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# Literacy development in alphabetic/nonalphabetic writing systems

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## Food for thought as you come in ….

- If you were asked to 'reform' (reinvent!) written English, what improvements would you recommend?
- How would these make written English better?
- What particular languages would you use as a model?

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## Lecture overview

- Framework for literacy acquisition
  - Gough & Turner's model
  - Challenges of the English orthography
  - Early foundations skills in English
- English vs. other alphabetic orthographies
  - Predictors of reading/spelling
  - Growth patterns
- English vs. Chinese (and other writing systems)

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## Learning outcomes

- Outline the simple view of reading
- Differentiate consistent (transparent) from inconsistent (deep) alphabetic systems
- Define logographies and outline challenges in terms of children's ability to learn them
- Describe three cognitive skills that predict emerging reading skills in English
- Consider their role (some of them) in other writing systems

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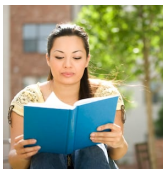
- **Spoken language**
  - Ubiquitous ability available to humans for thousands of years
  - Evanescent ("*Verba volant*")

- **Written language**
  - "Recent" cultural invention
  - Parasitic upon language (Mattingly, 1972)
  - Requires formal schooling over protracted period
  - Permanent ("*Scripta manent*")



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## Why care?

- Integrally liked to functioning of contemporary societies
  - Being illiterate in adulthood (14% of world population in 2016[1]) linked with poverty, poor health and social exclusion both for adult and their children (Oxenham, 2008; Post, 2016)
  - Struggling with reading and spelling (e.g., developmental dyslexia) limits children's academic learning experiences with knock on effects on employment opportunities, quality of life etc.

[1]UNESCO Institute for Statistics

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## Why care?

- Gateway to learning: Key to learning almost all subject materials
- Much of the vocabulary and language skill children and adults acquire comes from reading
- Being literate brings change in several linguistic and nonlinguistic domains
  - Perceptual differences in processing left-to-right mirror images (e.g. b vs. d); different metalinguistic abilities (**ability to reflect on language's different levels**)
  - PS: Note that being illiterate is different from being unschooled

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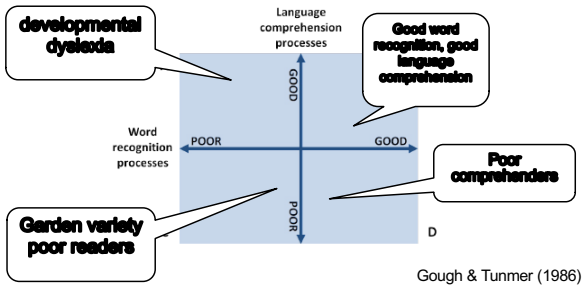
## Two components to successful reading




Gough & Tunmer (1986)

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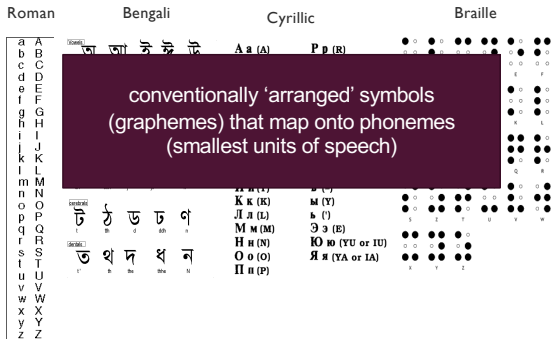
## Alphabetic systems

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## The case of English

- English is hard
  - **Inconsistent** in how letters map onto sounds and vice versa: B**e**d, h**ea**d, s**ai**d, l**eo**pard, fr**ie**nd
- Not chaotic!
  - Encoding of morphology (steal – stealth)
  - Lexical stress: unstressed vowels often pronounced as schwa vowel /ə/ which can map to any short vowel spelling: <scall**o**p> /skæləp/; <cact**u**s> /kæktəs/
  - Retention of historical spellings, e.g., diachronic change in phonology not matched with reform in orthography (e.g., **kn**ee)
  - Retained foreign spellings with Anglicized pronunciation (e.g., chat**eau**)

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## Candidate precursor skills?

