

# Developmental disorders of literacy and language

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The basic approach

## The basic approach:

- Reading is not a single mental process. It depends on many different mental subskills. Some of these are:
  - letter recognition
  - word recognition
  - knowledge of letter-sound rules
  - word comprehension

and there are others, of course.

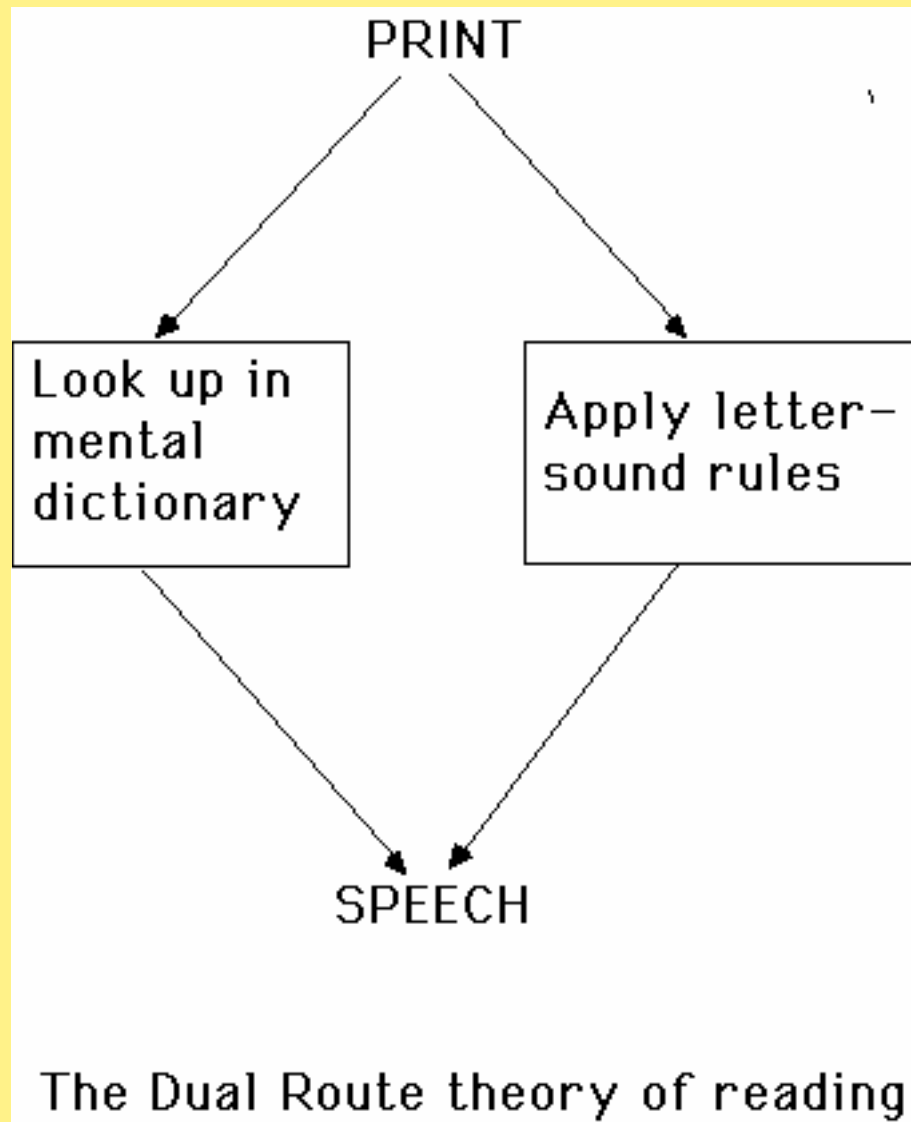
- Therefore, to become a skilled reader the child needs to learn all of these subskills.
- So if a child has a problem in learning any of these subskills, learning to read will not proceed normally.
- Therefore it must be true that children's reading difficulties will come in various different forms, depending on which subskill the child is having difficulty learning.

# Understanding children's reading difficulties

- Children's reading difficulties will come in various different forms, depending on which subskill the child is having difficulty learning.
- If so, we won't be able to make sense of children's reading difficulties unless we know what these subskills are.
- What are the various mental subskills that skilled readers possess that allow them to be skilled readers?
- This set of mental subskills I will refer to as the **READING SYSTEM**. What is this system like?

The Reading System of skilled readers:  
What is it like?

# Two ways of reading aloud



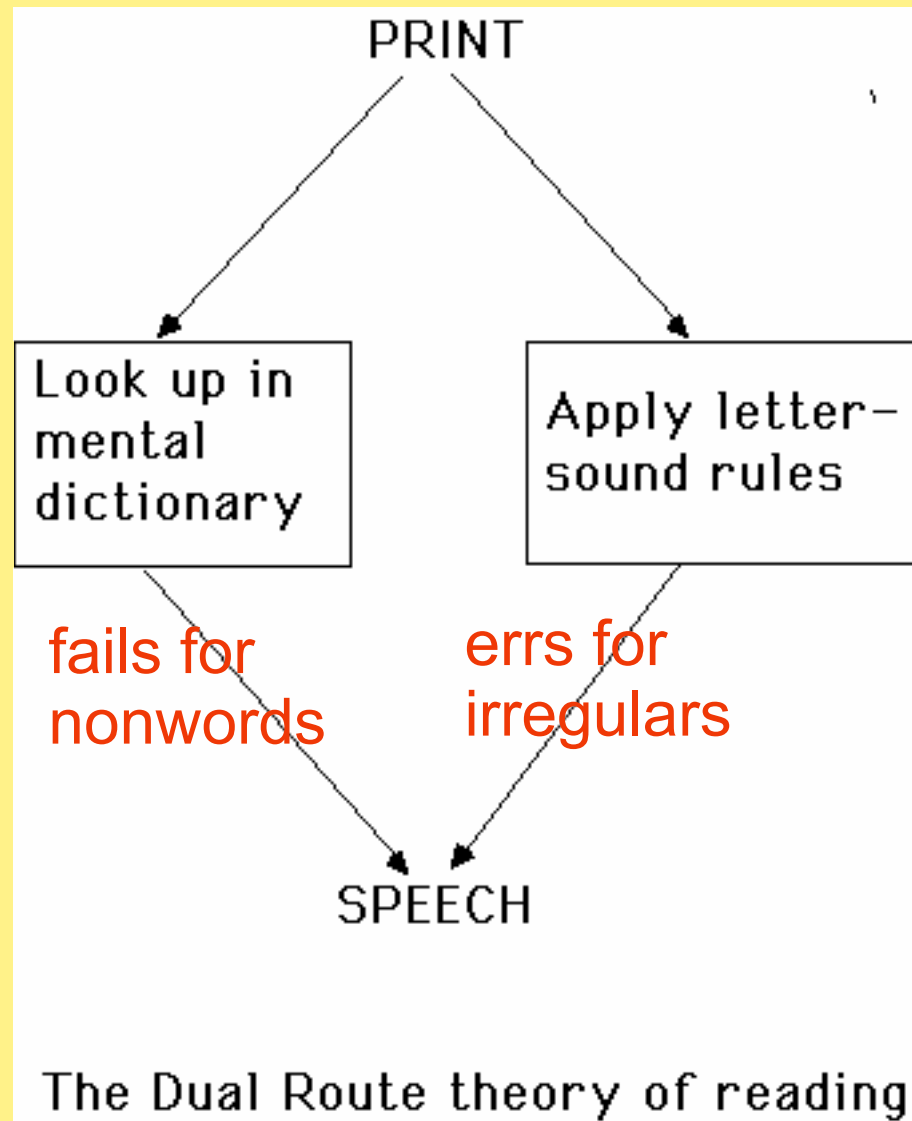
# A crucial distinction: regular vs irregular words

regular	irregular
TROUT	YACHT
RUB	SEW
MEET	AUNT
DOOM	BLOOD

## Another crucial distinction: nonwords vs words

word	nonword
TROUT	TROOM
RUB	REET
MEET	MUB
DOOM	HOUT

# Two ways of reading aloud



# The reading system: two elementary ideas

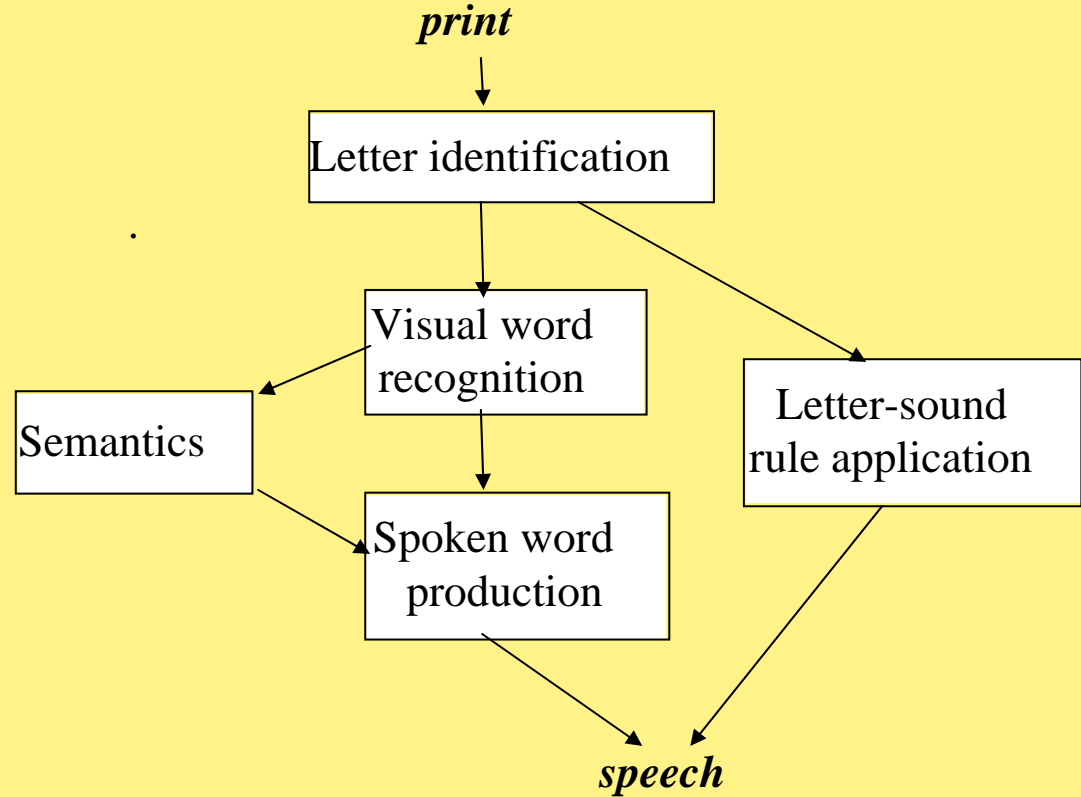
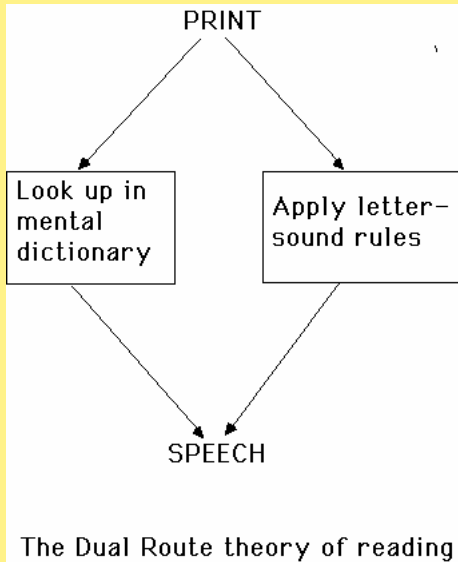
## FIRST IDEA

- Irregular words like YACHT can only be read aloud via the dictionary lookup system;
- skilled readers can read irregular words aloud;
- therefore skilled readers possess the dictionary lookup procedure for reading aloud

