

Developmental Dyslexia and Early Learning Environment

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It is an honour to be the editor of the selected, updated papers based on the October 2002 International Conference on Developmental Dyslexia in Children Using the Chinese Language: fMRI and Advocacy, organised by the Hong Kong Society of Child Neurology and Developmental Paediatrics (HKCNDP), for this special issue of the *Hong Kong Journal of Paediatrics*. I want to thank our authors for their contribution and the editor of the Journal for the privilege of publishing. Even in the space of two years elapsing between the well attended and well received conference and the publication of these papers, much has happened in the scientific studies of dyslexia and theory-based practices.

It is no exaggeration to say that these are the "best of times" for these endeavours. There is, for example, a book-length monograph on neurobiological and programmatic aspects of dyslexia¹ and an integrative paper on the very current definition of dyslexia.² This current definition explains the neurodevelopmental and cognitive-linguistic basis of developmental dyslexia in alphabetic language systems.² It clarifies the nature of single word decoding, discusses the consequences of phonological difficulties, eschews the IQ-discrepancy concept for instruction and brings to the fore the importance of effective classroom instruction. The translation from scientific findings in reading and its impairment to policy and practice is well discussed in a succinct book chapter.³ On the genetic basis

of dyslexia the finding of a candidate gene *DYX1C1* in chromosome 15q21⁴ has been hailed as "turning the page of a new chapter of [dyslexia] research".⁵ Directly on reading impairment in Chinese there is significant recent discovery from an fMRI study of reduced activation of the left middle frontal gyrus, suggesting dysfunction of neural circuits responsible for mapping the graphic form to the basic unit of the Chinese syllable and to semantic (and phonological) processes in visual-orthographic and verbal memory.⁶ All these are very exciting recent advances.

Of particular interest in the cognitive-linguistic studies of dyslexia in the Chinese language and services for individuals with this disorder is the most recent working definition by Lyon, Shaywitz and Shaywitz.³ These researchers discuss advances in epidemiology, developmental trajectory, neurobiological, and cognitive and linguistic characteristics of developmental dyslexia. Two of these components are particularly relevant for the purpose of this short paper. They are: (a) "difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities", and (b) "these difficulties typically result[ing] from a deficit in the phonological component of language" as characteristic of children with this disorder [pp. 5 & 7]. Lyon et al base their recent review on research studies dealing with alphabetic language systems, especially the "deep" English orthography. While reading and spelling disorders constitute the main difficulties of children with dyslexia in English, are similar characteristics found in children with developmental dyslexia using the morphosyllabic Chinese language system?

There is research evidence that phonology is activated early, rapidly and is a constituent part in identifying Chinese characters, at least at the early stage of learning to read.^{7,8} There is further evidence that phonological awareness played a role in learning to read Chinese characters and words in young children, but it was onset-rime awareness and not so much phoneme segmentation that was a better predictor of Chinese reading, even after partialling out the

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Note: This is an updated and shortened version of the address delivered at the International Conference on Developmental Dyslexia in Children Using the Chinese Language: fMRI and Advocacy in October, 2002 in Hong Kong. A part of this paper also appears in *BrainChild*, 2004, Vol. 5 No. 3, pp. 4-6.

effect of IQ.⁹ Moreover, speech-sound perception and repetition of Chinese characters with the same or varying tones after controlling for onsets-rimes in Chinese syllables and retrieval in working memory are amongst important parameters to explore in the phonological analysis of Chinese characters and word reading.¹⁰ In the area of writing to dictation and free writing it has been shown from a large corpus of Chinese characters and words written by elementary Chinese school children that phonological strategies predominated at the lower end of the elementary grades, then the use of graphemic and semantic strategies increased with older children as they gained graphemic and semantic knowledge.¹¹

Taken together, the above representative studies with individuals using the Chinese language suggest a tentative framework for assessing developmental dyslexia in Chinese. In general, this framework should consist of reading of real and pseudo two-character words, spelling of both real and pseudo two-character words, rapid automatised naming of Chinese syllable akin to a tongue twister tasks, and of numerics, speech-sound repetition with control for tones, onsets and rime similar to the tasks used by Leong and Tan¹⁰ and discussed earlier by Leong and others.^{12,13}

These suggestions deal with the assessment and diagnosis of individual children at-risk for dyslexia. Over and above help for individuals there is a larger issue for Hong Kong. This is the need for in-depth study of young children and to follow them through over the years. I outline two specific developmental studies that may be taken as exemplars for Hong Kong. One is a Canadian study and the other is from Finland and directly on dyslexia.

Developmental Studies of Young Children

The very comprehensive Canadian national long-term study of development and health known as National Longitudinal Survey of Children and Youth (NLSCY), begun in the mid-1990s with a random sample of 22,000 children aged 0-11 and continuing every other year with newborns at each cycle, has yielded significant data to guide policy makers, health and education professionals. According to the lead researcher, who is a professor of health care and epidemiology and who helped to design the longitudinal study and analyze its results, the data of NLSCY show that environment makes a difference and these differences translate into developmental inequalities with deleterious sequelae.^{14,15} The emphasis of these long-

term studies of children is that there should be universal access to opportunities for development, care and learning of children and the focus should be on children's environment, rather than just a one-on-one service.

Directly in the research area of developmental dyslexia, the ongoing Jyväskylä Longitudinal Study of Dyslexia documents the development of a group of 107 children at risk for familial dyslexia compared with 93 controls from infancy to their current age of about 7 and in the first grade (Lyytinen et al, 2004).¹⁶ These researchers report on brain event-related responses including ERPs to categorical speech perception and processing of specific temporal features of the Finnish language as precursors of dyslexia. From the comparison of the developmental characteristics of the at-risk and control groups Lyytinen et al show the importance of environmental effects including parent-child symbolic play and language interactions between parents and children and also the predictive power of some core language measures, both phonological and morphological specific to the highly agglutinative Finnish language. This prospective, fine-grained study serves as another noteworthy exemplar for similar investigations in Hong Kong and elsewhere.

The above emphasis on improving children's environment is particularly applicable to Hong Kong in that the school milieu is on tests, examinations in meeting so-called high standards and much less on learning per se and on children's health and welfare. I would like to urge very strongly that a high priority should be placed on early childhood health and education, and on upgrading the education of care-givers and teachers in these areas. The considerable resources available from different local research and development grants agencies should be directed to long-term, interdisciplinary, multi-site studies of the development of children along the lines of such notable investigations as NLSCY in Canada and the Jyväskylä Longitudinal Study of Dyslexia in Finland. In all these enterprises – research, practice and public policy – government, non-government and professional organisations all have very important roles to play in child development and provision for young children and for children at-risk for dyslexia. In setting right public policies about children's rights, much depends on getting the science right and in understanding what science tells us (and not tell us).¹⁷ The selected papers in this special issue are testimony to efforts in Hong Kong and overseas in this direction of scientific studies of dyslexia and advocacy for those with the disorder.

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