and not only as a consequence of test data (Reid, 2003).

Dyslexia assessment

The above argues for a dyslexia assessment to be seen as a dynamic process that operates according to scientific principles embedded in clinical practice. Relevant information is gathered concerning the performance and/or behaviour of individuals on a selected number of tests. These tests are different in what elements of abilities and/or skills they aim to assess, but generally tend to include representations of the individual’s cognitive abilities and her or his educational achievements as well as some of the skills that tap the underlying deficits in dyslexia as supported by empirical research in the field of dyslexia assessment. Reid (2003, p. 89) notes that although there are a number of tests that contain the word dyslexia in their title, there is no single dyslexia test because the identification of dyslexia is a process and that process includes ‘more than the administration of a solitary test’.

Dyslexia assessment tests are diagnostic tests that aim to ascertain whether the individual is actually failing and, if so, to what degree. Common to most is the establishment of the individual’s current level of performance in attainments by identifying the individual’s level of educational achievements and, in particular, her or his reading, writing and spelling skills. Beyond this, views about the purpose of an assessment may vary. Miles and Miles (1999, p. 108), for example, maintain that the primary aim of dyslexia assessment should be ‘that of clarification of the person’s strengths and weaknesses’. Farmer, Riddick and Sterling (2002, p. 117) argue that one of the key functions which a dyslexia assessment should perform is the ‘profiling of the individual student’s strengths, weaknesses and learning style’, while Stackhouse and Wells (1997) claim that the purpose of collecting assessment information regarding dyslexia is to arrive at a greater understanding of an individual’s needs. Reid (2003), on the other hand, views dyslexia assessment as a tool to identify the individuals’ learning styles and establish various aspects of the curriculum and curriculum activities that motivate or de-motivate them. However, almost all the researchers above agree that dyslexia assessment is a form of psycholinguistic assessment where participants’ performance on a range of tasks can be interpreted from a psycholinguistic perspective.

One of the main obstacles to the interpretation of such dyslexia assessments has been, as Miles (1994, p. 101)
notes, ‘the absence of agreed criteria for diagnosis’. This has been largely a result of the confusion over the definition of the condition, particularly the use of intelligence as an exclusion criterion and the role of IQ measures in dyslexia assessment. Whereas a distinction between an individual’s underlying abilities and her or his current literacy performance has been adopted in assessment practices, such IQ-reading discrepancies have been critiqued by a number of researchers (Siegel, 1988; Stanovich & Siegel, 1994; see also arguments in Nicolson & Siegel, 1996) and is not recommended by all (e.g., Working Party of the Division of Educational and Child Psychology of the British Psychological Society, 1999). This is in addition to the lack of an agreed cause of dyslexia despite recent attempts to view more than one competing theory in an overall ‘synergy’ (Reid & Fawcett, 2004) or an ‘eco-system’ (Nicolson, 2002), each of which echoes an earlier proposal by Frith (1997) that, arguably, has been the most successful multilevel causal modelling framework to define, understand and explain developmental dyslexia.

Challenges associated with dyslexia assessment in Arabic

To those challenges that could be said to apply to any language, there are a number that are specific to the Arabic language. The first is the fact that studies on the occurrence of dyslexia in Arabic have hitherto been rare. Dyslexia is not recognised as a specific reading difficulty and academic research on dyslexia is scarce (e.g., Abu Rabia, 2004; Elbeheri, 2004; Gilgil, 1995), despite endless efforts by various Arabic educational authorities to raise awareness of learning difficulties and special educational needs throughout the region. Currently, there are no methods of identification, assessment or diagnosis for dyslexia available to either educational psychologists or special educational teachers. However, the wealth of the Gulf region, the increase in the number of Western expatriates living there and the accompanying increase in and trust of American and English schools have brought about an increased awareness of learning and reading problems and of dyslexia. Examples of these situations are the many special educational needs units, schools and learning disabilities centres across the Arab world and the Gulf region in particular. However, some students who join such English language schools are Arabic native speakers (i.e., English is an additional language). When teachers suspect that these students show signs of dyslexic-type behaviour, the problem of the lack of adequate cultural-fair assessment for these students emerges. Some teachers or educational psychologists faced with this problem start using English tests which have been standardised on English- or American-speaking students in the hope that the Arab students attending their schools will have attained a level of proficiency in the English language that is advanced enough to justify using English tests. After all, having English tests with English or American norms are better than having no tests at all in Arabic. Others, more concerned about the fairness of their assessment tools, resort to Arabicised tests of English cognitive tests. The Stanford Binet, Wechsler intelligence scales and Raven’s Progressive Matrix are examples of general abilities tests that have been translated and adapted into Arabic. However, generally Arabic standardised tests are rarely used, either because they are few in number or because those administering the assessment process do not speak Arabic and therefore cannot use them. Even when an assessor can use an Arabic version, research is necessary to ensure that the test is appropriate for the context of testing and that norms are representative of all populations in which the test is used. For example, in our own work with Arabic-speaking children, norms for the Arabic version of the Coding subtest of the Wechsler Intelligence Scale for Children suggested that most children tested were producing scores less than two standard deviations below the mean – that is, the majority of these children (some 100 in total) were scoring in the bottom 10% of the population (or below a centile score of 10). Given that the children tested were from typical schools in the region where testing was conducted, and that there was no reason to believe that they had specific problems in any area of cognitive functioning, the only conclusion is that the Arabic norms for this particular test are not appropriate for this particular Arabic population.

