Preschool foundations of early reading acquisition

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The present paper describes research on the skills and processes associated with word and text reading acquisition in preschool children and during the first years of school. The aim is to provide an overview that gives a sense of the important milestones in language and literacy acquisition. A comparison of children’s performances against these milestones may thus guide effective intervention for health professionals, parents and other professionals. Also summarized and explored are the role of speech perception and production, grammatical and syntactic skills, and metacognitive skills, including phonological awareness.

Key Words: Child development; Emergent literacy; Language development; Reading

ETIOLOGICAL FACTORS

Evidence from large-scale twin studies (2) suggest very strongly that there is a genetic basis for reading, with a heritability of approximately 0.5 being typical. There are probably quite distinct genetic influences on word reading and listening comprehension (3). Furthermore, there appear to be separable genetic influences on early precursors to these skills, with both behavioural and genetic linkages between preschool phonological processing measures and later word reading, and between preschool oral language abilities and later reading comprehension (4). Despite the possibility of unique genetic influences on these two foundations of literacy, they are not fully independent, as there is evidence of reciprocal interactions among oral language and phonological processing abilities and between word reading and reading comprehension skills (5).

Attempts are well underway to identify specific brain sites associated with word reading. Replicated evidence from positron emission tomography and magnetic resonance imaging studies link phonological processing to left temporoparietal cortex activation in adults (6). Diffusion
SPEECH AND LANGUAGE UNDERPINNINGS

Oral language skills that are acquired during the infant and preschool periods are critical to the later acquisition of reading skills. Accurate perception and production of speech sounds are essential for learning the relationship between sounds and letters. The ability to understand oral language and express oneself coherently with grammatically correct sentences is directly related to written language comprehension and writing.

Speech perception

The foundation for oral language development is laid in the first year when the infant learns to perceive the speech sound contrasts of the maternal language. The infant is able to extract knowledge about language-specific meaningful sound contrasts, without knowledge of the meaning of words, through statistical learning mechanisms that are influenced by the distribution of sounds that occur in the speech input. The outcome of this learning process is governed by a complex interaction between the infant's auditory and learning abilities and the amount and nature of the speech input. The infant learns to ignore speech sound differences that are not meaningful while developing a heightened sensitivity to sound contrasts that are critical to later comprehension of language. Language-specific sensitivity to vowel contrasts is acquired during the first six months of life, while special sensitivity to consonant contrasts appears toward the end of the first year (11). The ability to respond to different words emerges during the second year of life, with toddlers responding initially to words that sound very different. Similar-sounding words (such as 'bear' and 'pear') are correctly identified before two years of age, when the words are produced very distinctly and presented in quiet conditions (12). The ability to perceive speech that is degraded or presented in difficult listening conditions is acquired very gradually through late childhood (13). The importance of speech perception to reading acquisition is highlighted by studies showing that speech perception abilities in infancy are associated with vocabulary learning in toddlerhood (14), that speech perception skills in preschoolers are associated with phonological awareness skills in kindergarten (15), and that speech perception deficits are associated with reading difficulties in older children (16). Furthermore, neurophysiological investigations have found that infants with a family history of dyslexia show unusual cortical responses to speech stimuli (17). The underlying cause of these speech perception deficits is not clear, although behavioural investigations suggest that children with dyslexia suffer fundamental difficulties with basic auditory processing (18).

Speech production

The ability to articulate speech also begins in infancy, with the emergence of canonical babble (i.e., speech-like but non-meaningful repetitive syllable sequences) between seven and 11 months of age. The development of babbling is profoundly impacted by the child's access to speech input and is clearly associated with the emergence of meaningful words in the second year of life (19). Although the child's first words are often inaccurate and difficult to understand, speech should be generally intelligible by three years of age and largely accurate by seven years of age (20). Difficulties with speech articulation offer an easily observable marker for developmental delays because parents are known to be reliable observers of their child's speech production accuracy, and these reports have been shown to be correlated with later speech and language development. For example, parents are able to reliably report when their infants first begin to babble (21). Parent ratings of the intelligibility of their preschool-aged child's speech have been shown to have excellent specificity and sensitivity as a screen for speech and language disability (22). Speech sound disorders and difficulties with phonological processing and reading are also clearly linked and may share a common genetic etiology (23).

