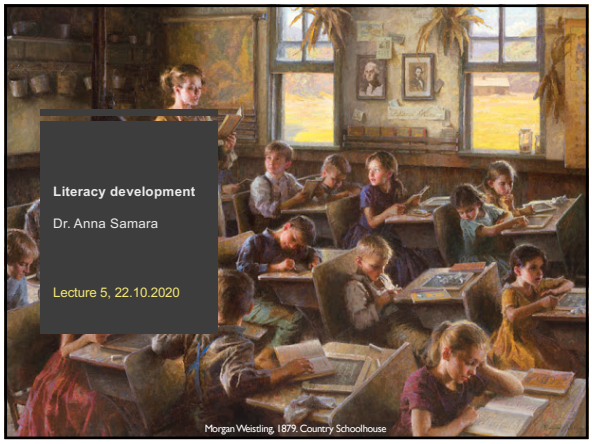

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Roadmap for Lectures 4 – 6 & 8

Oral language skills | Written language skills | Numeracy skills

Critical skills to access the school curriculum

Theory ⟷ Practice

Specific learning disabilities that affect LLN

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Lecture overview

- The development of reading
  - Three types of writing systems
    - Shared properties across them
  - The simple view of reading (Gough & Tunmer, 1986)
  - Foundations of emerging decoding (reading) skills
    - Evidence from longitudinal studies
- Spelling development
  - Why so hard
  - Three perspectives on spelling development

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Learning outcomes

1. Describe three types of writing systems
2. Define the terms "feedforward/feedback consistency"
3. Outline the simple view of reading
4. Evaluate longitudinal evidence on three cognitive skills that predict emerging decoding skills

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Across different systems, writing ....

1. Visible marks on the surface of a relatively permanent object
   - Symbols, unlike drawings, share conventional meanings across users
2. Represents language (but not all of its aspects)
   - symbols -> units of speech
   - e.g. many aspects of pronunciation (e.g. abstract vs. abstract) tend to be underrepresented

Reading aloud: Going from graphic input to speech/and or meaning

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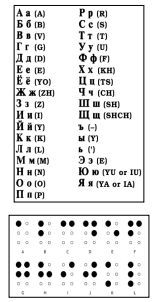
graphemes ⟷ phonemes



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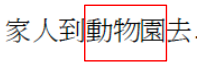
This is just one way of representing language

Syllabic scripts: From symbols to syllables, with no predictable relationships between most of them

Logographies: From symbols to morphemes [**smallest meaningful unit in language**] or words



"move" "things" "garden"

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- Alphabetic systems: graphemes ⟷ phonemes
- 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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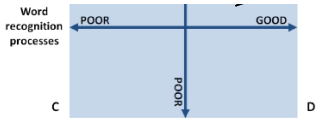
Simple view of reading

Reading = decoding (mapping letters into sounds) x linguistic comprehension



Gough & Tunmer (1986)

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Foundations of emerging decoding skill

- Emerging reading skills (i.e. reading skills among school starters) vary considerably
- Establishing what causally predicts individual differences in **decoding ability (mapping letters into sounds)** can help shape best educational practice
  - **proximal** vs. **distal** skills

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Methods (1)

- Longitudinal studies of unselected samples
  - Seek to examine how differences in set of cognitive skills measured at T1 relate to T2 (future) reading skills
  - Controlling for '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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Candidate precursor skills?

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

Byrne & Fielding-Barnsley (1989)

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1. Alphabet knowledge

- Knowledge of the letters by their sounds and names is key for mastering the alphabetic principle
  - Letter sound knowledge: e.g. Can you write the letter than goes with /sss/
  - Letter name knowledge: e.g. What is the name of this letter [e.g. S]; can you write the letter that goes with the letter S
- Alphabet knowledge is useful for teaching yourself a strategy where you decode by 'sounding words out' (Share, 1995)
- Variations in letter knowledge may tap into a basic visual-verbal associative learning mechanism that is a fundamental component of learning to read

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Phonological awareness

- Being able to manipulate and reflect on the **spoken structure of words**. This can be done at different levels.
  - phonemes (**smallest sound segments that can change meaning**) in spoken words (e.g. S T R EE T)
  - Onset vs. rime units (e.g. STR EET)
- Awareness often implicit, as well as explicit
  - **Phoneme deletion:** "What is left if you take the /m/ from mice
  - **Phoneme segmentation:** "Tell me the sounds in cat…?"