There are some tests available that have been specifically developed for testing in Arabic, which can be utilised when trying to assess either the current cognitive abilities of Arabic speakers or their educational attainments. For example, the Non-verbal Pictorial Mental Abilities test is a simple and easy-to-use test that has been used to measure non-verbal deductive reasoning abilities of Egyptian children (8 to 18-years-old) and which only takes 10 minutes to administer. Items contained in the test are drawn from the Egyptian environment and can be used across the Arab world, potentially making this test more valid for the environment of testing than English-background tests that may use inappropriate material for the Arabic culture. Similarly, measures of Forward and Backward Digit Span, which form a part of the Wechsler scales and have often been used in English-language dyslexia assessment procedures, can be used across a variety of cultures and languages. As such, they should be applicable for use in Arabic assessment procedures. However, visual presentation of materials needs to take into account the use of Hindi numerals currently prevalent across most of the Arab world.

In addition to general ability measures, there are examples of Arabic standardised literacy tests. For example, the Sirs Ellayan Silent Reading Test is a standardised silent reading test that was shaped in Egypt and suits the Egyptian environment. The test measures both reading accuracy (through single-word recognition, sentence recognition and sentence completion) and reading comprehension (through passage comprehension and multiple choice questions). It provides a good indication of children’s (8 to 14-years-old) silent reading skills. However, there is a lack of tests of reading fluency, a measure that may be particularly useful in measuring early acquisition difficulties of the transparent written form of Arabic. In addition, because of the large number of homographs in Arabic when short vowels (which are represented in the Arabic writing system as diacritical
markings above or below the letters – see discussions below) are not included in text, tests of individual word reading accuracy out of context would have to use fully vowelised words, that is, diacritic markers would have to be included for correct pronunciation. The alternative is to present non-vowelised words in passages where contextual clues are available to allow appropriate lexical access. Spelling is another test which is particularly relevant for identifying dyslexia amongst learners of Arabic, although again decisions need to be made about using assessments of single-word spelling versus passage dictation and whether short vowels are required or not. This issue may be particularly important when assessing older individuals who may be more familiar with non-vowelised texts outside of religious contexts.

Another equally relevant and important issue is the vernacular of the individual being assessed and the frequency and familiarity of vocabularies that make up the test items. There are 22 countries in the Middle East region where Arabic is the official language. Although Modern Standard Arabic is the unifying Pan-Arabic language spoken by more than 300 million native Arabic speakers, regional variations do exist among native speakers and such differences lead to a decrease in mutual intelligibility once geographical distance between native speakers increases. For example, a Kuwaiti-speaking in a Kuwaiti vernacular may have severe problems understanding a Moroccan-speaking in his local dialect, although both use the same language, that is, Arabic. Given that test measures will typically involve one individual verbally presenting information to another, then such large differences in dialect need to be considered, particularly when assessments involve the need for precise articulation and the recognition of articulation, as is the case in most measures of phonological awareness, which are typical of most dyslexia assessment procedures.

The general attitude inherent across the Arab world, particularly in the Gulf region, may also lead to assessment problems. There are anecdotal instances where an English-speaking assessor has been chosen to assess Arabic students simply because of the preference of a foreign assessor who it is assumed would do a better job and be better equipped than an Arabic-speaking assessor. However, a foreign (probably English-speaking) assessor may not have sufficient knowledge of the Arabic language to enable her or him to carry out a thorough assessment that might include indications of first language capability. The respect that the majority of Gulf Arabs have for the Western educational system may prompt them to insist on having Western assessors for their Arabic children with dyslexia rather than the knowledge of the Arabic language. This is the prevailing situation in the continued absence of dyslexia awareness within the Arab world.