- Verbal short-term memory, vocabulary, morphological awareness, executive function, visual attention ….
- Three extensively studied predictors
  - Phonological awareness: sensitivity to sound structures of a spoken language
  - Alphabet knowledge: letter sound/name knowledge
  - Rapid automatized naming: The ability to rapidly produce lexical labels for visually presented stimuli

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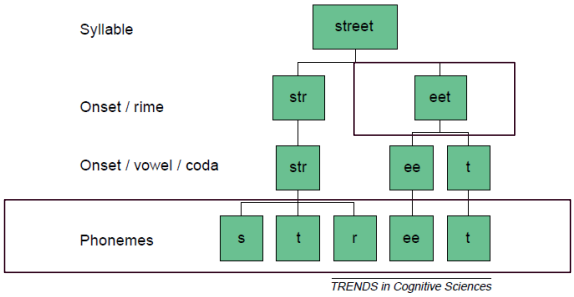
## Sensitivity to sound structures of spoken languages




Longstanding debate on their differential influence in English

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## Phoneme awareness tasks

- **Phoneme deletion task**
  - e.g. say 'fan'… again with saying 'f'
- **Phoneme segmentation task**
  - e.g. tell me the sounds in cat
- **Phoneme blending task**
  - e.g. 'what does /t/i/p/ say?'
- **Phoneme reversal**
  - e.g. say the sounds of skin backwards (insk)

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## Other phonological awareness tasks

- **Syllable segmentation**
  - Say each syllable in pencil (pen-cil)
- **Rhyme oddity**
  - Which is the odd one out: fin, win, sit?
- **Rhyme judgement**
  - Does sheep rhyme with keep?
- **Onset or alliteration oddity**
  - Which is the odd one out fin, fit, tin?

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## Rapid automatized naming (RAN)

- Inspired by the case study of Dejerine studied by the neurologist Geschwind: Able to match colors to their names but not produce their names
- Naming speed difficulties in dyslexic children (Denckla, 1972)
- **Nonalphabetic RAN** shown to predict RAN reading **fluency** (e.g., Lervåg & Hulme, 2009)
  - Integrity of a left-hemisphere object naming mechanism (Lervag & Hulme, 2009)
  - **Domain-general** speed of processing? (Kail et al., 1999)
  - Speed of accessing and retrieving phonological information from memory? (Torgesen et al. 1997)

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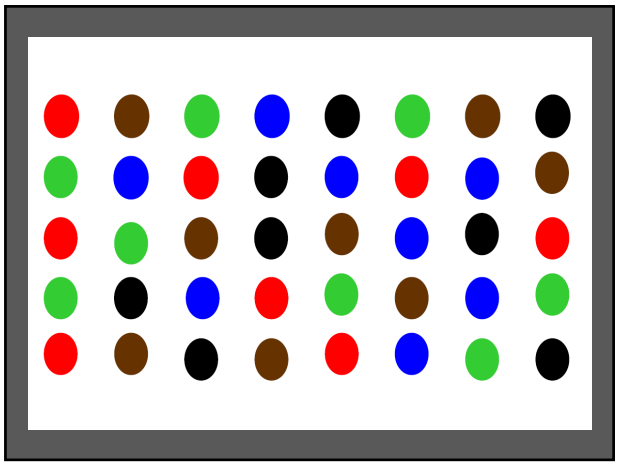

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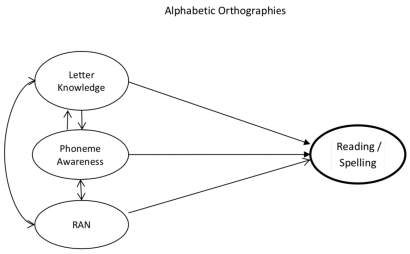
## Literacy foundation model (Caravolas & Samara, 2015)




Studies of early development of alphabetic literacy point to three key cognitive abilities that learners need to bring to the reading and spelling acquisition tasks: knowledge of the letters of the alphabet, phoneme awareness, and rapid naming of visually presented stimuli.