## SECOND IDEA

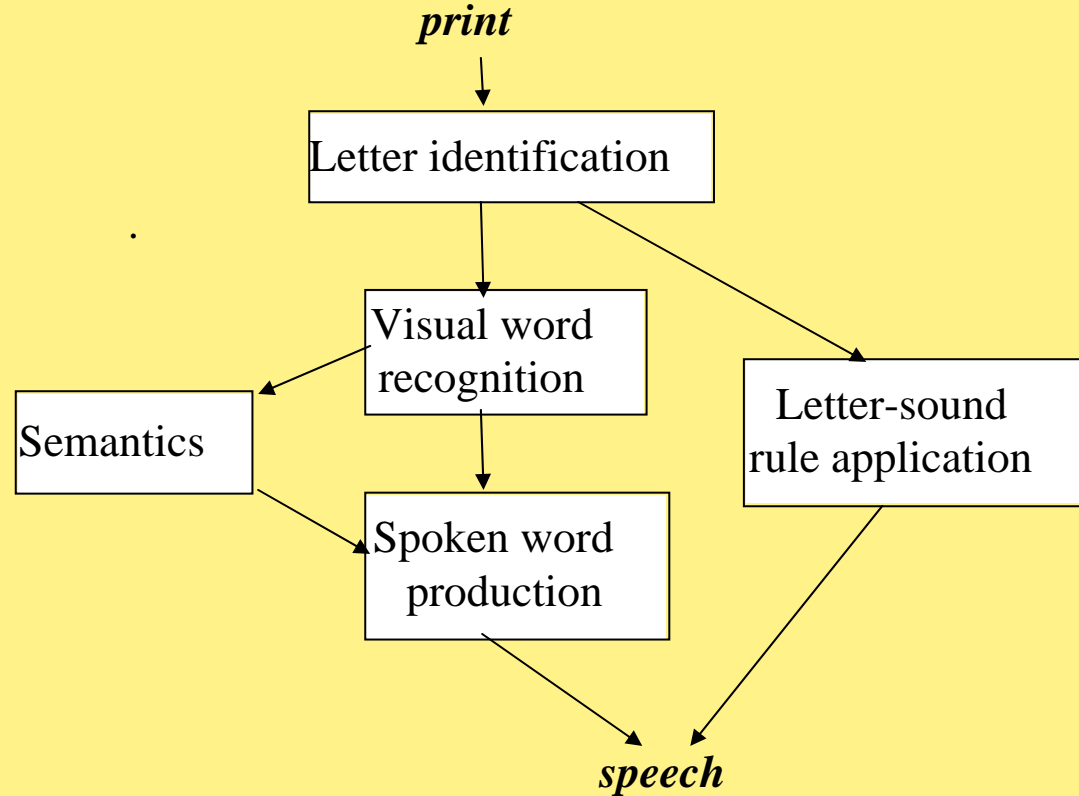
- Nonwords like TROOM can only be read aloud via letter-sound rules;
- skilled readers can read nonwords aloud;
- therefore skilled readers possess the letter-sound rule procedure for reading aloud

# The reading system: a little more sophistication



Elaboration of the dual route model of reading

# The reading system: a little more sophistication

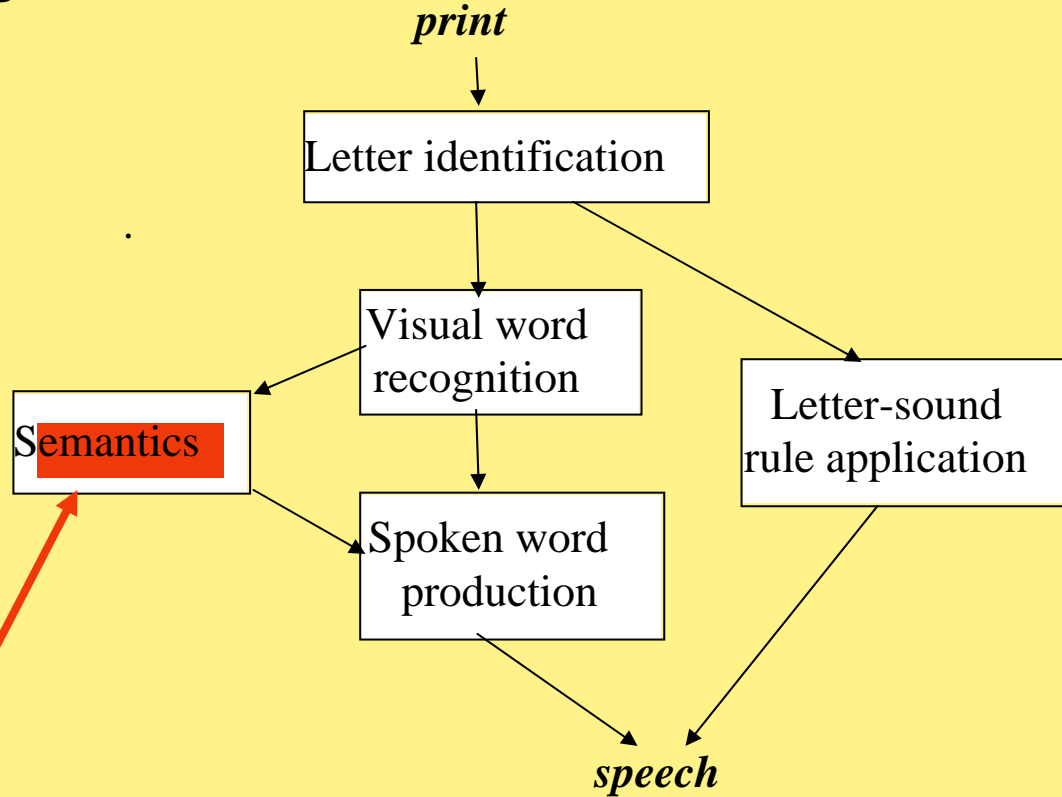


Elaboration of the dual route model of reading

- Skilled readers possess all five of these subskills
- A child who is having difficulty in acquiring any one of these subskills will have a reading difficulty

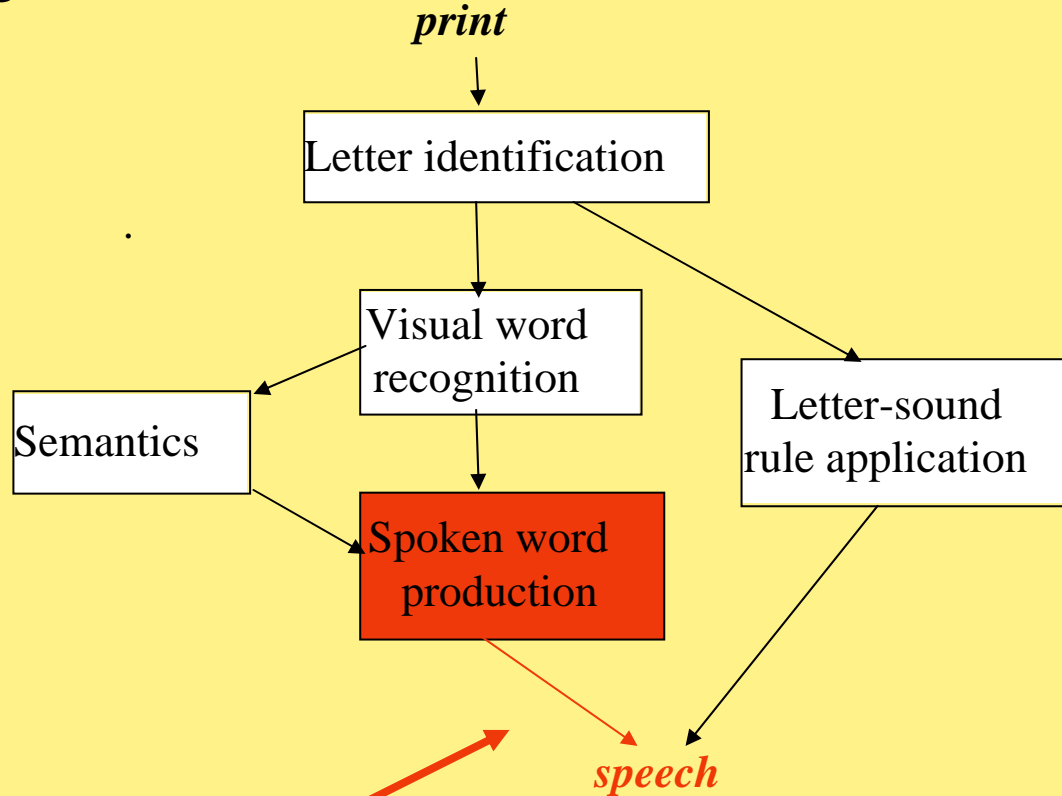
The reading system: some of its  
developmental  
difficulties

# The reading system: some of its developmental difficulties



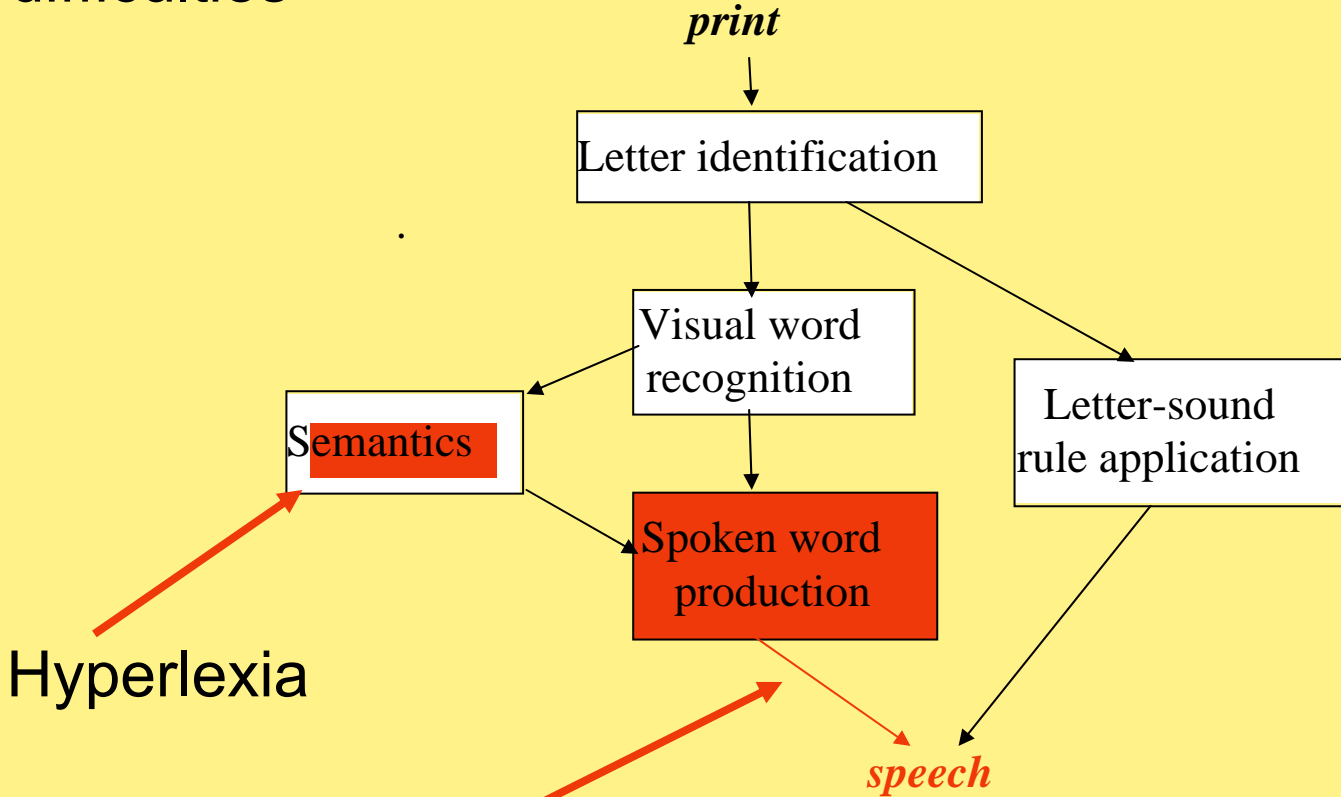
Hyperlexia: a developmental difficulty in acquiring word meanings (often seen in autism). Will affect reading comprehension but not reading aloud

# The reading system: some of its developmental difficulties



Developmental dyspraxia of speech: a developmental difficulty in speech production. Will affect reading aloud but not reading comprehension.