The Arabic script
The above issues become more challenging if the potential manifestations of dyslexia in Arabic are considered. Arabic has a transparent orthography, and this specific feature of the Arabic orthography may produce false negatives if single word reading accuracy is assessed and used as the main indicator of educational achievement, rather than measures that may be more relevant to the assessment of a transparent script, such as text reading, reading fluency or spelling (Everatt, Smythe, Ocampo & Veii, 2002; Goswami, 2000; Wimmer, 1993). As argued above, reading develops through children establishing direct connections between representations of printed words and representations of spoken words in their language system and that deficiencies in these representations and/or connections are the main causes of failure to acquire literacy at a normal rate. This phonological deficit hypothesis (Stanovich, 1988) has gained wide acceptance amongst researchers as a core cognitive deficit amongst individuals with dyslexia, although some have questioned whether this viewpoint can be considered a universal cause of dyslexia irrespective of the nature of the script used to represent a particular language, particularly if phonological skills are not equally important for learning to read across all orthographies (e.g., Smythe & Everatt, 2004). The ability to decode written symbols into sounds, the ability to store, as well as manipulate, language information and the ability to retrieve/produce verbal labels have all been associated with phonological processing; yet these processes may add independent variance to literacy (see Wagner & Torgessen, 1987).

Studies of English-speaking children have highlighted the importance of phonological awareness and the ability to decode letters into sounds as a predictor of variability in literacy acquisition (Snowling, 2000), in contrast to the evidence presented by Wimmer (1993) that rapid naming was the largest predictor of variance in reading ability amongst German-speaking children. Such findings suggest that the relationship between the different aspects of phonological processing and literacy may vary with the language or script studied and suggest that the most appropriate measures to include in an assessment procedure may vary with language and/or script. One of the factors that may explain these differences is again the transparency of the script (see discussions in, for example, Goswami, 2002; Goulandris, 2003; Katz & Frost, 1992; Landerl, Wimmer & Frith, 1997; Smythe, Everatt & Salter, 2004). Whereas measures of accuracy seem to predict variability in literacy acquisition of a less transparent script such as English, measures of fluency seem to be better predictors of variability in more transparent scripts.

However, Arabic is atypical in its transparency. Arabic uses a 28-letter alphabet to represent the 34 phonemes in the language. Short vowels are not regarded as independent graphemes in written Arabic, but are represented as extra diacritical markings which are only present in poetry, textbooks for foreign learners, children’s books and in otherwise fully vocalised or vowelised texts. These short vowels are otherwise largely neglected in non-vowelised texts, which form the majority of reading material experienced by readers after initial learning grades. Accordingly, a large number of Arabic words that appear in common everyday texts are homographic when presented out of context. In effect, Arabic has two scripts: a shallow
one when diacritical marks are used in the text and a deep one when they are not. This is an important specific linguistic feature of Arabic and one that is expected to have an impact on the choice of reading accuracy test. Given that the use of diacritical markers is relatively rare in most reading situations, their use in assessment procedures may be inappropriate to determine fully the normal reading ability of the individual being assessed. However, if unpointed words are used, these need to be placed in context for the reader to be able to produce the correct pronunciation of a word. Therefore word reading accuracy will need to be assessed under text presentation conditions, which will also mean that some assessment of appropriate comprehension will be needed to determine that the individual can access context to support word decoding and pronunciation.

The Arabic script evolved from Nabataean and Aramaic and, as with other Semitic languages, is written from right to left. Letters are consistent in shape in text – there are no upper (capital) or lower case variations as in many other alphabetic scripts. However, the Arabic script is cursive, with letters being joined to each other by means of ligatures, leading to letter shapes in text varying from their isolated form. The Arabic script consists of 17 characters, which, with the addition of dots that are placed above or below various letters, make up the 28 letters of its alphabet. Dots are, therefore, extremely important and differ in their number (one, two or three) and in their position (below or above the letter). Arabic letters modify their graphic shape according to their position within the word (i.e., initial, medial, final or isolated), while some additional letters are used in Arabic when writing place names or foreign words containing sounds which are not represented by a letter in Modern Standard Arabic, such as /p/ or /g/. The cursive nature of Arabic orthography means that words are written joined up and, as such, spaces in a continuous line of written Arabic should indicate spaces between different words. However, only 22 letters of the Arabic 28 conventional alphabet are two-way connectors (i.e., they join to both preceding and following letters), while the remaining 6 are one-way connecting letters (i.e., symbols that join to preceding ones only). These 6 one-way connecting letters in Arabic will create one or more spaces within the same word depending on how many of these letters are contained within the word. The cursive nature of the Arabic orthography and the additional problems caused by the 6 one-way connecting letters may make word boundaries in Arabic unclear, particularly for the inexperienced beginning reader.

