Assessment of Dyslexia in the Urdu Language

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CHAPTER 5

General Discussion

Reading is an important skill, not only for academic achievement but also for lifelong learning and successful socio-economic participation. In contrast to speech, reading requires explicit instruction. Traditionally, children first learn to read in primary school, where those speaking transparent languages, such as Spanish or Finnish, are generally able to read quite accurately after one year of formal instruction (de Jong & Van der Leij, 1999; Seymour et al., 2003). However, mastering advanced levels of reading fluency takes much more time (Landerl & Wimmer, 2008). In languages with deep(er) orthographies, such as English, children may even need more time of instruction to acquire the same degree of reading accuracy as children learning to read transparent orthographies (Seymour et al., 2003).

Despite adequate instruction, favourable circumstances, and individual differences that characterize normal variance in reading, a substantial number of children experience serious problems attaining adequate and fluent reading skills. These children may be suffering from dyslexia. This common learning difficulty affects approximately 3 to 10% of the population worldwide (Pennington, 2012), where the prevalence depends on the degree of transparency of the orthography being learned (Ziegler & Goswami, 2005). Exact estimates of children with reading difficulties or dyslexia in Pakistan (the setting of our

study) are not available. A recently conducted early-grade reading-assessment survey did indicate that the majority of primary schoolchildren in Pakistan read English and even Urdu, the native language of many children, far below the age-appropriate level or cannot read at all (Research Triangle Institute, 2015-16). If not timely remediated, reading difficulties will persist, with the disparity between typical and struggling readers growing bigger over time (Adolf, Catts & Lee, 2010). The persistent and worsening problems will affect the child's academic, personal and social life, which is not only detrimental to the child and its immediate environment but also adds to the social burden of dyslexia.

5.1 Development and Evaluation of a Dyslexia Assessment Battery for Urdu

A sound theoretically-based assessment of reading deficits is crucial for effective remediation and was the main motivating factor for the studies presented in this thesis. Our studies on Urdu have permitted us to advance knowledge and practice in the field of dyslexia in this widely spoken language.

We developed a dyslexia assessment battery for Urdu-speaking children and administered the tests on typical and struggling readers aged 7 to 11 years, thus gaining a deeper insight into the nature of the typical and impaired reading-acquisition processes in Urdu (**Chapter 2**). In doing so, we also tested the applicability of the dual-route model (DRM) for reading aloud to this novel orthography (Coltheart, Rastle, Perry, Langdon & Ziegler, 2001). We found our dyslexia test battery to be highly reliable and valid for the identification of children with reading and/or spelling deficits (based on the DSM-5 criteria) in Urdu. Moreover, the battery was shown to be suitable for the screening of large groups of beginning readers. Our tests also confirmed the diagnosis in children who had been diagnosed with dyslexia in English prior to our study.

When we applied the cut-off score proposed by the DSM-5 (< Pc 16) on the whole sample (typical as well as struggling readers), it led to 60% false negatives: only 50 of the 128 struggling readers we tested were screened out as positive. We came up with the argument that this disproportionately high number of false negatives was a result of including struggling readers in the population from which we derived our cut-off score. The assignment of the struggling readers in our study was based on teachers' and parents' referral, hence subjective. Therefore, the label 'struggling reader' may not necessarily have reflected the children's actual reading and/or spelling abilities. Some of the children may have had other reading or language-related difficulties, such as problems with text comprehension, or may perhaps even have been suffering from other learning deficits. Also environmental factors (inadequate language instruction, parental illiteracy), behavioural issues (ADHD) and/or cognitive factors (slow learner, short memory span) may have played a role. Although these conditions do not cause dyslexia, all these factors are known to often co-occur with dyslexia.