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3. Rapid automatized naming (RAN)

- Extensively investigated in recent longitudinal work (reading AND spelling (see Caravolas et al. 2012)
- Inspired by the case study of Dejerine studied by the neurology Geschwind: Able to match colors to their names but not produce their names
  - Similar naming speed difficulties in dyslexic children (Denckla, 1972)
- Very simple task (Denckla & Rudel) to investigate the ability to rapidly produce lexical labels for visually presented stimuli (e.g., color patches, letters, digits, or objects)

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Muter et al. (2004)

- Longitudinal study with 90 typically developing English-speaking children
- Tested 3 times over 2 years starting aged 4;09 [reception- very little formal exposure to literacy instruction]
- Measures
  - Letter knowledge
  - Phoneme awareness
  - Rime awareness
  - Receptive vocabulary
  - Grammatical awareness

Both measures of one's awareness of the phonological [sound] structure of spoken words

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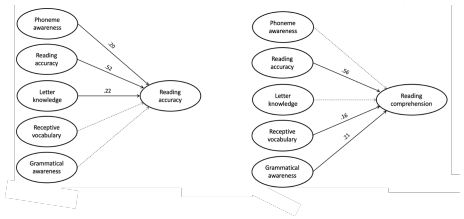
Two outcomes: reading accuracy and reading comprehension

Path model: form of multiple regression focusing on causality. Note that variables can be dependent and independent in different relationships



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Lervåg & Hulme (2009)

- 3-year longitudinal study of Norwegian children **before reading instruction has begun**
- RAN, measured with **nonalphabetic stimuli** predicted patterns of growth in reading **fluency**
- But what does this mean?
  - domain-general speed of processing? (Kail et al., 1999)
  - speed of retrieving phonological information from memory? (Torgesen et al. 1997)
  - integrity of the neural circuits involved in object identification and naming (Lervag & Hulme, 2009)

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extra study slide

Clayton et al. (2020)

- Studied the relationship between reading ability and four key predictors over the course of the 1st year of school
  - (1) PA, (2) letter-sound knowledge, (3) RAN, and (4) measure of automatic letter-sound integration (ability to **automatically** draw letter-sound associations)
- Replicates findings on predictive role of (1), (2), (3)
  - Bi-directional links btw (1), (3) and reading: Both skills predict reading ability AND they also *improve* from learning to read
- Evidence of early automatic letter-sound integration (4 months of schooling), though this ability does not predict variation in reading ability

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To sum up …Food for thought (and further reading)

- Three "cognitive foundations" shown to predit learning to read: letter knowledge, phoneme awareness, and RAN
  - If variations in these skills cause variation in reading ability, training them directly should improve reading outcomes
  - letter knowledge, phoneme awareness are certainly 'trainable' and taught as part of the curriculum
  - Would training RAN performance make you a better reader?
- Are these the only cognitive factors that influence children's reading development
  - Certainly not. Though higher-level skills (e.g. vocabulary knowledge) may be important later in development

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What about spelling?

Part 2

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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
- Clayton, F. J., West, G., Sears, C., Hulme, C., & Lervåg, A. (2020). A longitudinal study of early reading development: letter-sound knowledge, phoneme awareness and ran, but not letter-sound integration, predict variations in reading development. Scientific Studies of Reading, 24(2), 91-107.
- 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
- Lervåg, A., & Hulme, C. (2009). Rapid automatized naming (RAN) taps a mechanism that places constraints on the development of early reading fluency. Psychological Science, 20, 1040–1048.
- 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.

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