The most salient, characteristically Semitic, feature of Arabic is its basis of consonantal roots (which mostly consist of three letters) and its productive and derivational morphology. Arabic nouns, for example, are subject to desinential inflection, that is, endings are added to the base of the noun to indicate what grammatical function the noun serves in the phrase in which it occurs. Variations in shade of meaning are obtained first by varying the vocalisation of the simple root, and second, by the addition of prefixes, suffix and infixes. The Arabic root system is the key to understanding how Arabic grammar works. Once learners understand how roots work, they can start to identify which are the root letters of a word. They can also understand the patterns these roots produce, which in turn enables them to form different structures following these patterns. Such knowledge can then be utilised to pronounce words correctly and guess the meaning of new vocabulary. Although Arabic has a complex morphology, it is largely predictable. The root generally constitutes the semantic core of the Arabic word. Arabic roots, primarily consonantal, are embedded into morpho-phonological vocalic infixes and syllabic prefixes and suffixes. Variations in these patterns bring about variation in the meaning. However, consonantal roots remain in exactly the same order in any word derived from this root; variations in meaning result from changes in either internal vowels, from doubling one of the consonants, from specific additional letters or affixes or from any combinations of these. Number, gender, tense and case, definite or indefinite, is all achieved by inflecting roots. Moreover, affixed and suffixed pronouns, possessives, prepositions and conjunctions are also frequently used in Arabic. In other words, Arabic roots represent the conceptual content of the word and, as such, its semantic function, while the patterns represent their grammatical functions (see Schulz, Krahé & Reuschel, 2000).

Thus, in general, Arabic words can be decomposed into two abstract morphemes: the consonantal root and the phonological pattern. Roots and phonological patterns are abstract structures and only their joint combinations (after the application of phonological and phonetic rules) form specific words. Because of the productive nature of the Arabic morphology, Arabic writing was mainly designed to convey primarily the root information and hence, the Arabic writing system represents mainly consonants. Arabic is a highly agglutinative language (i.e., one word can correspond to a whole English sentence) because negative suffixes, tense suffixes, person prefixes can all be added to the word base in Arabic. This results in a highly derivational and dense morphology which, although helpful in communicating the core semantic meaning of the root embedded in various patterns, demands a lot of unpacking on the part of the reader in order to arrive at the exact meaning of an Arabic word. The predictability of the morphology again can be used to support this unpacking. Morphological knowledge is very important when learning to read Arabic as knowledge of related words (derivations) and knowledge of different forms of the same words (inflections) tend to provide clues to orthographically correct spelling. A good example of this specific linguistic feature of Arabic is the overriding tendency of written Arabic to preserve morphological clues over phonological transparency – non-vowelised text retains morphological bases but not spelling-sound consistency.

The above brief description of the specific linguistic features of Arabic shows that even in a language with a script that has regular phoneme-grapheme correspondences, there may be complexities that are likely to pose challenges.
to Arabic speakers with dyslexia. The shallow nature of the pointed Arabic orthography may result in greater reading accuracy than that attained by speakers of languages with more opaque orthographies. However, its highly inflected and derivational morphology might be expected to pose challenges to Arabic individuals with dyslexia and, as such, morphological/orthographic knowledge may be an important contributor to the reading development of Arabic-speaking children. Such knowledge is likely, therefore, to be an additional source of individual differences in the reading ability of Arabic-speaking children and may affect the relationship between literacy ability and phonological skills found in other language, particularly as Arabic roots are phonologically highly opaque and manifest at the surface level in a variety of syllable forms. Thus, although the transparent nature of the Arabic orthography when vowelised may be expected to support the acquisition of early word reading amongst Arabic-speaking children, the high number of homographs and the highly inflected and derivational nature of Arabic morphology may have a negative impact on acquisition.