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## Lecture overview

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## Methods

- Longitudinal studies of unselected samples
  - Seek to examine how preschool differences in set of cog skills measured at T1 relate to T2 (future) reading skills
  - Controlling for autoregressor or 'stability' effects: earlier reading predicts future reading
  - Unlike concurrent correlations, the design provides *some* evidence for the direction of effects: **Skill X (cause?)** precedes reading (effect)…
  - But still correlational… Need follow-up training studies showing that by training X, **reading improves**

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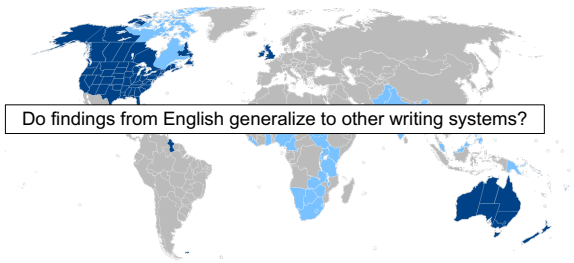

Do findings from English generalize to other writing systems?

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## Cross-linguistic comparisons

- Aim: To uncover universal and the language-specific aspects of learning to read/spell
  - learner characteristics vs. writing system characteristics
- Today's lecture: emphasis on early foundational skills spanning the first 2 years of life: children progress from having no reading or spelling/writing abilities to being 'independent decoders' and spellers (though imperfect)
- Two possibilities
  - Different foundation skills OR same foundation skills but different (a) weighting? (b) timing? (c) persistence?

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## Ziegler & Goswami: A Psycholinguistic Grain Size Theory

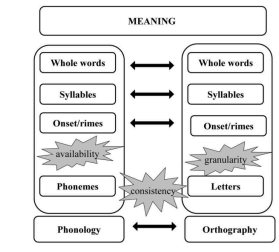


*Figure 1.* Schematic depiction of the three main problems of reading acquisition: availability, consistency, and granularity.

- Availability problem: not all phonological units are consciously (explicitly) accessible prior to reading
- Inconsistency problem: multiple readings for orthographic units and/or multiple spellings for phonological units
- Granularity problem: bigger grain sizes -> more orthographic units to learn

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## Share (2008)

- Repercussions of English orthographic exceptionality
  1. Qualitative difference patterns of reading behaviour (e.g., lexicalizations vs. neologisms)
  2. Misleading emphasis on reading accuracy? (largely a nonissue for the majority of the world's alphabetic orthographies) over reading fluency
  3. Partiality toward oral reading
  4. Exaggerated role of phonemic awareness?
  5. Emphasis on emergent literacy skills and whole-language teaching approaches

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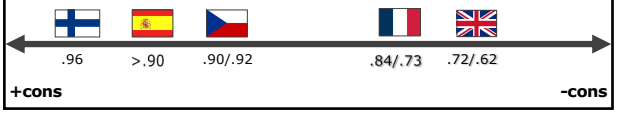
## Is English really that exceptional?

- Predictability of the relationship from letters to sounds (**Feedforward consistency**)
  - Mint, hint, lint, pint(!)
- Predictability of the relationship from sounds to letters (**Feedback consistency**)
  - Bread, dead, bed(!)

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| Language | Real words | Pseudo-words |
|---|---|---|
| Greek | 98 | 92 |
| Finnish | 98 | 95 |
| German | 98 | 94 |
| Austrian German | 97 | 92 |
| Italian | 95 | 89 |
| Spanish | 95 | 89 |
| Swedish | 95 | 88 |
| Dutch | 95 | 82 |
| Icelandic | 94 | 86 |
| Norwegian | 92 | 91 |
| French | 79 | 85 |
| Portuguese | 73 | 77 |
| Danish | 71 | 54 |
| Scottish English | 34 | 29 |

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## Seymour, Aro, and Erskine (2003)

- English vs. 14 European languages of different orthographic consistency
- 87% accuracy for reading familiar high-frequency words and 82% for reading nonwords after 1 year of schooling
- English: 34% and 29% for familiar/nonwords respectively!
- Differences do not appear attributable to factors such as age, gender, syllable complexity, or letter knowledge
  - E.g., in within- subject bilingual comparisons, L2 reading performance outperforms L1 performance in the same individual!

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## Is PA less important in consistent orthographies?

- The argument: In **consistent orthographies**, systematic phonics methods suffice to boost and override pre-existing individual variations in PA within 1-2 yrs of schooling
  - In Dutch, effects of phonological abilities increase up from kindergarten to Grade 1 and subsequently disappear (de Jong & van der Leij, 1999)
  - In German, impaired phonological awareness in Grade 1 do not impair the acquisition of phonological coding processes (**efficient and automatic mapping of print to sound**) in Grade 3 (Wimmer, Mayringer, & Landerl, 2000)

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## Is PA less important in consistent orthographies?