A second potential explanation for the high volume of false negatives is the arbitrariness of the diagnostic cut-offs in this condition. Dyslexia is not a distinct category but reflects

deficits at the lower end of the 'reading-abilities' continuum (Shaywitz, Escobar, Shaywitz, Fletcher & Makuch, 1992). In-line with this 'lower end of reading-abilities' hypothesis we applied the cut-off scores again, and this time to the group of typical readers only, excluding the struggling readers, and the sensitivity of our test increased, ranging from 76 to 89 percent for different tests. Accordingly, it is impossible to make an unambiguous and categorical distinction between those who have and those who do not have dyslexia (Ellis, 1984). Every cut-off point to separate typical from dyslexic readers is somewhat arbitrary and susceptible to critique (e.g., Pennington, 2006). Cut-off values vary from study to study depending on the definition of dyslexia that is adopted (Siegel, 2006). Shaywitz et al. (1992) argued that dyslexia should not be viewed as an 'all-or-none entity' but as a condition that varies in terms of severity. This ambiguity does not question the reality of dyslexia, but does indicate the subjectivity in its diagnosis. Nevertheless, for an adequate diagnosis and referral for treatment, a cut-off point is a practical necessity (Siegel, 2000).

The second motive driving our studies was the wish to understand the key patterns that underlie typical and impaired reading processes in Urdu. Our test distinguished well between typical and struggling readers, with high effect sizes, showing that the latter group was most severely impaired in spelling accuracy, followed by reading accuracy. This co-occurrence of spelling and reading impairments is consistent with previous literature (Bosman & Orden, 1997; Frith, 1980; 1984; 1985; Mehta et al., 2005; Moats, 2005; Mommers, 1987; Nicolson & Fawcett, 1994; Seymour & Porpodas, 1980; Thomson, 1984) and in congruence with the DSM-5 definition of dyslexia that we adopted for our research (American Psychiatric Association, 2013), which states that dyslexia is a specific learning disorder that affects reading and/or spelling abilities. The effect sizes for reading speed were also very high, affirming that reading speed is one of the main problems in the majority of children with dyslexia. More about the pattern of deficits can be found in the discussion of Chapters 3 and 4.

Our third research objective was to explore the applicability of the dual-route model (DRM) of reading aloud (Coltheart et al., 2001) to Urdu. Since our test battery gauged single and multiple deficits in the functional components of the DRM, we could test its applicability to Urdu. The high discriminatory ability of our test, between typical and struggling readers as well as within struggling readers, was indicative of DRM's relevance (Chapter 2). The DRM proposes two distinct routes for reading: an indirect and a direct route. Through the indirect route, reading occurs by converting letters into sounds, while through the direct route, the visual word form of a word is directly processed without breaking it up into sounds. Consistent orthographies are more easily processed by means of the indirect route than inconsistent orthographies that do not have one-to-one letter-to-sound mapping.

Urdu is both consistent when fully written out with vowel markers or diacritics (Mumtaz & Humphreys, 2001) and inconsistent when the diacritics are omitted. This fluctuating orthographic-depth makes Urdu an interesting language in which to study typical and struggling readers. In the study reported in Chapter 3, we conducted an in-

depth investigation of the reading profiles of these two groups by manipulating orthographic transparency, in that we compared their performance when reading words with and without diacritics, and lexicality by comparing their performance on words and pseudowords. By manipulating these two orthographic features, we sought to probe lexical and non-lexical processing in Urdu to thus determine which of the two routes beginning readers rely on most and to see whether strategies would differ between typical and struggling readers.

5.2 Inconsistencies in the Urdu Orthography

Similar to Arabic and Persian, the presence or absence of diacritics render the orthographic depth of Urdu inconsistent. Initially (i.e. in grades 1-2), children in Pakistan are taught to read using the shallow orthography (with diacritics), but as early as from grade 2 reading and textbooks no longer include these vowel markers (Rao et al., 2010). The children participating in our study were attending grades 3-7 and were hence mostly exposed to the deep orthography (without diacritics).

The results of our second study (**Chapter 3**) unequivocally showed that both the typical and struggling readers displayed a more accurate and faster performance on opaque words (without diacritics, having one and more than one correct pronunciation) than on transparent words (with diacritics), which is indicative of the transparency effect, as well as on words compared to pseudowords, demonstrating the lexicality effect. We found evidence of the transparency and lexicality effects, i.e. a preference for the direct or lexical route (visual word recognition) over the indirect or non-lexical route (letter-to-sound conversion), which is consistent with previous studies that have also found a preference for the direct route in Arabic-speaking individuals reading non-diacritic script (Frost et al., 1987; Roman & Pavard, 1987; Tabossi & Laghi, 1992). Our results suggest that both typical and struggling readers of Urdu were slowed down by the presence of diacritics, with the effect being most pronounced in the impaired readers suggesting a phonological deficit in this group.