# The reading system: some of its developmental difficulties

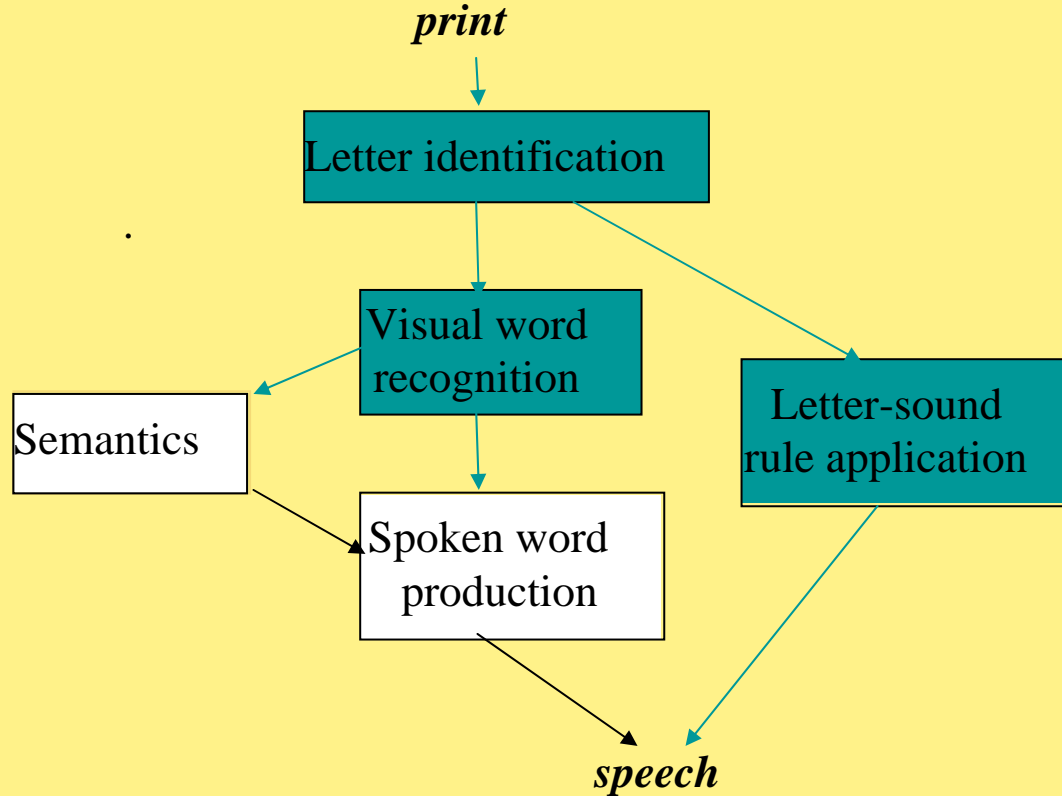


Hyperlexia

Developmental dyspraxia of speech:

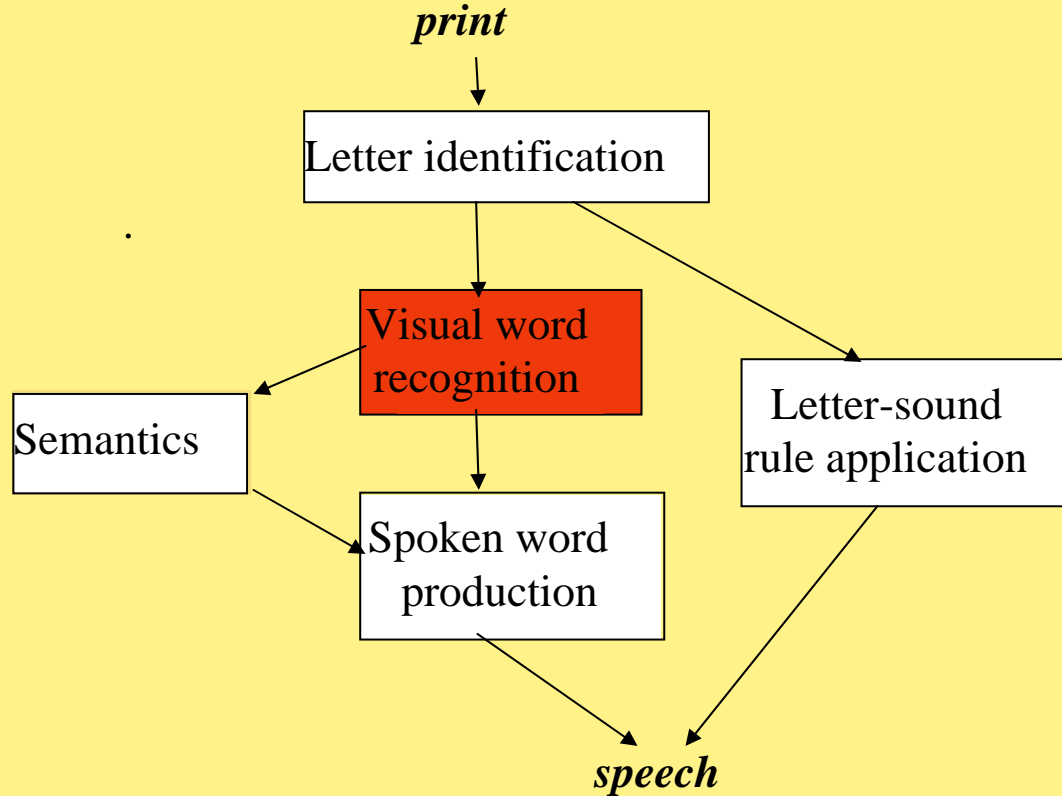
Although both affect reading in some way, they also affect spoken language, so are not specific reading difficulties.

# The reading system: specific reading difficulties



If a developmental difficulty is specific to reading, it would have to affect only the green components here - one or more of them.

# The reading system: one specific reading difficulty



What would this child's reading be like?

- Nonwords
- Regular words
- Irregular words

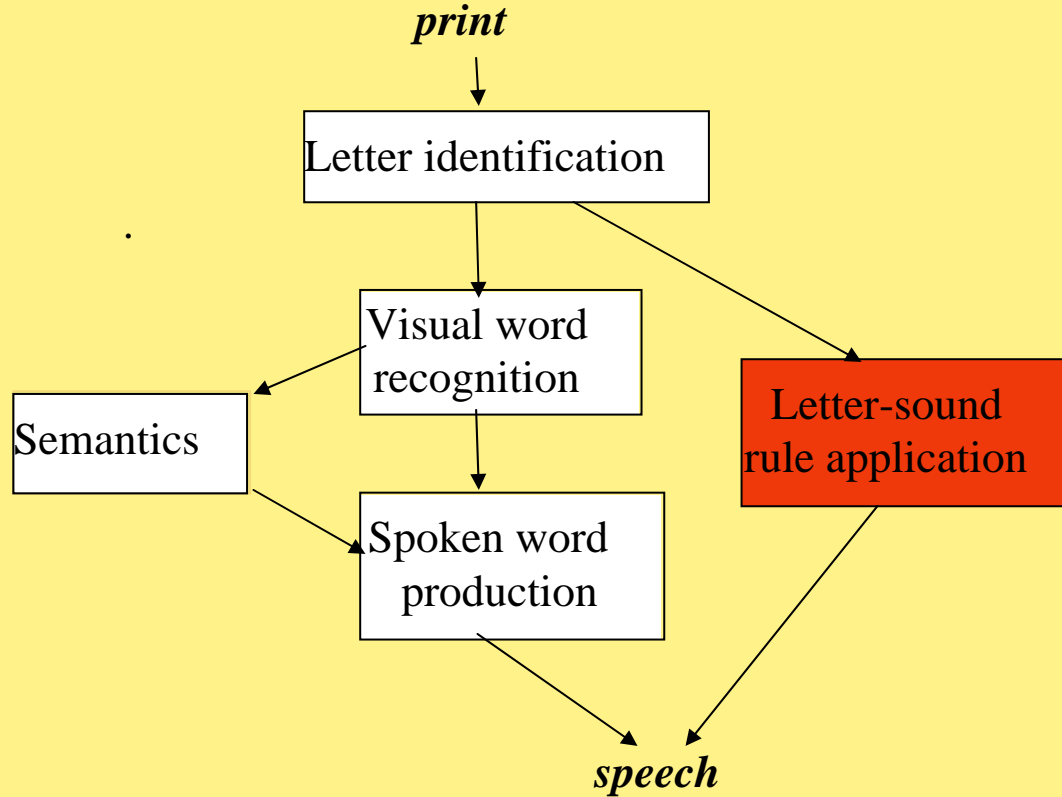
✓

✓

✗

“Developmental surface dyslexia”

# The reading system: another specific reading difficulty



What would this child's reading be like?

- Nonwords X
  - Regular words ✓
  - Irregular words ✓
- “Developmental phonological dyslexia”

The normal course of learning to read

# The normal course of learning to read: an overview.

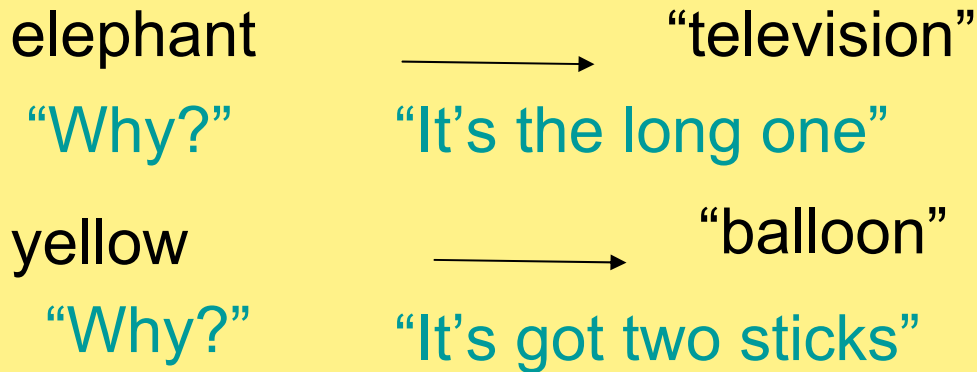
As children learn to read, they generally go through these four stages:

- Develop a small sight vocabulary, then
- Learn how to sound out, then
- Use sounding out to build up a bigger sight vocabulary, then eventually
- Give up sounding out so as to become a fast and fluent reader.

The normal course of learning to read: a little more detail.

As children learn to read, they generally go through these four stages:

- Develop a small sight vocabulary



At this stage, children are not using letters to read, but gross visual features. They don't have a Reading System yet.

The normal course of learning to read.

As children learn to read, they generally go through these four stages:

- Develop a small sight vocabulary, then
- Learn how to sound out

**A crucial fact:**

A seven-year-old child may have a sight vocabulary of perhaps 50 words, but an auditory vocabulary of perhaps 10,000 words

So it will constantly be the case that such children will be seeing words in print that they have never seen before but which they'd instantly recognise if they heard the word.

## A crucial fact:

A seven-year-old child may have a sight vocabulary of perhaps 50 words, but an auditory vocabulary of perhaps 10,000 words

So it will constantly be the case that such children will be seeing words in print that they have never seen before but which they'd instantly recognise if they heard the word.

What a huge help it would be if these children could pronounce these unfamiliar words to themselves. That would allow them to use their large auditory vocabularies to recognise the words.

That's the reason why sounding-out is so important.

The normal course of learning to read.

As children learn to read, they generally go through these four stages:

- Develop a small sight vocabulary, then
- Learn how to sound out, then
- Use sounding out to build up a bigger sight vocabulary.

Sounding out is a crucial aid to building up a big sight vocabulary. Nevertheless, the child must eventually give it up, because:

- It makes reading very slow
- It cause confusion between SAIL and SALE
- It fails for irregular words

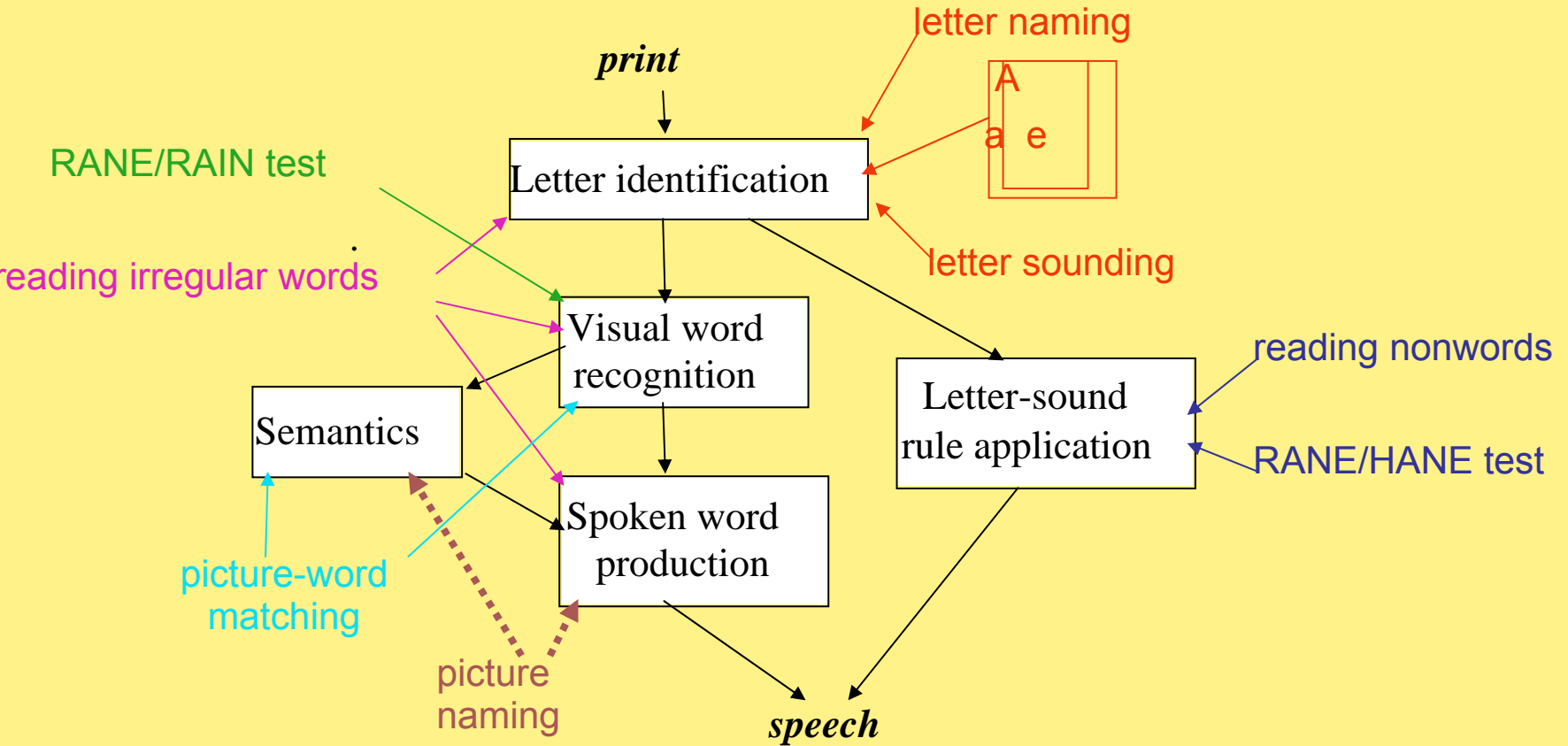
The normal course of learning to read.