- Ziegler et al. (2010): compared Phoneme awareness (as well as RAN, verbal short-term memory) in French, Portuguese, Dutch, Hungarian, and Finnish 2nd graders
  - Outcomes: word and nonword reading speed and accuracy among 2nd grade children.
  - Phoneme awareness as the **main predictor** in all languages and across **all four reading measures**
- Vaessen et al. (2010). Same pattern in cross-sectional study with Portuguese, Dutch, and Hungarian 1st to 4th grades (although phoneme awareness ACC more important than speed in consistent orthographies and vice versa)

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## Is RAN more important?

- The argument: When accuracy asymptotes quickly (ceiling effects by the end of 1st/2nd grade), speed and fluency become the discriminating measures of individual/developmental differences
- Georgiou et al. (2012): English-speaking (highly inconsistent), Finnish-speaking highly consistent) and Greek-speaking children (consistent in reading direction, less so for spelling)
- Measures
  - letter knowledge, PA, and RAN (kindergarten)
  - NW reading accuracy, text fluency, spelling (end grade 2)

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## Georgiou et al. (2012) results

| | RAN | Letter knowledge | PA |
|---|---|---|---|
| English | nonword decoding, spelling | **yes** | nonword decoding |
| Finnish | no | **yes** | no |
| Greek | Reading fluency, spelling | **yes** | |

- But two years gap between T1 and T2: might be concealing rapid changes in consistent orthographies

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## Caravolas et al. (2012)

- A causal theory of literacy development needs a well controlled, longitudinal study of children assessed (1) before or at the start of formal literacy instruction, and (2) within the 1st year of literacy instruction
- Essential to ensure parity in skill measurement used across languages
  - Closely matched measures (e.g., words matched for length, frequency, syllable structure etc.)
  - Reliable measures
  - Multiple measures for given construct

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## Methods

- English, Czech, Slovak and Spanish children tested 6 times over 3 years, from beginning of formal schooling
- Large battery tests across language
  - NVIQ, VIQ, VSTM, Morphological awareness, Syntactic awareness, Orthographic awareness. Paired associate learning, Visual attention, LK (sounds, names), PA (isolation & blending), RAN (objects, colors), Graded Reading (aloud, silent), Graded Spelling (letters, 35 words)

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## Matched measures, e.g. picture-word matching

| | | | | |
|---|---|---|---|---|
|  | roads ☐ | daisy ☐ | rose ☐ | cage ☐ |
|  | robe ☐ | lis ☐ | rose ☐ | bain ☐ |
|  | roca ☐ | árbol ☐ | rosa ☐ | silla ☐ |
|  | ruce ☐ | váza ☐ | růže ☐ | bota ☐ |
|  | ruky ☐ | listy ☐ | ruža ☐ | mäso ☐ |

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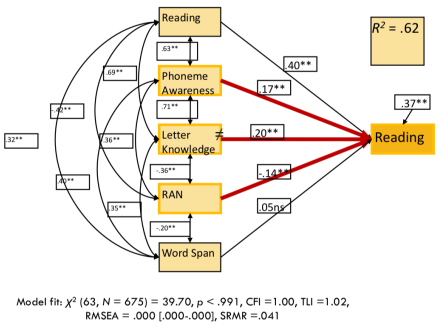


Model fit: $X^2$ (63, $N$ = 675) = 39.70, $p$ < .991, CFI =1.00, TLI =1.02, RMSEA = .000 [.000-.000], SRMR =.041

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## Caravolas et al. (2012).

- Excellent fits across languages: associations between predictors & longitudinal relationships between predictors and later reading and spelling scores, are essentially almost identical across the languages
- Longitudinal variations in reading and spelling are predicted by phoneme awareness, letter knowledge and RAN (and the autoregressive effect of earlier reading or spelling skills respectively) but not word span.
- A clear and remarkably consistent pattern of predictive relationships for early reading and spelling skills in all four languages.