As argued in **Chapter 3**, diacritics make words visually more complex and create a higher perceptual load, slowing down the reading process (Abdelhadi, Ibrahim & Eviatar, 2011; Taha, 2008). Because our stimuli were not selected with the specific aim of isolating these effects, we will be using targeted stimuli in future investigations. Alternatively or additionally, the delay in reading may have been caused by the children's unfamiliarity with diacritic Urdu script. Given that they are far less exposed to the shallow orthography, this might explain why we did not find a facilitating effect of the higher orthographic transparency. Consistent letter-to-sound mapping encourages processing via the phonological route but Urdu print, to which children are exposed after grade 2, does not allow consistent mapping, forcing the children to process words through the whole-word recognition route.

Our results were consistent with those of Rao and colleagues (2011), who compared speakers of Urdu (inconsistent orthography) and Hindi (consistent orthography) in a lexical-decision and word-naming task. They found a lesser use of the phonological route

when Urdu was being read. The authors explained this difference in terms of the varying orthographic depth of Urdu resulting from the presence or absence of diacritics. They also found stronger word-frequency effects in Urdu than in Hindi, which is also in line with our findings. If, as discussed, Urdu readers primarily rely on the visual word recognition route, it would be expected that high frequency words would be recognized better than low frequency words. More support for their and our findings comes from the countrywide baseline Early Grade Reading Assessment (EGRA-USAID) conducted between 2013 and 2014 in Pakistan. This survey found scores to be better for familiar words than for pseudowords in all the provinces of Pakistan. All of these findings converge into a conclusion that Urdu readers primarily employ the visual-word recognition method to read as letter-to-sound conversion seems less developed, especially in struggling readers.

One of the reasons for the dominant use of the direct route in learning to read Urdu could be the rote-learning method that is widely used in the educational system in Pakistan. By rote learning we mean the memorisation of whole words through repetition, where words are not broken down into sounds. Even before formal reading instruction starts, children are exposed to the visual word forms through 'Beginning Qaida', one of the introductory reading books used for children aged 3-5 years in pre-nursery, nursery and kindergarten settings. In Figure 5.1 below, we provide an example of beginning reading material in Urdu.

Figure 5.1: A page from Beginning Qaida (Urdu preschool reading book). The 'ا' (/ə l ɪ f/ - the first letter in the Urdu alphabet given at the top of the page in red) is presented together with four pictures representing words starting with this letter (without diacritics).

Figure 5.1 shows a page from a beginners' reading book, introducing the letter *alif* (ا), the first letter of the Urdu alphabet, along with four pictures of objects starting with

this letter. *Alif* is a vowel and represents various sounds depending on whether it is placed at the beginning, middle and/or end of a word. At the beginning of a word, it is used with diacritics to indicate three short vowel sounds '/ə/', '/ɪ/' and '/ʊ/'. If it is followed by either the letter wā'o (و) or ye (ی) it designates long vowel sounds (e.g. '/oː/'). A variant of *alif* called *alif madd* (آ) connotes the long vowel sound '/aː/' also at the beginning of a word. In the middle of a word, the same sound '/aː/' is denoted by the *alif* (ا) only. The variety of sounds associated with *alif* is depicted in Table 5.1.

Table 5.1: Examples of sounds associated with the letter 'alif'

Transliteration	IPA	The letter alif
A	/ə/	اَ
I	/ɪ/	اِ
U	/ʊ/	اُ
Ā	/aː/	ا ـا آ
e	/eː/	ایـ
o	/oː/	او
au	/ɔ/	اَو

Note. Dotted circles are given to clarify the position of the alif.