As children learn to read, they generally go through these four stages:

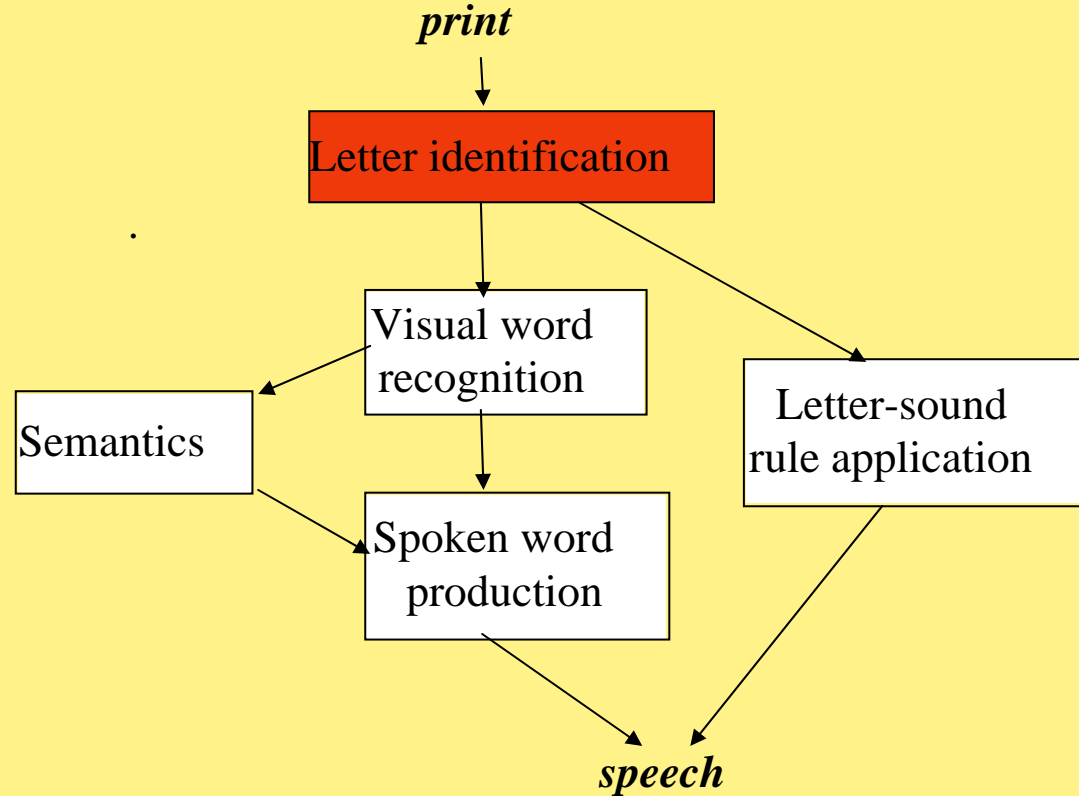
- Develop a small sight vocabulary, then
- Learn how to sound out, then
- Use sounding out to build up a bigger sight vocabulary, then eventually
- Give up sounding out so as to become a fast and fluent reader.

- Assessment of basic reading difficulties

# The reading system: overview of assessment

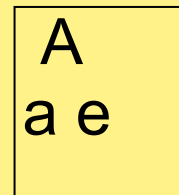


# The reading system: assessment

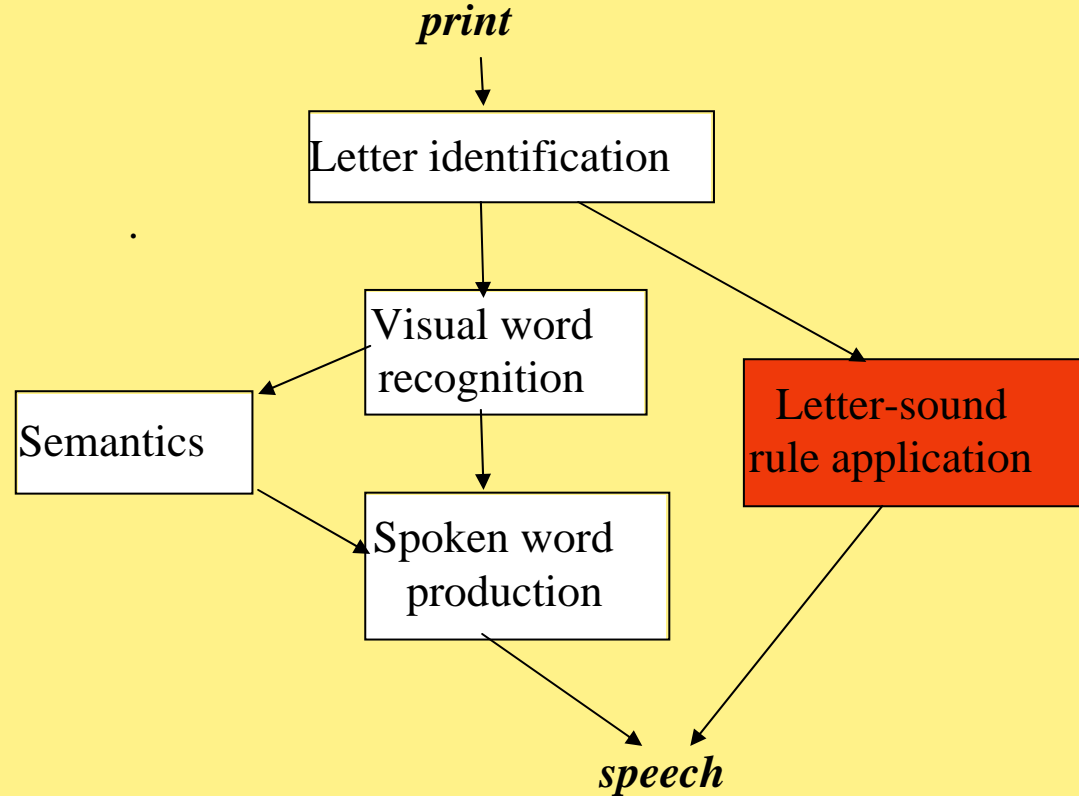


## Three ways of testing letter identification:

- Letter naming
- Letter sounding
- Cross-case matching



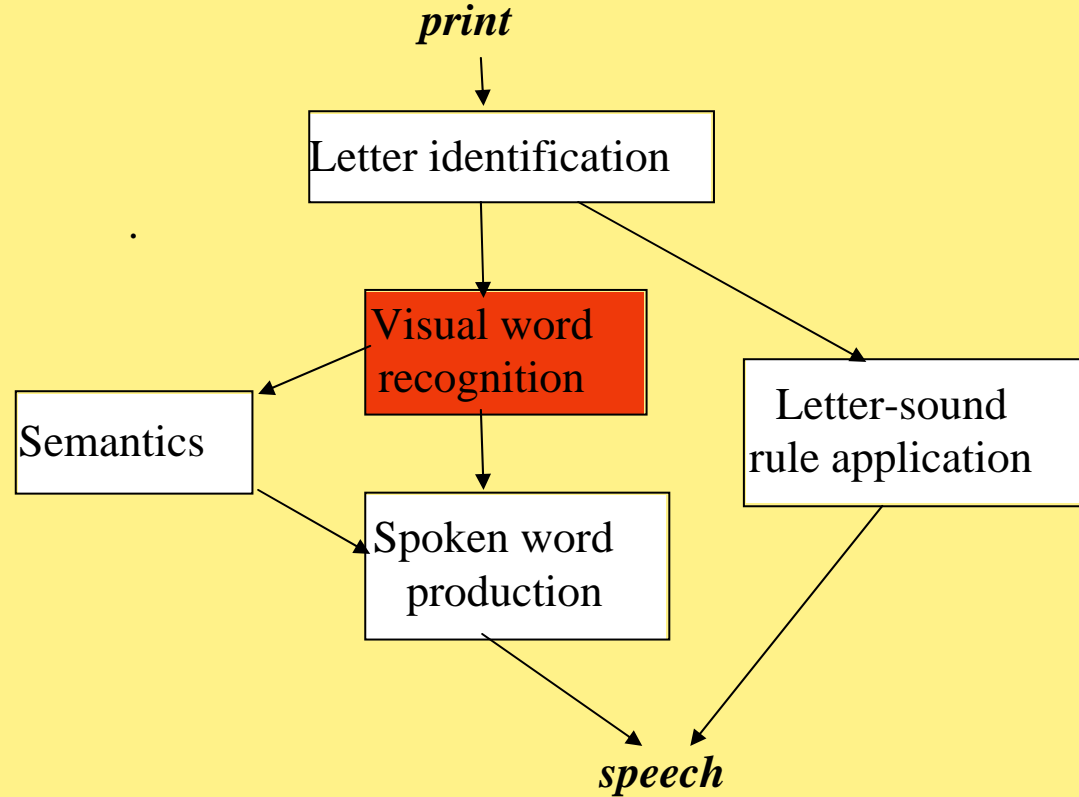
# The reading system: assessment



Two ways of testing letter-sound rule application:

- Reading nonwords aloud
- RANE HANE: which sounds like a word?

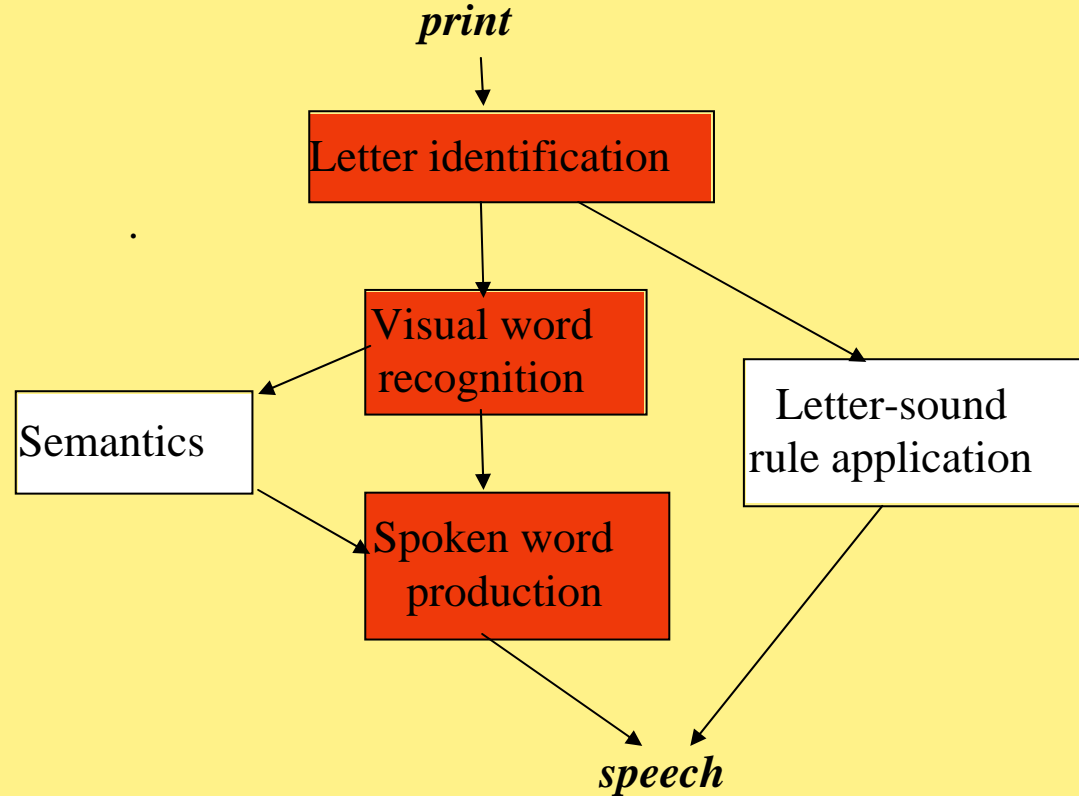
# The reading system: assessment



One way of testing visual word recognition:

- RANE RAIN: which is the real word?