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## Caravolas et al. (2013)

- Caravolas et al.'s (2012) results suggest that the cognitive skills driving reading development might be universal across alphabetic orthographies in the **earliest phase of literacy development**.
- Rates and patterns of reading growth across across three languages differing in alphabetic consistency (English, Spanish, Czech)
  - RQ1: Do English learners follow the same DELAYED growth trajectory?
  - RQ2: Do English learners follow a different growth trajectory?

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## Regarding reading growth across languages…

- Nonlinear growth – spurts and plateaus
- Significant impact (spurt) of formal literacy instruction
- Slower growth in grade 2
- Possible *difference* between English and consistent orthographies: initial spurt related to start of instruction is more protracted
- But little direct cross-linguistic research….

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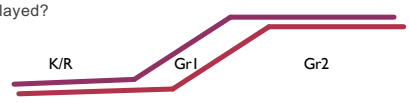
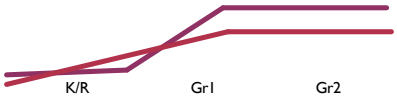
## Questions about growth

- Comparing groups of similar initial reading ability:
  - Do English learners follow the same growth trajectory, just delayed?




  - Do English learners follow a different growth trajectory

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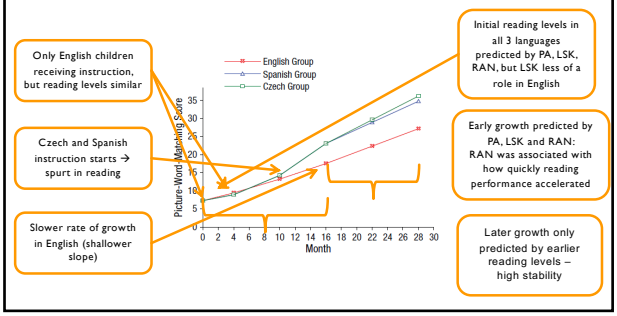
## Caravolas et al. (2013)

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## Chinese

- Chinese: Language used by 1.2 billion people (16% of world population)
- Standard Chinese (Mandarin): one of the official languages of China and Singapore and a national language of Taiwan
- Extensive orthography: 3,000 to 4,000 characters
- Cultural considerations:
  - Traditional script (Hong Kong, Taiwan) vs. simplified script (Mainland China, Singapore)
  - Pinyin: Roman letter (alphabetic) coding system for Chinese characters taught bf schooling in Mainland China
  - Zhu-Yin- Fu-Hao (=symbols of phonetic pronunciation) in Taiwan

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## The Chinese logography

- In logographic systems, symbols map onto morphemes [**smallest meaningful unit in language**] or words

家人到動物園去.

"home" "person" "move" "things" "garden"

*The family went to the zoo*

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## Learning to read Chinese

- Typologically different to English
  - Simpler phonological structure (e.g., no consonant clusters)
  - **Basic unit of speech: syllable**
  - Visually complex characters (400 expected to be learnt after 1 year of schooling)
  - Tones (suprasegmental feature): different tones = different meanings for syllable
- Key questions:
  - Does learning to read Chinese depend more on the ability to make appropriate visual distinctions?
  - … phonological vs. morphological awareness (learner's ability to reflect on/manipulate the meaning units in spoken words)?

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## Are visual skills more important in logographies?

- Huang & Hanley (1995): tested 8-year-old primary children from the UK, Hong Kong, and Taiwan on tests of visual skills and reading ability
- Visual tests
  1. Visual form discrimination (VFD) task
  2. Visual Paired Associates (VPA) test
- Controlling for IQ, visual skills strongly predictive of Chinese reading ability (both groups), NOT English reading ability
- Limitations: Cross-sectional data, ceiling effects for English VFD performance

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## Phonological awareness?

- Linked to learning to read an alphabetic orthography or an integral part of humans' biological preparedness for rapid early spoken language acquisition
- Radically different relationship between phonology and orthography in Chinese
- But *there i*s a relationship…
  - only 18% of Chinese characters are strictly pictographic
  - 80-90% of Chinese characters have a component (**phonetic radical**) that gives information about the pronunciation of the word
  - But this information is highly unreliable

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## Phonological awareness?