In Figure 5.1, at the bottom left, a word اُونٹ (camel) is given, which is pronounced as '/uː n ʈ/' where the sound of '/uː/' is represented by a combination of alif (ا), a missing diacritic marker ُ on top of alif (ا) and a letter wā'o (و). However, with the missing diacritic on top of alif this word can also be pronounced as '/oː n ʈ/' which would be a wrong pronunciation. Therefore, for the correct sounds to be inferred, diacritics need to be mentioned. In the same figure at the top right word انار (pomegranate) has the letter *alif* twice in it. The first *alif* is pronounced '/ə/' and the diacritic that should have been placed above the vowel is missing, which is why a beginning reader would not know whether the correct sound is '/ə/', '/ɪ/' or '/ʊ/'. Therefore, unless the correct diacritic marker is there it can be pronounced in three different ways: '/ə n aː r/', '/ɪ n aː r/', '/ʊ n aː r/'. In most schools in Pakistan, the letters are not introduced with diacritics and letter sounding and blending rules are not explicitly taught to beginning readers. Rather, children learn to link the pronunciation of a word to its visual form by repeating and memorising the pronunciation of the whole word.

The effects of this practice are reflected in the fact that in our study reported in Chapter 3 all children generally performed poorer when reading pseudowords and words with diacritics than when pronouncing words without diacritics, where the effects were larger in the struggling readers. Support for this argument is also found in the EGRA-USAID (2013-2014) conclusions, where the poor performance of beginning readers on pseudoword reading, letter-sound knowledge and phonemic awareness was attributed to rote learning and the lack of proper instructions on letter sounds. Moreover, comparing words and pseudowords in Urdu, Rashid et al. (2010) also found that response times and

error rates were significantly increased for pseudowords compared to words, which further supports our conclusions.

Indeed, in Pakistan reading instruction is generally not based on teaching phonics, except in a small number of private schools where only English letters (not Urdu letters) are introduced with the phonics method. The absence of phonics instruction was also highlighted by Nawab (2012) who emphasised the need for a proper training of phonic rules for primary school teachers. He argued that children's poor reading performance could be largely explained by inadequate introduction to letter-sound associations and rules. For example, in Figure 5.1 again, at the top right a word انار (pomegranate) has the letter *alif* twice in it, the first *alif* is pronounced '/ə/' and the second *alif* is pronounced '/aː/' – a long vowel sound. So the pronunciation of انار is '/ə n aː r/'. If the young reader is not familiar with the letter-sound association rule that *alif* has a long vowel sound when it is used in the middle of a word, s(he) may incorrectly pronounce it as '/ə n ə r/'. Therefore, children need to be taught the letter-sound association rules depending on the position of letters in order to pronounce them correctly. Interestingly in Urdu, when a position of a letter is changed within a word, not only the sound but the shape of it also changes - a phenomenon known as letter position effect which we will cover in detail in the next section.

5.3 The Effect of Letter Positions in Learning to Read Urdu

Our third study revolved around the letter-position effect in Urdu (**Chapter 4**). We explored the difficulties beginning readers face in positioning and ordering letters into words. Letter positioning is one of the three functions of the orthographic-visual analysis system of the DRM. In the Urdu alphabet, letters change shape according to their position in a word, for instance, the letter 'غ' /ɣ/ in isolated form has three contextual forms: initial غـ, medial ـغـ and final ـغ.

We examined reading accuracy in the same sample of typical and struggling readers that participated in our other studies and found that both groups performed better when reading words in which letters changed shape depending on their positions than when they read cognates in which the shape of the letters remained the same. This tendency was found to be significantly greater in the struggling readers than it was in the typical readers. Intuitively, multiple letter forms may pose difficulties in reading but, surprisingly, we found position-dependent letter changes to be a facilitating factor in Urdu. We also found a high migration tendency in low-frequency words compared to their high-frequency cognates. This trend was observed in both groups but again significantly more so in the struggling readers. Finally, there were fewer migrations of initial and final letters compared to middle letters, a difference which was also greater for the struggling readers.