# The reading system: assessment



- Reading irregular words aloud needs **ALL THREE** of these subskills
- So a child who is normal on this task is normal on all three of these subskills

bed  
 free  
 hand  
 luck  
 chicken  
 cake  
 need  
 long  
 drop  
 market  
 mist  
 sail  
 life  
 middle  
 plant  
 bump  
 cord  
 navy  
 wedding  
 brandy  
 chance  
 marsh  
 check  
 flannel  
 stench  
 context  
 nerve  
 curb  
 weasel  
 peril

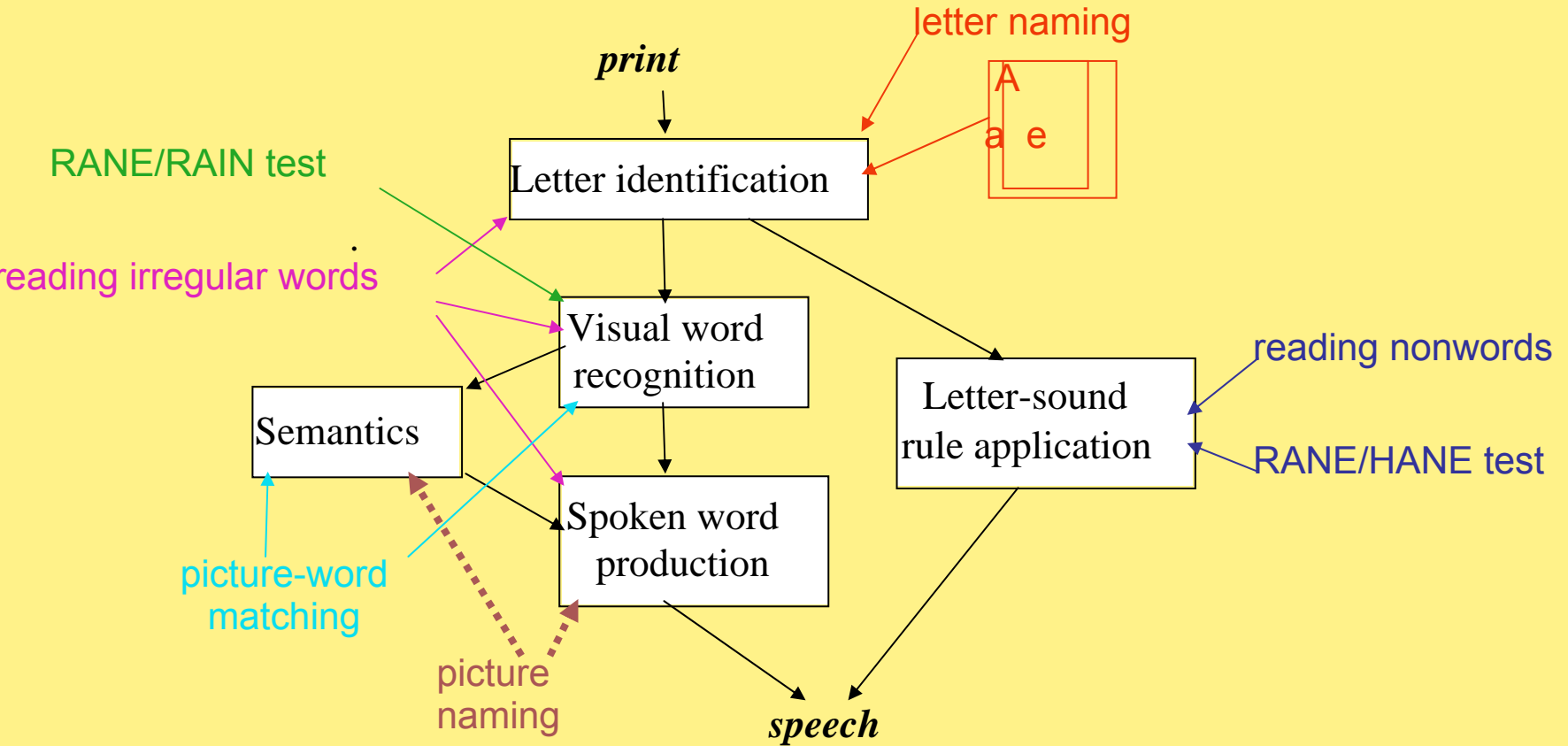
good  
 friend  
 give  
 eye  
 head  
 wolf  
 work  
 pretty  
 shoe  
 come  
 blood  
 island  
 break  
 bowl  
 sure  
 iron  
 soul  
 ceiling  
 lose  
 choir  
 cough  
 yacht  
 routine  
 brooch  
 tomb  
 bouquet  
 gauge  
 meringue  
 colonel  
 pint

norf  
 rint  
 delk  
 aspy  
 baft  
 spatch  
 drick  
 hest  
 brinth  
 framp  
 gop  
 bick  
 peef  
 grenty  
 stendle  
 tapple  
 farl  
 pite  
 seldent  
 borp  
 brennet  
 gurve  
 crat  
 boril  
 bleaner  
 ganten  
 trope  
 pofe  
 doash  
 peng

## Australian norms available

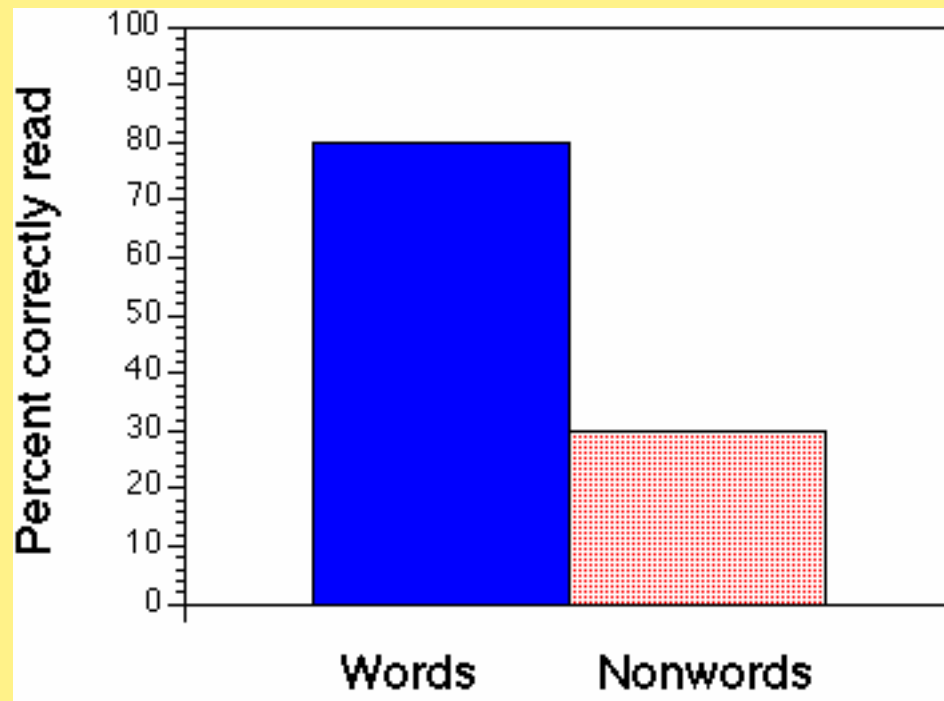
- Coltheart & Leahy, Australian Journal of Psychology, 1996
- Edwards & Hogben, Australian Journal of Psychology, 1998

# The reading system: overview of assessment

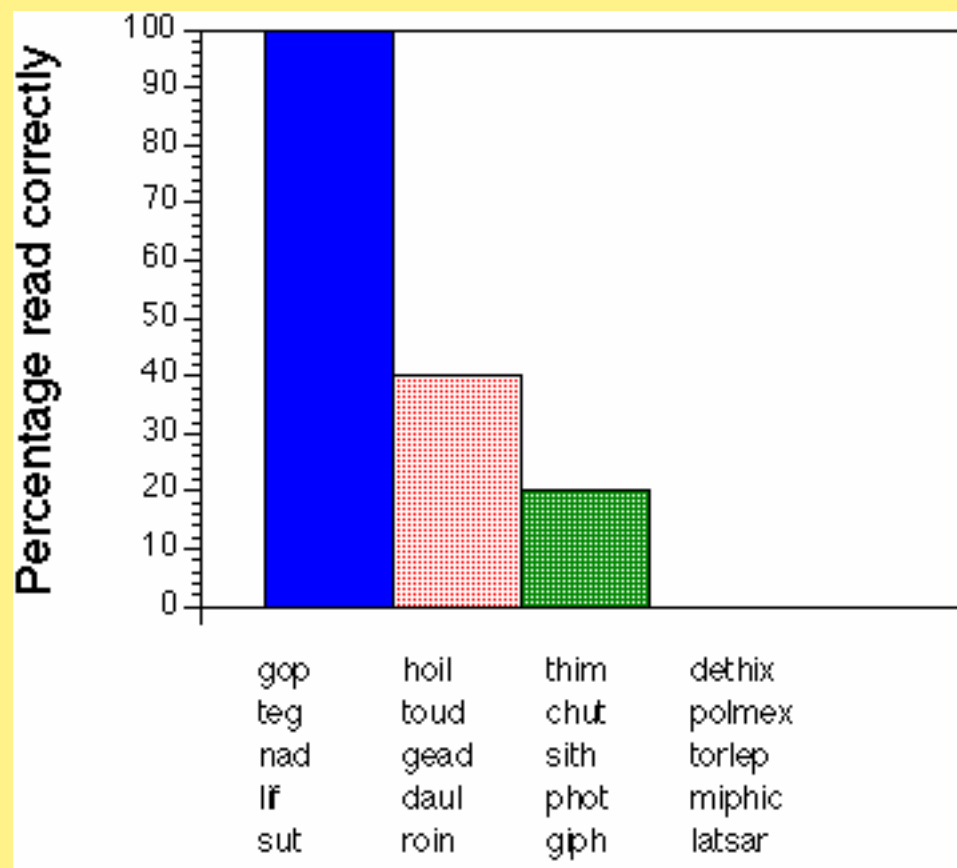


Case studies of two types of  
difficulty in learning to read.