Oral language

Delayed achievement of early expressive language milestones is another readily observable risk factor for ongoing difficulties with linguistic development and academic achievement. First words typically emerge at or before the first birthday. Total expressive vocabulary size expands rapidly thereafter, reaching approximately 100 words at 18 months of age and 200 words by 24 months of age, on average. Parental reports of vocabulary size can be used to identify late-talking toddlers as children who produce fewer than 20 words at 18 months of age or fewer than 50 words at 24 months of age. Although the majority of late-talking children achieve language skills that are at least minimally within the average range by three years of age, late-talkers as a group display significantly worse language skills than their peers through high school (24). The risk of persistent delays is substantial for certain subgroups of late-talking children, specifically toddlers, who have concomitant delays in language comprehension.
and/or a family history of language or reading disability (25). Because language comprehension is difficult to observe in young children, all late-talking children should be referred to a speech-language pathologist for further assessment.

Difficulties with grammar are also correlated with reading disability and can be identified early as the failure to produce word combinations by two years of age or the persistence of certain grammatical errors (such as 'him walk' rather than 'he walks' or 'he walked') through to four years of age. Close behavioural correlations and genetic linkages are observed for vocabulary and grammar development (26), although these language skills are also strongly influenced by the quantity and sophistication of the language input provided by parents (27). Further advances in language skills are observed in the form of increasingly mature narrative skills as children progress through the early school years. The inability to tell a coherent story at school entry is a particularly good predictor of persistent language and reading disability among children with a history of delayed language development as preschoolers (28).

**EMERGENT LITERACY SKILLS**
Emergent literacy skills in general, and phonological awareness skills in particular, form a bridge between a child's development of oral language skills and the eventual acquisition of written language competence. These skills emerge in the preschool period from the interaction of the child's facility with oral language, and specific modelling and instruction on the part of parents and other caregivers (29).

**Phonological awareness**
Usually described as the capacity to reflect on the sound structure of the spoken language, phonological awareness is indexed by such diverse abilities as tapping out the number of syllables in a word, matching words that rhyme with each other, or deleting sounds from a given word (ie, Say 'rat' without the 'rr'). Why is it important? The results of 30 years of research worldwide have shown that phonological awareness is perhaps the best predictor of reading ability that we currently have. Furthermore, poor knowledge of the sound structure of spoken language is considered to be the 'core' deficit that underlies reading disability (30). Kindergarten-aged children should be able to identify words that rhyme or share the same beginning sound. In fact, many children show some awareness of rhyme and alliteration as early as three years of age.

**Letter knowledge**
Letter name knowledge has a complex relationship with reading. While closely related to reading, it is also known that training letter names does not itself raise reading ability (31). Letter sound knowledge is also an important predictor of phonological skills, and may partly emerge from letter-name knowledge (32). Children may often represent the sounds in words using a combination of letter names and letter sounds (ie, ‘bn’ [bean]) in early spelling.

Children are particularly likely to use letters from their own names at this stage (33). The authors have recently found that name writing ability (as measured by accuracy in representing initial, final, initial and final, or all letters of a child's name) is an excellent predictor of phonological abilities in five-year-old children. The ability to identify their own name or common environmental print items (ie, ‘Coca-Cola’, ‘Loblaws’ or the ‘Ottawa Senators’ hockey logo) were poor predictors of phonological abilities. It may be that in name writing, with a conscious and effortful focus on ordered letter representation, children first learn how to use explicit phonological abilities for literate ends.

**Print concepts**
As Marie Clay noted some years ago, more general print knowledge predicts reading success. In Clay’s Sand: The Concept About Print Test (SANDS) (34), children are asked to point to the front of a book, signal directionality of print and identify a title (etc). Such measures used in kindergarten and early in the first year of school are predictive of reading (35), possibly because they index the child’s prior experience with print and the extent to which the home and school environment supports the early acquisition of literacy skills. However, phonological awareness performance is a better indicator of risk for dyslexia.