Overall, the pattern of errors was the same in both the typical and struggling readers in that all children made more errors when reading same-shape, less frequent words, and words with the potential for medial letter migrations. Still, the large group differences in accuracy and speed indicated that these problems were severely aggravated in the

struggling readers. We obtained close-to-ceiling accuracy proportions for the typical readers (M >85%) but a dramatic drop in the accuracy of the struggling readers (M <50%). Therefore, we suggest that words with the potential for these particular letter migrations could be used to test for specific cases of letter position dyslexia as children with this type of dyslexia have been reported to exhibit issues with letter positioning in particular, while other reading- and spelling-related functions of the DRM remain intact (Friedmann & Rahamin, 2007; Kohnen et al., 2012). The literature also shows evidence (Friedmann & Gvion, 2005; Friedmann & Haddad-Hanna, 2012) that, as a function of the orthographic-visual analysis system, letter identification can develop normally even when letter-position encoding is selectively impaired. Further investigations to test this claim for Urdu are crucial, as, if proven true, remediation can be targeted better. Children may then, for instance, be trained to attend each letter of a word to help them prevent making letter-position errors (Rahamim & Friedmann, 2003).

Assimilating our findings from this study (Chapter 4) with the previous ones (Chapter 2 and 3) we found further support for our argument regarding Urdu readers primarily relying on the visual word recognition as a reading method. Most probably this is why the words that looked more similar to each other (same-shape) were more prone to errors than the ones that did not look similar (changed-shape) and thus were easier to correctly recognize. Moreover, as in the previous study (Chapter 3) we found the frequency effect again for reading accuracy and speed, with high frequency words being recognized better and faster than low frequency words. Furthermore, unlike letter-to-sound conversion, in visual word recognition attention is directed towards the initial and final letters and then together to the medial letters thus resulting in more migration errors in reading medial letters (Friedmann and Gvion, 2001).

5.4 Towards a Complete Diagnostic Protocol for Dyslexia in Urdu

The usefulness and accuracy of a reading or dyslexia test battery depends upon its potential to provide a comprehensive assessment covering three diagnostic categories, namely a categorical, explanatory and an action-oriented diagnosis (Kleijnen et al., 2008). We will next evaluate to what extent our test fulfils these standards by discussing its strengths and weaknesses. Is our test comprehensive and, if not, what changes are needed?

The results of our study indeed showed that our test battery meets the first requirement in that it provides a categorical diagnosis, often referred to as a descriptive diagnosis. That is, it gives a conclusive outcome indicating whether an individual meets the criteria of dyslexia (e.g. those of the DSM-5) and thus belongs to a clinical group. The test was reliable and valid and met the dyslexia criterion (cut-off < Pc 16) as corroborated by the fact that it confirmed the diagnosis of the children that had been diagnosed with dyslexia in English prior to our study. Because of the dearth of dyslexia screening and diagnostic materials for Urdu, we were unable to include children that had already been specifically diagnosed with dyslexia in Urdu. As ours is the first dyslexia assessment test for

Urdu-speaking children and since we evaluated its effectiveness in children aged between 7 and 11 years attending private middle-income schools, its generalisation is limited for now. However, we expect the test to be suitable for children from different socioeconomic backgrounds attending other types of schools. We plan to administer the battery to a wider population to standardise the test and develop age-appropriate norms.

Our dyslexia test also seems to fulfil the second requirement in that it provides an explanatory diagnosis, linked to the DRM of reading, and thus allows clinicians to make a judgement about the underlying factors contributing to the reading and/or spelling impairments of the individual tested and to recommend targeted remediation. We based our test on the DRM and in addition, to reading-related and associated cognitive factors, hence it yields a profile of a child's abilities and deficits on a number of factors including letter identity recognition, letter order processing, letter-sound identification, phoneme and syllable blending, word recognition, reading and spelling skills, vocabulary and rapid naming.

We also found indications that our test affords an action-oriented diagnosis in that it provides differential clues for remediation. It does not only distinguish well between typical and struggling readers at group level, but also provides the opportunity to see if children have certain subtypes of dyslexia through detailed profiling of specific strengths and weaknesses. Through this detailed profiling one can really focus on the problematic areas in the reading development of these children and can provide better remediation and treatment. For instance, our results (Chapter 2) showed that some struggling readers in our study had issues with pseudoword reading while having their word reading through recognition intact. The number of children who exhibited this pattern was more than the inverse condition.