- McBride-Chang, Bialystok, Chong, & Li (2004): 1st graders from China, Hong Kong, and Toronto
- Chinese character recognition in kindergarten and Grade 1 best predicted by **syllable awareness** whether Children were learning Chinese by Pinyin (Mainland China) or not (Hong Kong).
- Phoneme awareness did not predict unique variance in Chinese character recognition in either group of children
  - But significant predictor of English word recognition, over and above syllable awareness

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## Literacy in Chinese: Summary

- Syllable but not phoneme awareness
- Evidence on visual skills rather mixed: Intuitively seem to play a role in learning to read and write Chinese (and probably more important than in English)
  - Findings might depend on how they are measured?
  - Correlates but not unique predictors
- Early days to say whether Triple foundation model holds well in nonalphabetic orthographies but preliminary evidence suggests RAN and character knowledge as important predictors too

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## Other systems

- Research on nonalphabetic orthographies is dominated by studies of Chinese. There is other types of system too
- In a purely syllabic script, different symbols = different syllables, with no predictable relationships between most of them. These are rare
  - Cypriot syllabary
  - Japanese hiragana

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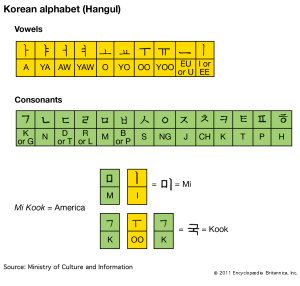
## Other systems: Alphasyllabaries




- Phonemes arranged into syllable-sized characters
- Very little research on these, but probably most convincing finding is that awareness of syllables and phonemes is a strong predictor

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## Concluding thoughts & remarks

- **Complete science of reading must embrace all of the world's readers and all of the scripts that they read**
- Implications for spelling instruction: Thorough understanding of cross-language similarities and differences needed if if teaching strategies are to be optimised in different languages: e.g., effectiveness of preliteracy instruction, synthetic phonics etc.
- Implications for developmental dyslexia
  - Non-English dyslexics may seemingly have less severe difficulties than their English-speaking counterparts but they are still impaired relative to same-speaking children
  - Speed impairments are prominent but less obvious to teachers/parents
  - Absolute magnitude differences may again be exaggerated by poor item matching (Ziegler et al., 2003)

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## Core & recommended reading


- Caravolas, M., Lervåg, A., Mousikou, P., … & Hulme, C. (2012). Common patterns of prediction of literacy development in different alphabetic orthographies. *Psychological Science, 23(6)*, 678-686
- Caravolas, M., & Samara, A. (2015). Learning to read and spell words in different writing systems. In A. Pollatsek & R. Treiman (Eds.) Handbook of Reading. Oxford University Press. [personal author's copy on moodle]
- Hulme, M.J. & Snowling, M. J. (2013). Learning to read: What we know and what we need to understand better. Child Development Perspectives, 7, 1-5
- McBride, C., & Wang, Y. (2015). Learning to read Chinese: Universal and unique cognitive cores. Child Development Perspectives, 9(3), 196-200.
- Muter, V., Hulme, C., Snowling, M. J., & Stevenson, J. (2004). Phonemes, rimes, vocabulary, and grammatical skills as foundations of early reading development: Evidence from a longitudinal study. Developmental Psychology, 40, 665–681.
- Nag, S., & Snowling, M. (2011). Reading in an Alphasyllabary: Implications for a Language Universal Theory of Learning to Read. *Scientific Studies of Reading, 16(5)*, 404-423.


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## Core & recommended reading


- Seymour, P. H., Aro, M., & Erskine, J. M. (2003). Foundation literacy acquisition in European orthographies. *British Journal of Psychology, 94*, 143-174.
- Share, D. L. (2008). On the Anglocentricities of current reading research and practice: the perils of overreliance on an "outlier" orthography. *Psychological Bulletin, 134*, 584-615.
- Treiman, R., & Kessler, B. (2005). Writing systems and spelling development. In M. Snowling & C. Hulme (Eds.), Science of reading: A handbook (pp.120-134). Oxford, England: Blackwell [available via R. Treiman's personal website]
- Zhang, J., & McBride-Chang, C. (2011). Diversity in Chinese literacy acquisition. Writing Systems Research, 3(1), 87–102.
- Ziegler, J. C., & Goswami, U. (2005). Reading acquisition, developmental dyslexia, and skilled reading across languages: A psycholinguistic grain size theory. Psychological Bulletin, 131, 3–29.


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## Any questions?

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