**SCREENING AND FOLLOW-UP**
Many general development screening tools have items related to language and literacy development (ie, Infant and Child Development Inventories <www.childdevrev.com>; Ages and Stages Questionnaire <www.brookespublishing.com>). Parent-reported inventories that are specific to language development are also available (ie, Language Development Inventory <www.aseba.org>; McArthur Communicative Development Inventories <www.brookespublishing.com>). A speech and language milestones checklist is available at no charge from the Canadian Association of Speech-Language Pathologists and Audiologists (<www.caslpa.ca/PDF/milestones_brochure.pdf>). Screening instruments for the identification of delays in preliteracy and literacy skills have been developed, primarily for use by preschool and grade school teachers (ie, Phonological Awareness Literacy Screening <pals.virginia.edu>). As mentioned earlier, children who demonstrate delays in the acquisition of language or early literacy skills are at particular risk for dyslexia if there is a family history of language and literacy impairments. Children who are deemed at-risk should be referred to a speech-language pathologist or a developmental clinic for further assessment.

Indicators for the risk of future reading difficulties are the same for children who are learning to read in their first or second language; that is, language delay in the first language and/or poor letter name knowledge and phonological awareness skills in the first or second language would be cause for concern. Children who are not speaking the language of instruction at kindergarten entry have a disadvantage for phonological awareness skills in comparison with
children who speak the majority language. However, given appropriate instruction in preliteracy skills during the kindergarten year, these children will achieve expected levels of preliteracy and word reading skills by the first grade. This has been shown to be the case even when the child’s first language is characterized by a markedly different phonological and writing system than English (ie, Chinese). Unfortunately, children’s oral language skills in the second language typically do not catch up even after 17 months of education in the second language. These delays in oral language skills are likely to impact on reading comprehension in the later primary grades if they persist.

However, delays in the acquisition of letter sound knowledge and basic decoding skills are not expected in children who are learning to read in a second language, and should thus be of equal concern for grade 1 children regardless of language background (36).

**INTERVentions**

Individual differences in reading ability may be minimized through appropriate environmental inputs before the onset of formal reading instruction. Structured interventions during the preschool period have a significant impact on later reading acquisition. Randomized controlled trials have demonstrated unequivocally that language stimulation, interactive reading, explicit teaching of letter sounds and phonological awareness interventions, administered in daycare and kindergarten classrooms, can improve language and phonological awareness abilities in the short term and lead to improved reading outcomes over the long term (37-40). Furthermore, it has been shown that interventions for at-risk children are most effective when they begin during infancy (41). These studies show that simply exhorting parents to read to their children is not likely sufficient to prevent reading disability. Shared reading activities influence reading acquisition when the parent uses books for explicit teaching of new vocabulary, letter names and sounds, and print conventions. Parents and other caregivers can improve language skills by asking questions about the pictures and story that are designed to teach the child new words, encourage the child to recall and retell the story, and help the child to relate the story to their own experiences. Books can also be used to teach the child to identify letters and letter sounds and to focus on the sound structure of words.

**CONCLUSIONS**

Large-scale and longitudinal investigations of reading acquisition have shown that children who prove to be reading disabled are different from birth, evidencing atypical neural and behavioural responses to speech in infancy, delayed achievement of speech and language milestones as
preschoolers, and deficient emergent literacy skills at school entry. Many of these signs of future language and literacy difficulties are readily observable (Figure 1) and offer an opportunity for early identification and subsequent provision of interventions that focus on vocabulary development and phonological awareness as a means to prevent reading delay. However, we caution that although a focus on verbal cognition is important, it is not the only factor to consider. Space constraints in the present article preclude a detailed discussion of these wider issues, but clinical experience suggests that the fostering of a love of reading in a culture that values literacy, shared attention with an adult over books (in enjoyable low-stress contexts), personal motivation and interest are all likely to play a significant role in literacy acquisition.

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REFERENCES


Practitioner review: Early reading acquisition