Consequently, we were able to infer from the results we obtained that in the participating and possibly other Pakistani schools there are shortcomings in early reading instruction, most notably in early phonics instruction. With our test battery, existing teaching methodologies can be evaluated more in detail and evidence-based strategies can be developed to improve early reading instruction. Teachers may be supported in making their teaching practices more effective for all pupils, while they may be additionally trained in techniques to address specific reading issues of particular pupils. Outside the classroom and based on the test outcomes, parents may also be more involved in their child's reading development by providing them with tailored strategies to help their child handle the difficulties he or she is facing.

5.5 Practical Implications for Pakistani Schools and Future Directions

Around the world, remedial systems for children with dyslexia are being developed, refined and implemented. Despite a growing awareness, these reading and spelling difficulties have not received the priority they deserve in Pakistan. In allocating the scarce resources available for public services, low priority has been given to issues such as dyslexia.

Recently, there was an attempt to change this situation, however. In an effort to improve the reading status of children in Pakistani schools, a countrywide baseline survey was conducted (EGRA-USAID, 2013-14).

As soon as norms have been established, our newly developed reading assessment battery for Urdu can be used to reliably identify and classify struggling readers. This puts us in the position to systematically evaluate reading and spelling instruction methods. As our results showed that the children we tested rely more on visual word recognition than on phonological decoding, whole-word methods can be compared to decoding-oriented methods. The outcomes of such a systematic investigation may inform us about the most adequate instruction methods for beginning readers of Urdu in general and for those who show marked phonological deficits in particular. Along the same lines and connected to the phonological deficit issue, it seems already viable to conduct interventions to remediate decoding issues, the effects of which can be evaluated with pre- and post-assessments. One such potentially highly effective remedial programme is called GraphoGame (GG). This computer-based game facilitates the individual young learner in acquiring basic literacy skills and can also be used to gather reading-related information from a large number of children for research purposes (Richardson & Lyytinen, 2014). Thus it would be highly suitable to teach Urdu-speaking children the phonics approach that appears indispensable for boosting their reading skills.

A standardised reading assessment test will also open the doors to recently developed response-to-instruction models (RTIs), which are considered today's 'gold standard' for effective remediation (Fuchs & Fuchs, 2006). Rather than waiting for struggling children to fail at school and for them to be classified as needing help, RTI methods test whether these children have a reading difficulty before they start experiencing its (long-term) consequences and assesses how they respond to an instructional intervention. Classically, in primary-school settings, RTIs start with a screening of all students, for which our battery could be used. When its outcomes indicate problematic areas or deficits in the reading performance of groups of or individual students, an intervention may then be developed to remediate the reading issues at this early stage.

To expedite such an initial screening programme in Pakistan, we will be developing a digital version of our test battery and will make it available online, while linking it to a data-collection platform to also enable us to establish the prevalence of dyslexia within the population with sufficient precision to be useful for the development of remedial care services. Online screening will also allow us to determine the specific prevalence rates per type of school (private, public, community, etc.), variations across age, gender and socio-economic status and thus the type of services needed (e.g. remedial teaching, counselling, parent management training, medication, or cognitive-behavioural therapy), and where these are needed most to set up service facilities in the areas with the highest prevalence of dyslexia.

The next step in such an RTI model is to conduct periodic assessments in at risk groups (e.g. in the 25% weakest readers) to monitor progress and the effects of interventions. Remediation or care services can then be adapted to the individual needs of

the struggling reader. To monitor and enhance children's reading performance, assessment and intervention can also be provided in a digitally game-based and age-dependent learning environment addressing various specific problems in letter-word reading at increasing levels of difficulty. Non-responders can then be diagnosed as having dyslexia at an early stage and referred for targeted treatment.

Clearly, any RTI model should not only be diagnostic but primarily remedial in nature. Moreover, the beneficiaries of RTIs are not only the children themselves. Parents and teachers are other important stakeholders, as well as the community at large, especially in the longer term. RTI models should hence be multifaceted and not only comprise sound assessments but also targeted interventions and counselling for the at-risk and struggling beginning reader as well as training, instruction and support for teachers and parents.