Findings informing assessment practice

Although research on dyslexia in Arabic is scant, a number of recent findings are consistent with conclusions derived from English cohorts and, therefore, suggest that models of English literacy difficulties may, at least partially, be applicable to Arabic. Measures of the decoding of letter sequences into appropriate pronunciations (i.e., non-word or pseudoword reading tasks), as well as measures of phonological awareness (e.g., an awareness of rhyme or the ability to delete individual phonemes from a word), have further been found to be predictive of reading amongst young Arabic learners (from Grades 1 to 5) independent of whether vowelised single-words or non-vowelised texts were used as items in the measures of reading ability (Al Mannai & Everatt, 2005; Elbeheri & Everatt, in press). These conclusions were similar to those derived from studies comparing good and poor Arabic readers (Abu-Rabia, Share & Mansour, 2003; Elbeheri & Everatt, in press). Such findings suggest that processes which lead to a recognition of sounds within words and their relationship to the alphabet have the potential to differentiate those with average ability levels in Arabic reading and writing from those with literacy skills indicative of dyslexia weaknesses.

However, such research (see Elbeheri & Everatt, in press) has also suggested that both whole cohort correlations between literacy and phonological processing, as well as differences in phonological skills between good and poor readers, were smaller than corresponding correlations/differences found in English language studies. These smaller phonological effects were more consistent with data from children whose first language was not English (e.g., see cross-language comparisons in Everatt, Smythe, Ocampo & Gyarmathy, 2004). This can be seen in Figure 1, which contrasts phonological deficits amongst Arabic-poor readers with those amongst English-poor readers. The graph shows the relative performance of Arabic or English children with poor literacy skills compared to the levels of performance produced by children with average or good literacy skills. Good and poor literacy groups were taken from the same school classes, ensuring that they were group-matched on school year and had had a similar educational background. Groups were also comparable in terms of the proportions of males to females tested. Arabic and English cohorts covered the same primary school grades to allow a comparison of groups at a similar formal educational level – although this meant that groups differed in average age (the Arabic children starting Grade 1 a year later than the English children), chronological age comparison showed similar profiles of results. Scores presented in Figure 1 were derived from measures of the ability to decode pseudowords correctly (i.e., non-word reading), recognise individual phonemes or the rhyme-parts of words (phoneme deletion and odd-one-out tasks), retain phonological forms for a brief period of time and reproduce them in order (memory span), and access verbal labels of line drawings of familiar objects (rapid naming). All test measures had been used with a large number of children from both language backgrounds to ensure that they were appropriate for both cohorts. Data are presented as Z-scores for each measure, with zero representing the mean produced by average-to-good readers on the test and Z-scores above and below zero representing the standard deviation produced by the same group. Comparisons indicate that although both Arabic- and English-poor readers present evidence of below average ability on most measures of phonological skills, these weaknesses appear larger amongst the English-speaking children with poor literacy skills, the only exception being the ability to recognise rhyme, which was much less predictive of literacy weaknesses than the other phonological measures with the English-language cohort.

The above discussion suggests that smaller effects of phonological processing measures may be characteristic of more transparent orthographies, which may, in the case of Arabic, be a result of the initial learning of the relatively shallow vowelised text. Given this potential influence,
measures of processing speed or rate of reading may be better predictors of literacy achievement than accuracy assessments amongst young Arabic learners. It is interesting to note that, in the graph, rapid naming produced as large an effect for the Arabic children as measures of phonological awareness and phonological memory (memory span), although measures of decoding accuracy produced the largest effect size for both cohorts suggesting that there is a major influence on literacy skills of the ability to decode letter strings into an appropriate sound form. Arabic may be similar to English in the importance of accuracy compared to rate in distinguishing good from poor readers/spellers, but further research on Arabic is necessary to confirm this prediction and to assess whether the importance of accuracy versus rate varies with experience of vowelised versus non-vowelised forms, and whether measures of speed of processing or fluency might be a better predictor of literacy acquisition than phonological awareness or reading accuracy scores. For example, in a study of Farsi-speaking Grades 1 and 2 children with and without dyslexia, Tehrani and Everatt (submitted) found improvements in reading accuracy amongst the children with dyslexia across the two grades, but continued weaknesses in reading rate. Given that Farsi uses a similar script to Arabic, and the same switch from vowelised to non-vowelised text, further research on the importance of rate versus accuracy would seem appropriate to inform assessment procedures. However, the conclusion here seems to be that measures of decoding can be used as an appropriate assessment tool in Arabic in a similar way to their use in English-language assessment tools.