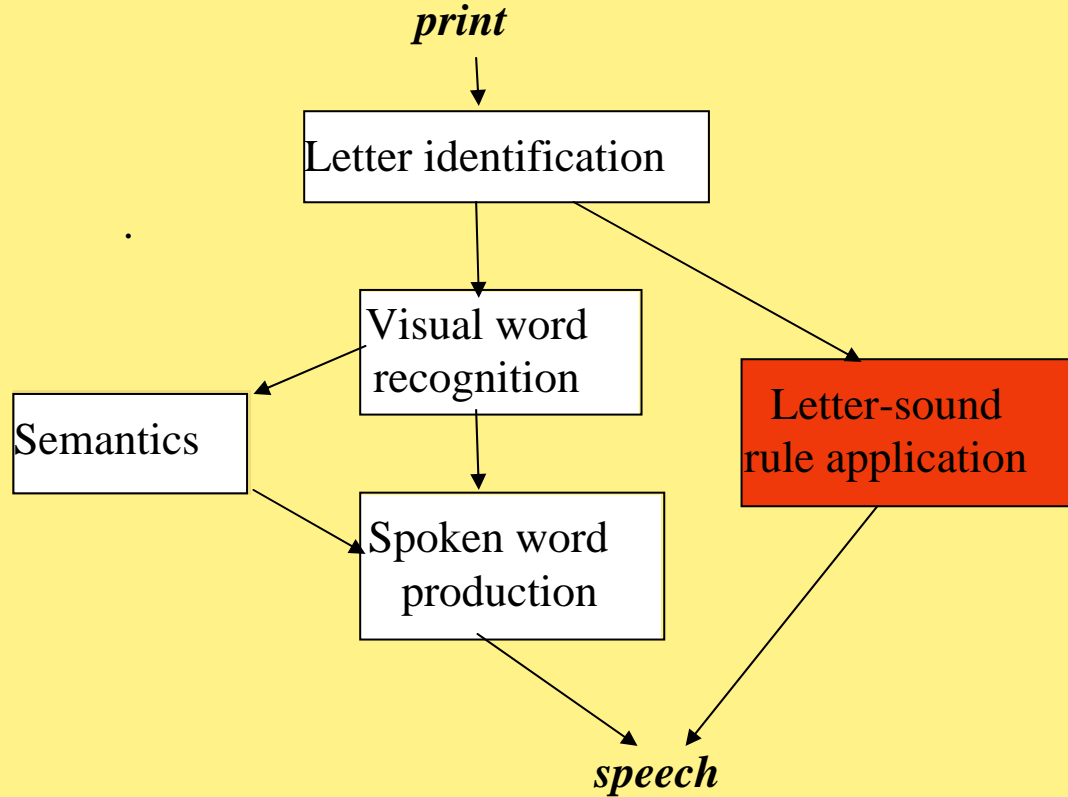
# Case JF



# Case JF



# JF: developmental phonological dyslexia



Specific difficulty in acquiring the letter-sound reading route

Was successfully treated with a systematic phonics approach (“From Alpha to Omega”)

## Case MI

- Aged 9
- IQ 141(Verbal 130, Performance 142) (That is in the top 1% of people).
- His reading was only in the 38th percentile
- His spelling was only in the 12th percentile.
- Both parents professionals, and highly literate.
- His two siblings were good readers
- Every other child in his class had learned to read well
- M.I.'s spoken language was good and there was no history of neurological disorder

## MI reading aloud

- Regular words 26/30 correct
- Nonwords 26/30 correct
- Irregular words 8/30 correct
- Note how good he is at reading nonwords (above average for 9 year olds, which is 24/30) and how bad he is at reading irregular words (9 year olds average 22/30 correct).
- Most of his misreadings of irregular words were the pronunciations that the rules prescribe.

# MI reading aloud irregular words: some examples

island → “iz-land”

break → “breek”

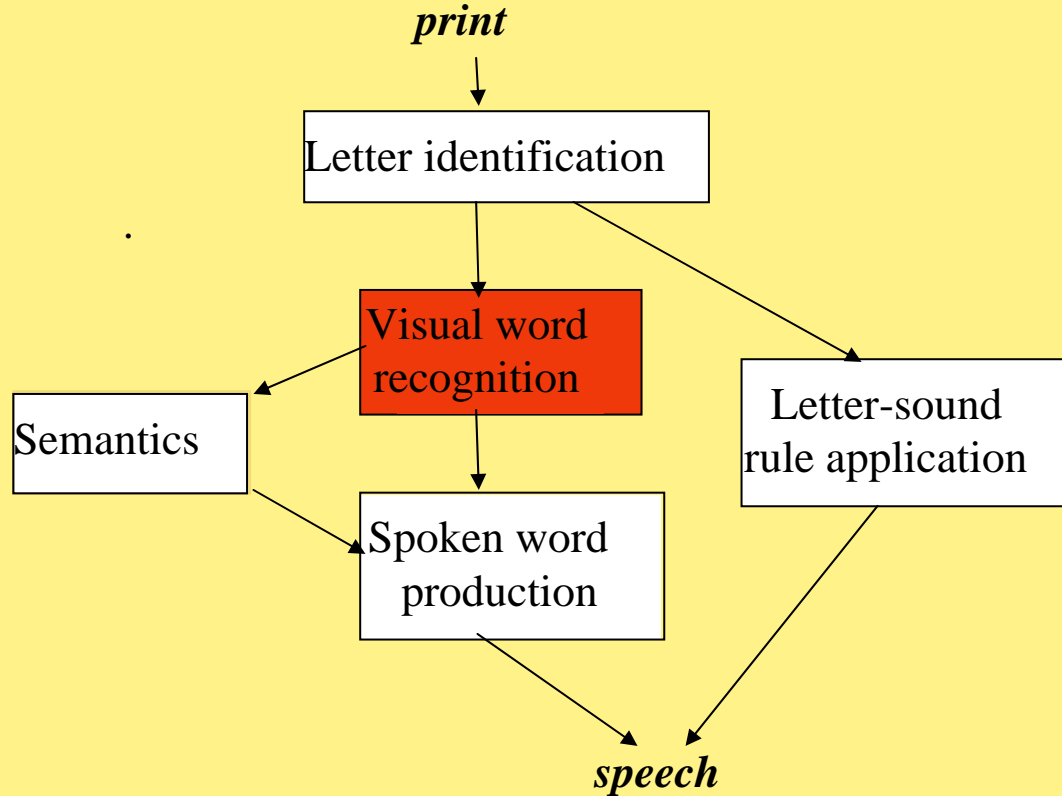
quay → “kway”

yacht → “yatched”

shoe → “show”

All of these are examples of using letter-sound rules to read aloud, rather than whole-word recognition.

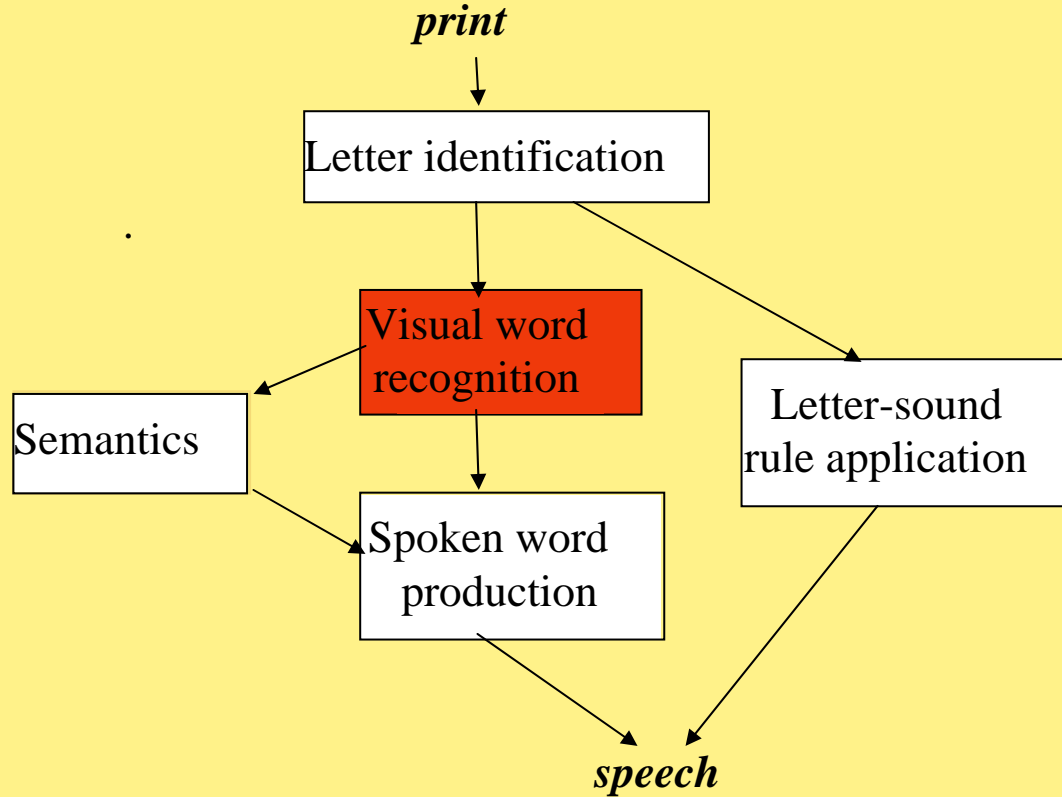
# MI: Developmental surface dyslexia



Specific difficulty with visual word recognition, i.e., abnormally small sight vocabulary

Thus many words that should be recognised are not; so MI can only read these via letter-sound rules.

# MI: Developmental surface dyslexia



Why has MI been unable to develop an adequate sight vocabulary?

# MI: Developmental surface dyslexia

Why has MI been unable to develop an adequate sight vocabulary?

Phonology?

- MI normal at judging whether words rhyme
- MI normal at phoneme deletion (“polmex” -> “olmex”)

# MI: Developmental surface dyslexia

Why has MI been unable to develop an adequate sight vocabulary?

Phonology? No

Visual memory impairment?

- Visual recognition memory test
- Benton visual retention test
- Visual sequential memory test

## MI: Visual recognition memory

Visual recognition memory for words:

MI sees 50 words, then sees word pairs and has to say which member in each pair he was shown before.

- 47/50 correct (normal for adults)

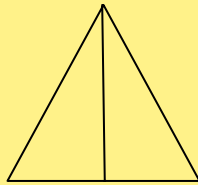
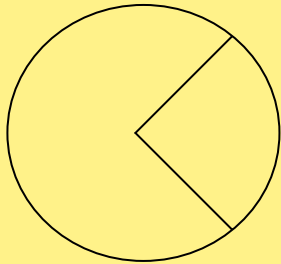
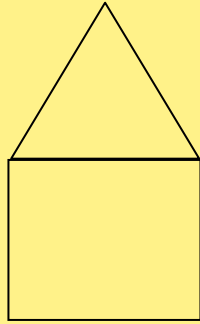
Visual recognition memory for faces:

MI sees 50 unfamiliar faces, then sees face pairs and has to say which member in each pair he was shown before.

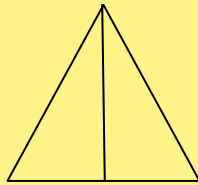
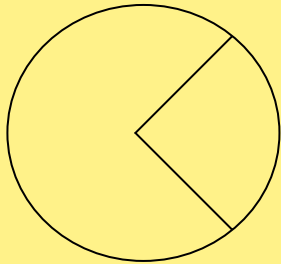
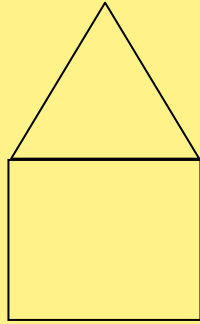
- 45/50 correct (normal for adults)

So no problem there.

# MI: Benton visual retention test



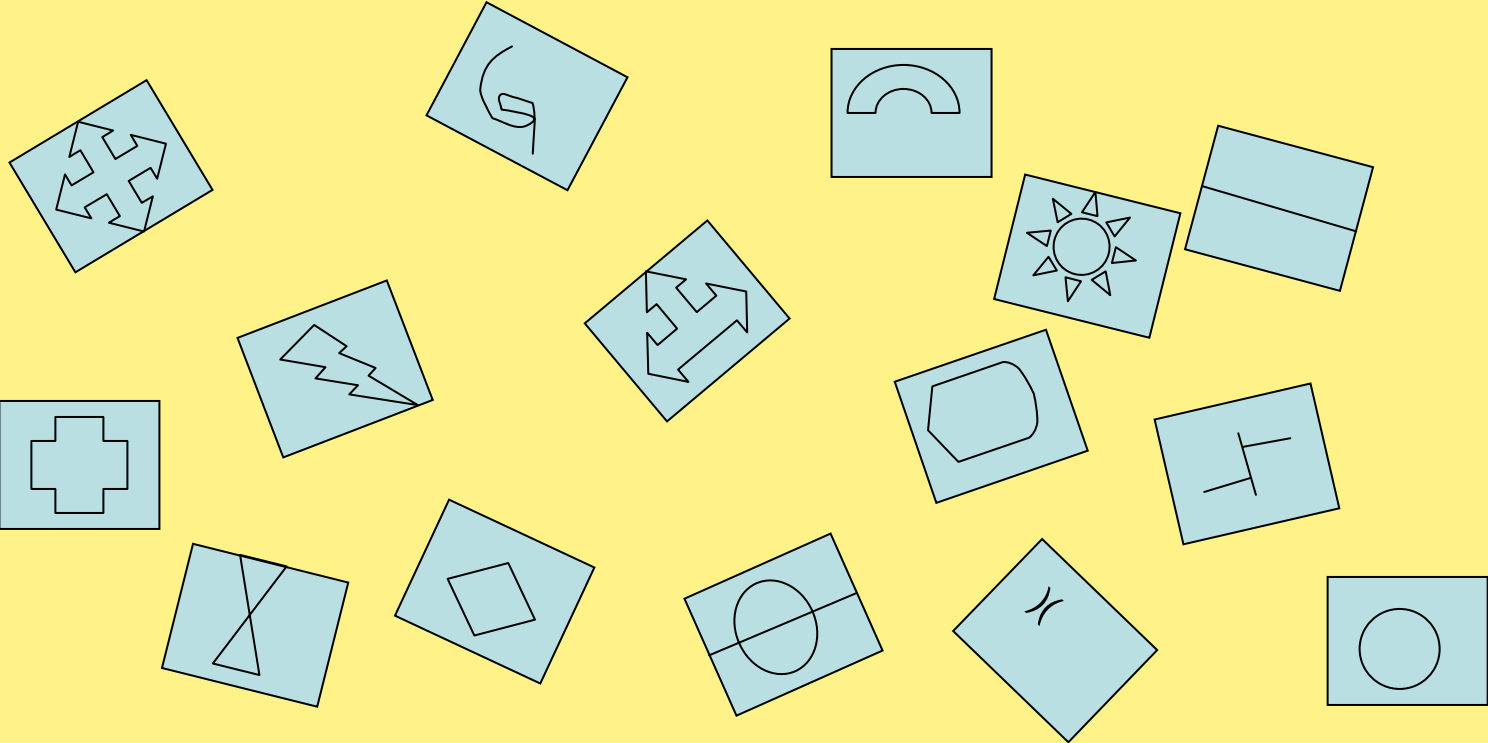
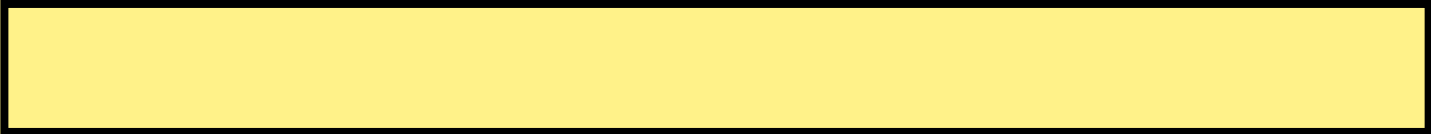
# MI: Benton visual retention test



