# Today's topic:

- **Pre-presentation discussion: Orthographic learning and reading difficulty**

*Background:*

- Wang, Marinus, Nickels, & Castles (2014), "Tracking orthographic learning…"

# 0. Course info and announcements

- **Article presentation** on *Th* Mar 21
  (after Group 4 prep discussion)

  - Check-in with **Group 3** members
  - Reminder: See presentation **assignment handout**, linked from Daily syllabus or Links for assignments web page

# 0. Key points today

- Quick background review:  Decoding

- Article background and key concepts

- Big-picture research questions

- Statistical analysis

# 1. Warm-up

**Group discussion**

- What is meant by **decoding** as a technical term in research on reading?

  How is decoding related to...
  - phonics?
  - phonological awareness?
  - morphological awareness?  (RE #3)

- What are some aspects of reading that are **not** part of decoding?

# 1. Warm-up

**Group discussion**

- What is meant by **decoding** as a technical term in research on reading?

  - converting from written symbols **to spoken language**

- Reminder:  The **"simple view" of reading**
  by P. Gough and colleagues

  $R = D \times C$    | **Reading** is the product of
  (written-symbol) **decoding** and
  (spoken-language) **comprehension**

## 2. Background and key concepts

- Wang, Hua-Chen, Eva Marinus, Lyndsey Nickels, and Anne Castles.  2014.  Tracking orthographic learning in children with different profiles of reading difficulty.  *Frontiers in Human Neuroscience* 8: article 468, 1-14.

  - Article link (UNC Libraries)

# 2. Background and key concepts

- Wang et al. (2014) talk about
  - **decoding**
    - letters to ...
  - **automatic whole-word recognition**
    - written word to ...

# 2. Background and key concepts

- Wang et al. (2014) talk about
  - **decoding**
    - letters to sounds (i.e., using phonics)
  - **automatic whole-word recognition**
    - written word to lexical entry (retrieve stored written form)

## 2. Background and key concepts

- **Dual-route model** of reading aloud (Coltheart et al.)

  - see Fig 1 in the article (p 4)

- How does this model represent…

  - decoding?

  - whole-word recognition?

# 2. Background and key concepts

- Which mechanism should be helpful in reading...?

|  | **decoding** | **whole-word recognition** |
|---|---|---|
| new words/ nonwords |  |  |
| irregular words (irregular spelling) |  |  |
| regular words (regular spelling) |  |  |

# 2. Background and key concepts

- Which mechanism should be helpful in reading...?

| | decoding | whole-word recognition |
|---|:---:|:---:|
| new words/ nonwords | ✔ | ✘ |
| irregular words (irregular spelling) | ✘ | ✔ |
| regular words (regular spelling) | ✔ | ✔ |

- Wang et al. (2014) talk about

  - **orthographic learning**
    "the transition from the slow sounding out of an unfamiliar new word to the rapid automatic recognition of the same word" (Wang et al. 2014: 1)

  - **self-teaching hypothesis** = about *how* orthographic learning happens
    - **decoding** as first, most important step
    - **orthographic processing** as a secondary factor

# 2. Background and key concepts

**Discussion**

- How would you define **dyslexia**?

# 2. Background and key concepts

- Rayner et al. (2012: 345)       [see Course Reserves]
  "The term **dyslexia** is used to describe individuals who have difficulty reading words accurately and fluently."


- *Dyslexia* literally means 'difficulty with reading'
  - On a continuum from mild (spelling difficulty) to severe (major reading and writing problems)
  - May cooccur with ADHD or motor-sequencing problems

## 2. Background and key concepts

- Dyslexia is **not** a greater tendency to confuse **direction** or **orientation** of letters, words

    - "…beginning readers who are dyslexic do not make such mistakes any more frequently on average than other beginning readers"
    (Rayner et al. 2012: 352, citing studies from 1960s, 1970s)

# 2. Background and key concepts

- ***Dyslexia*** literally means 'difficulty with reading'

    As defined by the NIH (from Rayner et al. 2012: 354):

    Dyslexia is a specific learning disability that is neurobiological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede the growth of vocabulary and background knowledge.

    - Symptoms (for diagnosis) are behavioral
    - Main cause is *phonological* processing problems (not visual or auditory perception)
    - Main impairment is single-word reading, but this affects vocabulary and reading comprehension

Rayner et al. (2012)

- Some patterns in developmental dyslexia
    - Estimated to occur in 5–17% of all children

    - Runs in families (genetic?  or environmental?)
        - Genetic evidence for phonological coding and orthographic coding as separate factors

    - Contribution of biological gender?
        - Slightly more common in males
        - Likely underdiagnosed in females
        - Gender balance may differ by diagnostic criteria, severity

## 2. Background and key concepts

Rayner et al. (2012: 353)

- Dyslexia is at the end of a **continuum** of poor reading skills — it is **not** a distinct **category**

- The way that dyslexia manifests, or affects reading skills, can vary a lot from child to child

- Are there **subtypes** of dyslexia, that might respond to different kinds of intervention?
  - Early research not conclusive — small samples, phonological awareness not tested

# 2. Background and key concepts

*Treatment/interventions?*

- Rayner et al (2012: 371) [emphasis added]

  - One problem with the term dyslexia is that many parents and teachers think of it as a **pathology**, and as a result believe that the child can never learn to read, write, and spell. There is **no need** for such a hopeless prognosis, if the child can be **identified before third grade** and provided with the appropriate educational services (Torgesen, 2004; Torgesen & Hudson, 2006).