A final area where Arabic data may diverge from that typically found in studies of English-speaking children with or without dyslexia is the influence of non-verbal measures. In each of the recent studies discussed above (Abu-Rabia, Share & Mansour, 2003; Al Mannai & Everatt, 2005; Elbeheri & Everatt, in press), scores on measures of non-verbal ability emerged as a predictor of literacy levels and/or as a factor that distinguished good and poor readers. These data suggest that there may be more of a role for non-verbal processes when reading Arabic text compared to English text. Consistent data have been reported in a study of bilingual children in the UK (Everatt, Smythe, Adams & Ocampo, 2000). These bilinguals use the Quran as part of normal religious practices, and therefore are exposed to the Arabic script. In contrast to monolingual English children with good or poor literacy skills, bilingual children with good versus poor English literacy skills could be distinguished by measures of non-verbal ability. Such findings suggest that specific features of the Arabic script may lead to differences between those at risk of literacy weaknesses and those who are able to develop expected levels of reading and writing skills. Clearly, further research is necessary to determine whether this area of assessment might require further consideration in an Arabic language assessment process.

In conclusion, the findings discussed are consistent with phonological processing skills being a predictor of literacy ability amongst Arabic learners, and with impairments in such skills being a cause of dyslexia. As such, these measures should form the basis of dyslexia assessments in Arabic. However, the data suggest that more work involving Arabic learners would be appropriate to identify potentially more complex relationships between phonological processing skills and factors such as variation in text transparency with experience (i.e., the move from primarily vowelised to non-vowelised text), orthographic processing and/or morphological awareness, as well as fluency assessment and context dependency, in order to identify further predictors of literacy ability and the underlying deficits amongst monolingual Arabic children with dyslexia.

Conclusions
This paper has argued that dyslexia may manifest differently across languages, and that test measures with a predominant linguistic focus developed in one country may not be suitable in another country without appropriate modification. In addition, it is noted that dyslexia may manifest as more than simply a difficulty with reading and, therefore, non-literacy measures that may be transferable to different languages may be useful in assessment procedures. However, the paper argues that culture and educational contexts need to be taken into account in both test development and in the administration of the assessment. Such considerations can focus on the barriers to learning and deal with these within a dyslexia-friendly perspective.

The aim of this paper was to highlight issues for the development of appropriate assessment procedures for Arabic-speaking individuals, rather than endorse specific measures. That framework is envisaged to include tests of ability which, based on current dyslexia assessment procedures, focus on three areas: literacy weaknesses, literacy-related cognitive deficits and general ability (to assess the specificity of any deficits). In this paper, several measures of general ability were mentioned that have been modified for an Arabic language context; however, further work is necessary to show that these measures are appropriate culturally and educationally for Arabic dyslexia assessment purposes. It may be more effective to develop or select a measure of the required skill/ability that has been produced for the targeted context, and the Non-verbal Pictorial Mental Abilities test was used in the present paper as an example of such a locally developed measure of non-verbal ability, although a verbal scale such as that used in the Wechsler scales may be useful particularly in diverse language/multilingual contexts. Literacy measures require the same considerations. Rather than translating an English-language single-word reading test into Arabic, a presentation format (non-vowelised text) that is more familiar to the individual taking the test (particularly those with one or two grades of reading experience) may be more appropriate (the Sirs Ellayan Silent Reading Test was presented as an example), as might Arabic standardised measures that focus on reading rate and text writing. Finally, the evidence discussed in this paper indicates that measures associated with phonological processing (decoding and awareness, as well as verbal short-term memory and speeded access) can
be used in Arabic language dyslexia assessments to identify those with cognitive-related literacy weaknesses by giving due consideration to local conditions (e.g., vernaculars, culturally familiar nameable items, Hindi numerals). However, it seems advisable to give further consideration to orthographic and morphological processing given the features of the Arabic language/script discussed.

Dyslexia assessment is a dynamic process, which is ultimately intended to help the person with dyslexia. It is only following an appropriate assessment that an individual with dyslexia can obtain the help and support to which they are rightly entitled and, therefore, those conducting the assessment must do their best to ‘get it right’. In order to assess someone for dyslexia, the assessor must be knowledgeable of the likelihood of dyslexia manifestations in the context of the individual being assessed. Fairness and good practice of dyslexia assessment requires a basic knowledge of the specific linguistic features of the language of the individual being assessed. Fairness is also best served if assessment tools used are relevant to the context and culture of the individual being assessed. Such awareness of the linguistic, cultural and other background elements of the individual being assessed should collectively form a framework of dyslexia assessment.

References
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