MI: 10/10 correct (in superior range of adult scores)

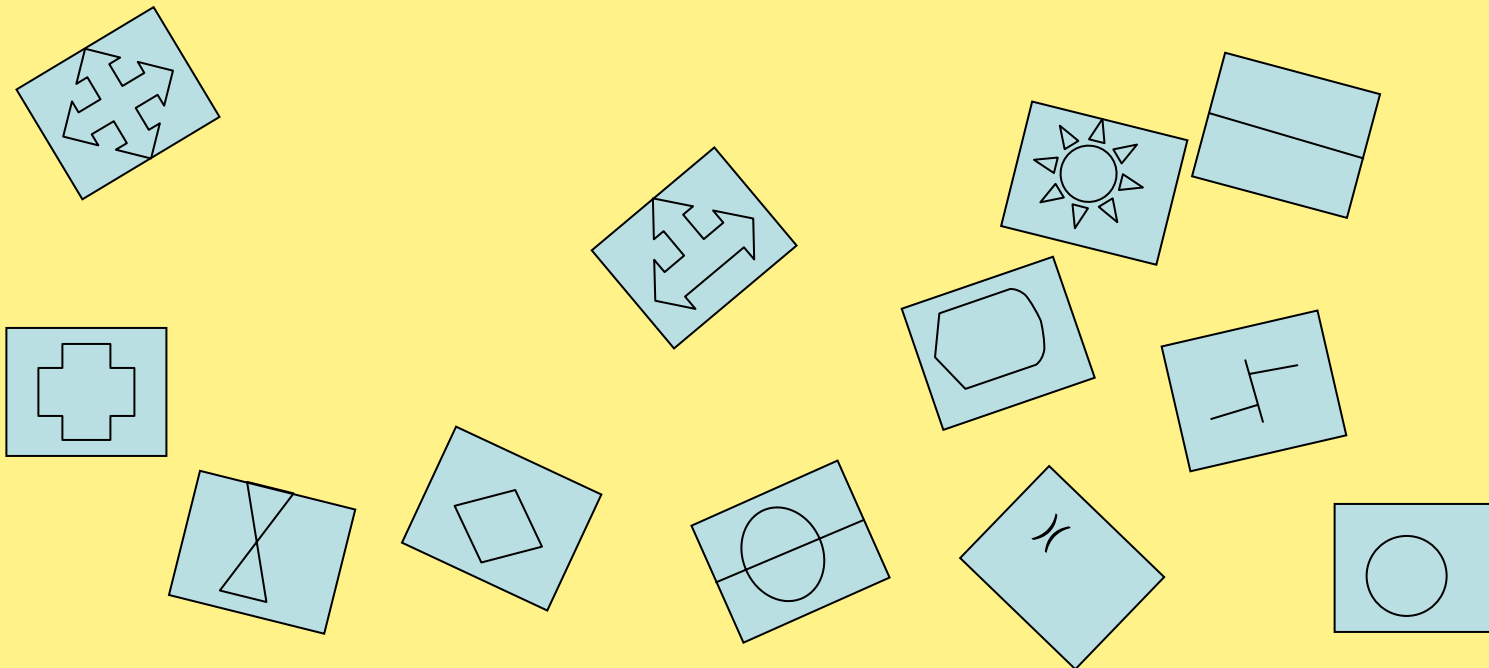
# Visual sequential memory test

“See these?”



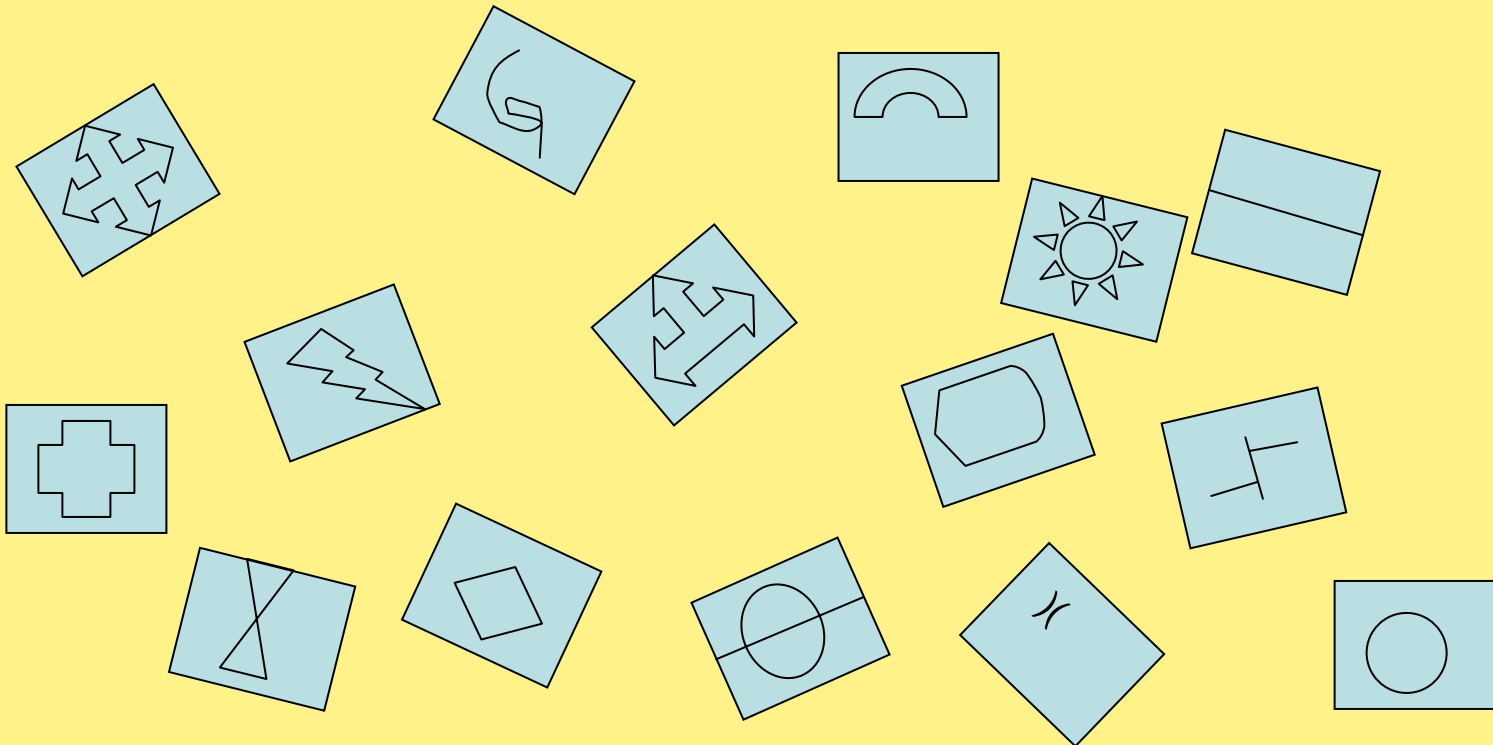
# Visual sequential memory test

“See what I’ve made?”



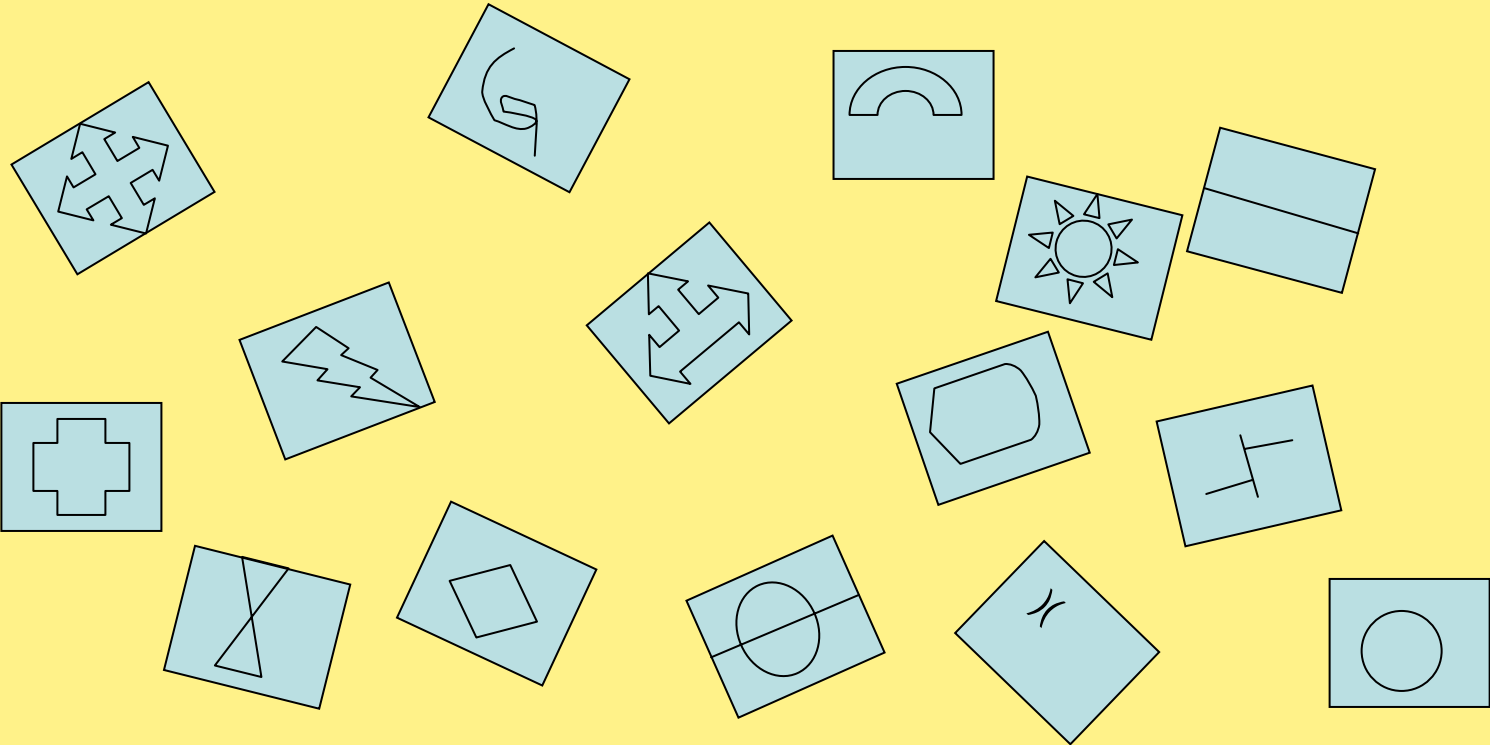
# Visual sequential memory test

“Now you do it”



