Children's problems with text comprehension: Focus on vocabulary and inference.

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The goal of comprehension

Outcome of skilled comprehension is the construction of a coherent and integrated representation of the meaning of the text - a *Mental Model* or *Situation Model.*

(Gernsbacher, 1990; Johnson-Laird, 1983; Kintsch, 1998)

Overview of talk

- Why are inferences important for comprehension?
- Poor comprehenders' problems with inferences
- What is the direction of the link between inferences and comprehension?
- What is the role of inference in vocabulary acquisition?
- What is the role of vocabulary in inference skill (with reference to the Lexical Quality Hypothesis)
- Conclusions and suggestions for teaching & remediation

Text comprehension: beyond words and sentences

- We go beyond the literal meaning of text and “fill the gaps” with inferences

- *A student carelessly threw away a burning cigarette. The fire destroyed many trees on the campus*

Text comprehension: beyond words and sentences

- Only a fraction of our interpretation of language is licensed by what is explicitly stated.
- For example: *Mary heard the ice-cream van coming. She remembered her pocket money. She rushed into the house*

Text comprehension: beyond words and sentences

- Inferences can help us to link the text into a coherent whole and make it more memorable.

- The idea that text comprehension is an integrative and constructive process.

- BUT, they can also make us think we have "remembered" material that was never presented in the first place!

Text comprehension: beyond words and sentences

Comprehension is an **INTEGRATIVE** process, in which information from different sentences is combined

Text comprehension: beyond words and sentences

Molly was carrying the glass of juice.

She tripped on the step.

Her mum fetched the mop.

Text comprehension: beyond words and sentences

Comprehension is an **INTEGRATIVE** process, in which information from different sentences is combined

and

Comprehension is a **CONSTRUCTIVE** process, in which explicit information in a sentence or sentences is supplemented by knowledge about the world from long-term memory.

Text comprehension: beyond words and sentences

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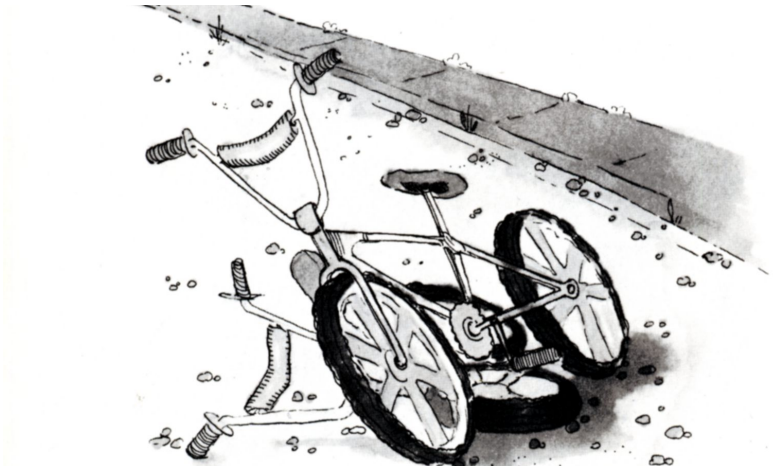
Word reading & reading comprehension

Neale Analysis of Reading Ability

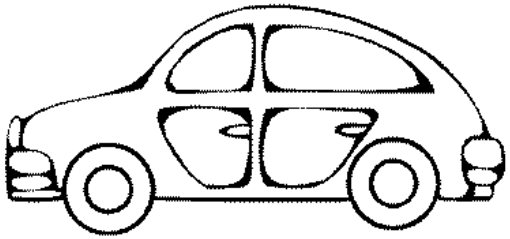


Kim stopped on her way to school. In the middle of the traffic lay two children. Their bicycles had crashed into each other. Kim ran quickly to help.

She saw that no-one was hurt. The children pointed to a television camera. 'We are taking part in a road safety lesson,' they said.

Written vocabulary assessment

Gates MacGinitie Vocabulary subtest



cap

cat

car

can

a different sword

weapon

practice

turn

team

spurt

Poor text comprehenders

Reading comprehension scores are poor relative to both chronological age and word reading accuracy

	chron. age	word reading	reading comp.	sight vocab (max=45)
Good comps	**7,8**	**7,8**	**8,3**	**38**
Poor comps	**7,9**	**7,10**	**6,7**	**37**

Integration and inference

- Good and poor comprehenders differ in their propensity to make (at least) two different types of inference:
- **Integration** of information in the text, to establish connections in text (local cohesion inferences)
- **Construction of meaning:** Incorporation of information from outside the text (general knowledge) with information in the text to fill in missing details and understand the text as a whole (global coherence inferences)

Integration and inference

Poor comprehenders have difficulty in making inferences to connect ideas (local cohesion) and to incorporate background knowledge to make sense of a text (global coherence)

Debbie was going out for the afternoon with her friend Michael. By the time they got there they were very thirsty. Michael got some drink out of his bag and they shared that. The orange juice was very refreshing.