# 2. Background and key concepts

*Treatment/interventions?*

- Rayner et al (2012: 357) [emphasis added]

  - ...**most** children with early reading problems **benefit** from supplemental decoding instruction, whether or not they are **diagnosed** with dyslexia.

  - Should children **fail to receive** appropriate instruction, however, they **do not** appear to **grow out** of their reading difficulties simply with the passage of time.

## 2. Background and key concepts

- Wang et al. (2014) follow a traditional distinction:
  - **Phonological dyslexia** —

  - **Surface dyslexia** —

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- Wang et al. (2014) follow a traditional distinction:

  - **Phonological dyslexia** —
    - decoding = difficulty
    - memorized words = okay

  - **Surface dyslexia** —
    - decoding = okay
    - memorized words = difficulty

## 2. Background and key concepts

- Back to the **self-teaching hypothesis** about *how* orthographic learning happens
  - **decoding** as first, most important step
  - **orthographic processing** as a secondary factor

- Which type of dyslexia is **surprising**, if this hypothesis is correct?

# 3. Research questions

**Discussion**

- **Big-picture research questions**?

# 4. Experiment design and statistical analysis

- Why do the authors need to develop a way to **test** for orthographic learning that is minimally influenced by decodability?

# 4. Experiment design and statistical analysis

- Backward masking:  a mask (here, ####) appears on screen after target in the same location, as if "covering up" the target

# 4. Data processing and statistical analysis

- Statistical analysis for Study 1 includes

  - *t*-test —

# 4. Data processing and statistical analysis

- Statistical analysis for Study 1 includes
  - *t*-test — is the **difference** between two sample **means** statistically significant?

    (for more info, see VassarStats, Ch 9–12)

# 4. Data processing and statistical analysis

- Statistical analysis for Study 1 includes

  - **ANOVA** —

    - **main effect:**

    - **interaction:**

# 4. Data processing and statistical analysis

- Statistical analysis for Study 1 includes

  - **ANOVA** — are means in groups with multiple crossed factors same/different?
    - **main effect:** this predictor matters when the categories of the other predictor are combined
    - **interaction:** the effect of one predictor differs based on the value of the other

    (for more info, see VassarStats on ANOVA)

# 4. Data processing and statistical analysis

- Statistical analysis for Study 2 includes

    - Set of **correlations** —

- Statistical analysis for Study 2 includes

  - Table of **correlations** — How much does the value of *x* predict the value of *y*?

  - Note:  There isn't really a great way to produce a data graphic for a table of correlations

    - "Correlogram" adds color / shading / plot-point size to each cell in the table (see examples)

    - You are not required or expected to do this!

# 4. Data processing and statistical analysis

- Statistical analysis for Study 2 includes

  - **Stepwise multiple regression** analyses

- **Regression**:

  - The elements of the analysis
    - **Predictor** variables (independent variables)
    - **Control** variables (also independent variables)
    - **Outcome** variables (dependent variables)

  - The analysis asks:  **How much** does each predictor (and control) variable **influence** the outcome variables?

# 4. Data processing and statistical analysis

- Statistical analysis for Study 2 includes

  - **Stepwise multiple regression** analyses

- **Stepwise**:

  - Start with factors you just want to **control** for: **how much** do these **influence** the outcomes?

  - Then do another regression analysis
    - **How much** do the *remaining* factors (here, the predictors) **influence** the outcomes...
    - ... *after* the effect of the factors in the first step is accounted for?

# 4. Data processing and statistical analysis

- Statistical analysis for Study 2 includes

    - **Stepwise multiple regression** analyses

- **Interpreting** the regression **results**:

    - The **amount of influence** of each predictor (or control) factor = the **coefficient**, or **beta**, value

    - *Data graphic:* You can **plot** the coefficients (betas) for the predictors! (What comparisons are interesting to highlight?)

- Statistical analysis for Study 2 includes

  - **Stepwise multiple regression** analyses

- **Interpreting** the regression **results**:

  - I have some questions about Table 5!

    - I suspect a formatting error (Step 1 vs. Step 2 for the predictors)

    - I don't understand why age, IQ coefficients are given for both steps — ?

# 5. Upcoming

- Group 4 article prep next Tu (after Spring Break)

- Then two presentation days in a row