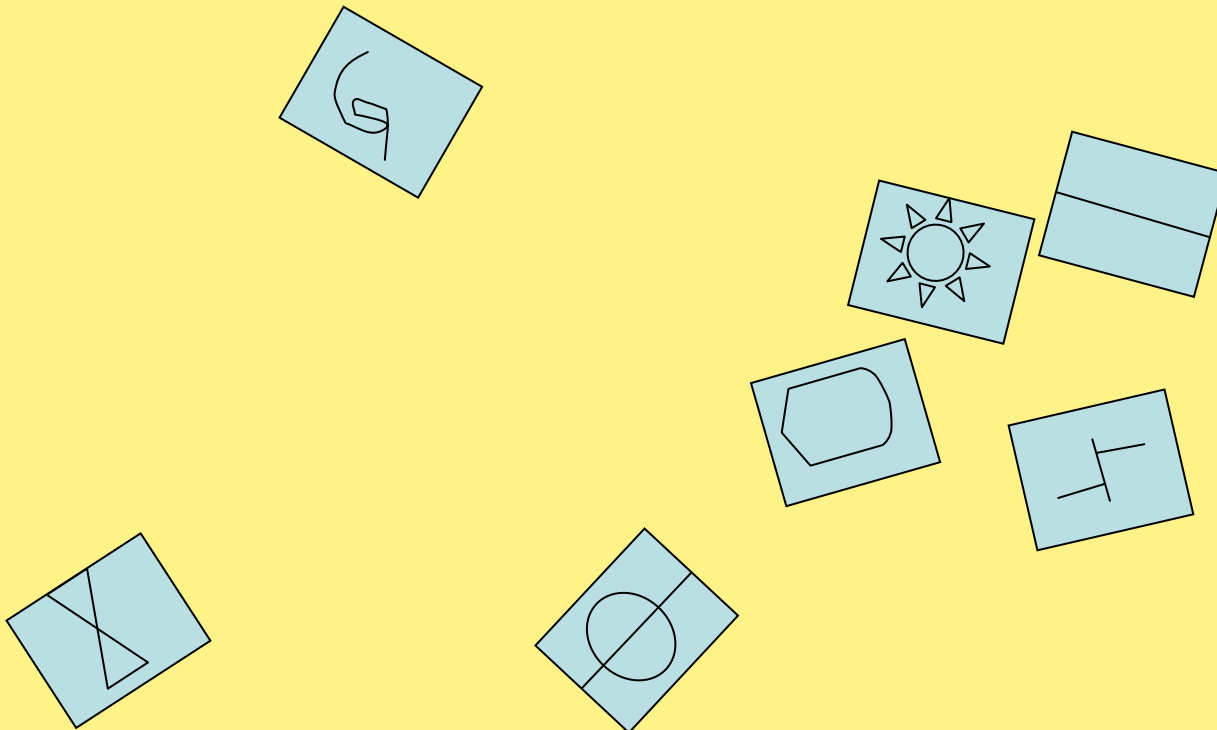
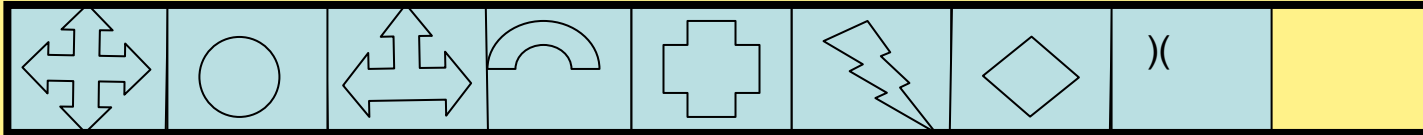
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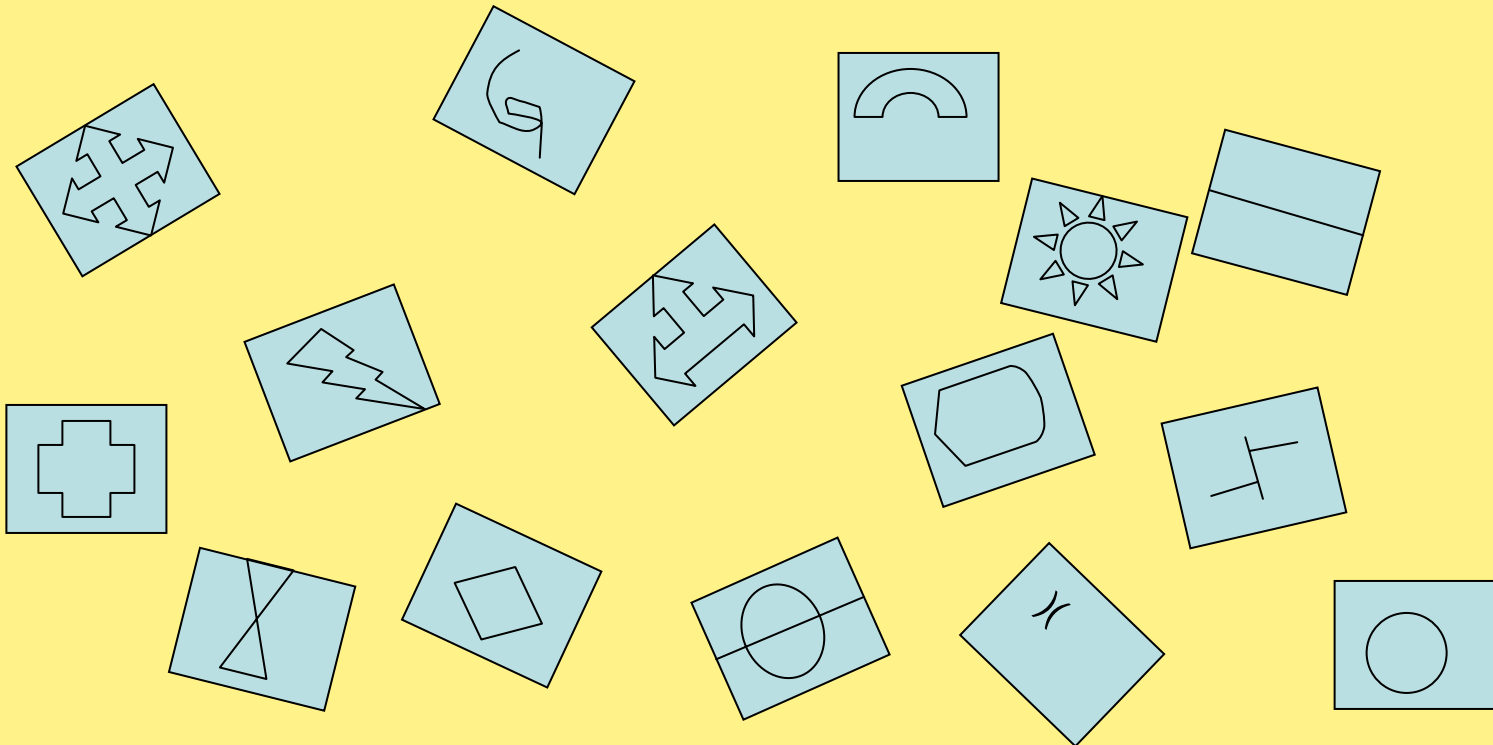
# MI: Visual sequential memory test

“See what I’ve made?”



# MI: Visual sequential memory test

“Now you do it”



MI: Visual sequential memory test

Score: 99th percentile

(i.e. a higher score than 99% of adults)

# MI: Developmental surface dyslexia

Why has MI been unable to develop an adequate sight vocabulary?

Phonology? No

Visual memory impairment? No

Answer:

We haven't the faintest idea

Causes and treatments for these two types of difficulty in learning to read.

# ***Causes and treatments for children's reading difficulties***

Poor phonics (nonword reading) ability - that is, developmental phonological dyslexia.

- This is well understood now.
- Associated with phonological (speech processing) problems before reading, so identifiable before reading begins i.e. in kindergarten.
- Genetic influence - link to chromosome 6
- Treatable in kindergarten by phonemic (sound) training e.g. "I Spy" games, and later by systematic phonics programs, e.g. the SWELL program from Macquarie, or THRASS, or Jolly Phonics, or the Spalding program, or Letterland.

# ***Causes and treatments for children's reading difficulties***

Poor sight vocabulary - that is, developmental surface dyslexia.

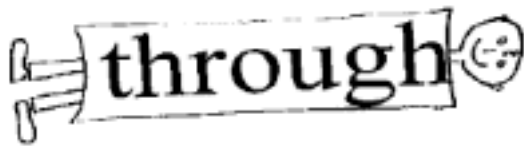
- Not well understood.
- Cause(s) not known (remember MI?).
- Genetic influence - possibly chromosome 15?
- Various effective ways of treating it by systematic whole-word recognition training (perhaps using visual mnemonics).

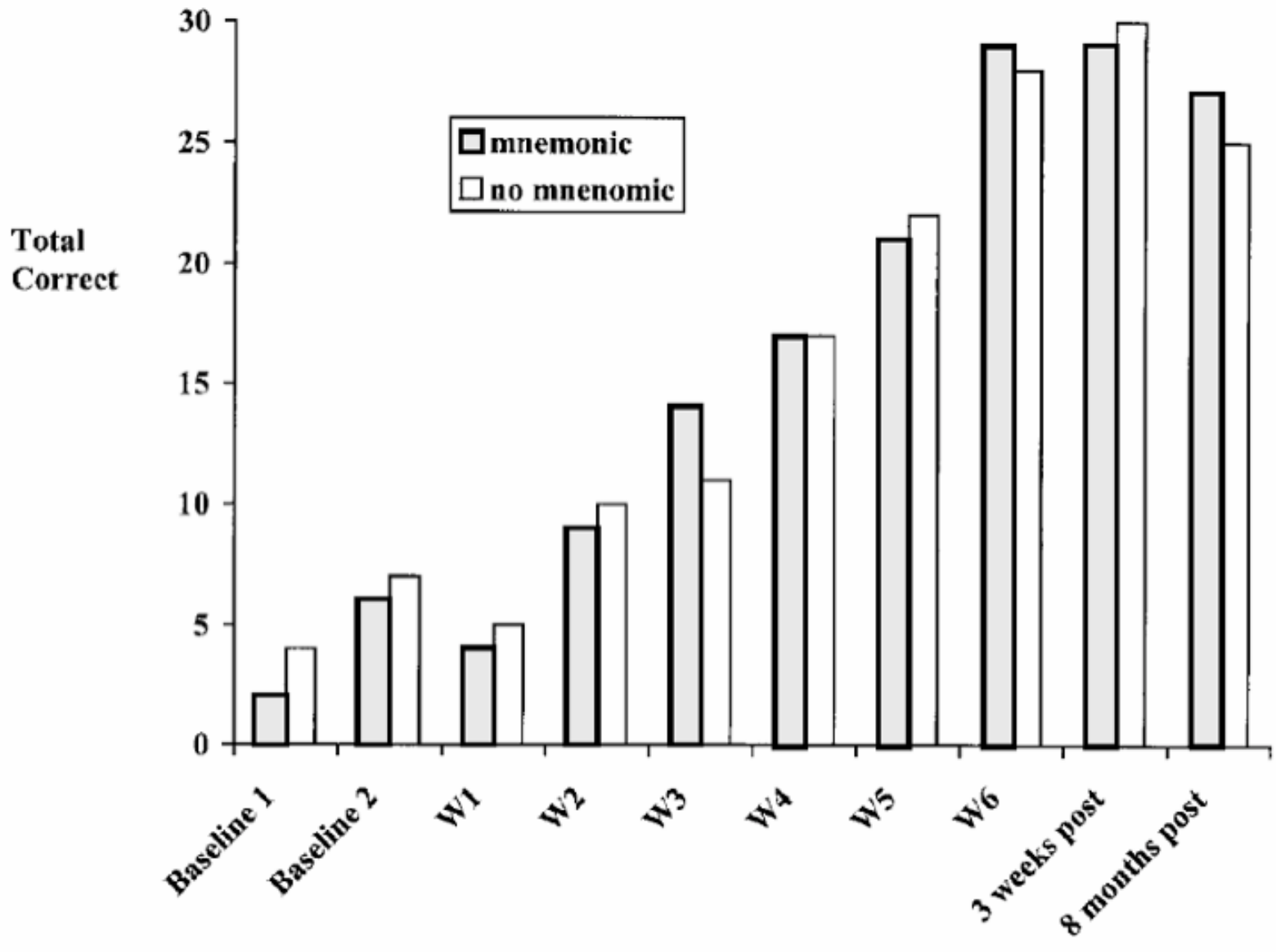
TJ: a mixed dyslexic with almost no phonic knowledge and very limited sight vocabulary. Latter problem targeted.

60 words were trained

Half of the words got practice with feedback PLUS a mnemonic cue

The other half got practice with feedback only





# What about spelling?

- Exactly the same story
- Spelling depends upon two routes:
  - A dictionary lookup route (irregular words)
  - A rule-based route (unfamiliar words)
- Children can be having spelling difficulties with just one of these routes
- Both types of spelling difficulty are treatable

# Overview

- The basic approach
- The Reading System of skilled readers: What is it like?
- The reading system: some of its developmental difficulties
  - The normal course of learning to read
- Assessment of basic reading difficulties
- Case studies of two types of difficulty in learning to read.
- Causes and treatments for these two types of difficulty in learning to read.
- All of this applies just as much to spelling.