Q: Where did Michael get the orange juice from?

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… Debbie put on her swimming costume but the water was too cold to paddle in, so they made sandcastles instead. They played all afternoon and didn't notice how late it was. Then Debbie spotted the clock on the pier. …

Q: Where did Debbie and Michael spend the afternoon?

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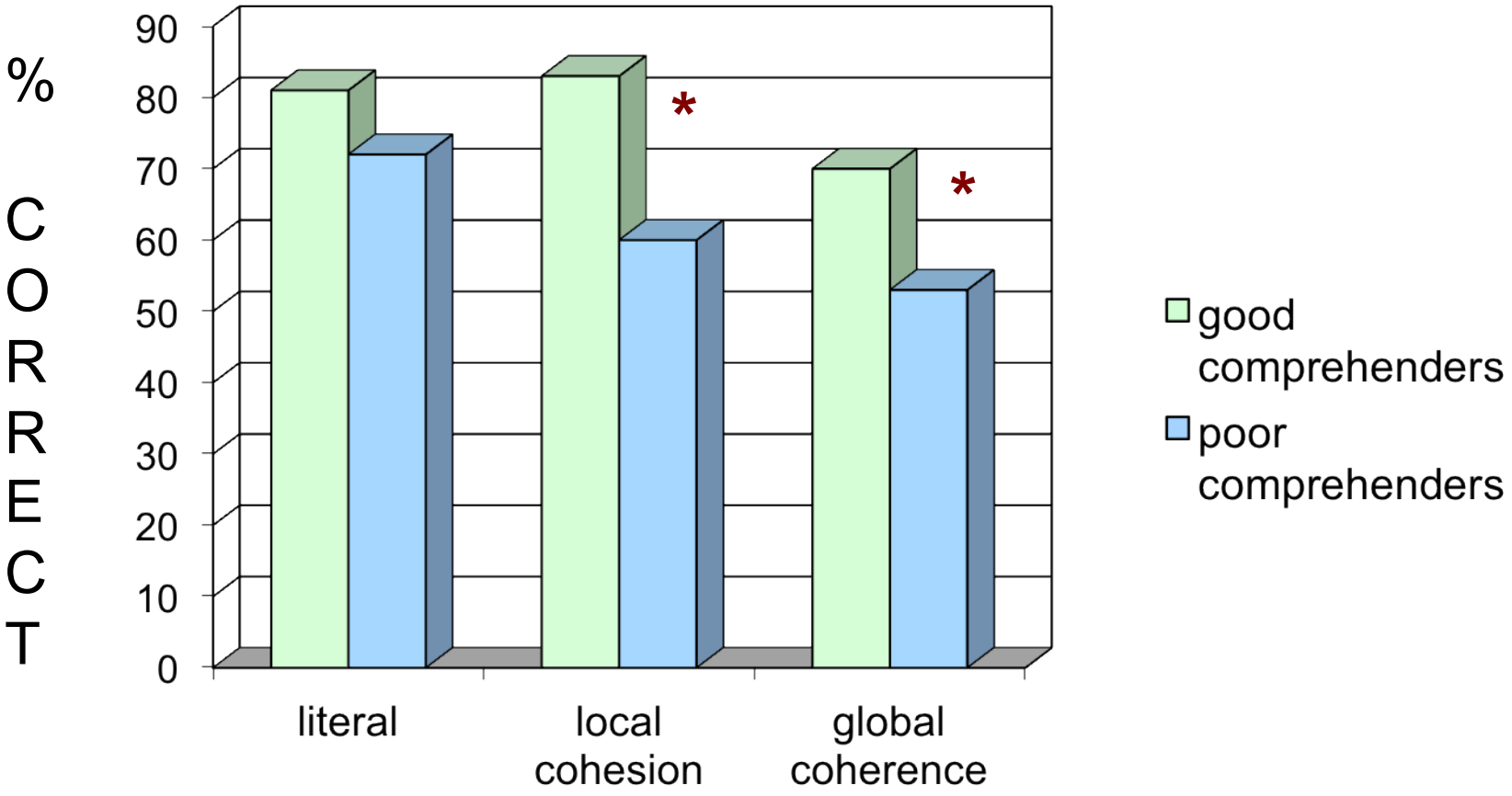
Inference and integration: Results



Cain & Oakhill (1999) *Reading and Writing,* ***11***, 489-503

Overview of talk

- Why are inferences important for comprehension?
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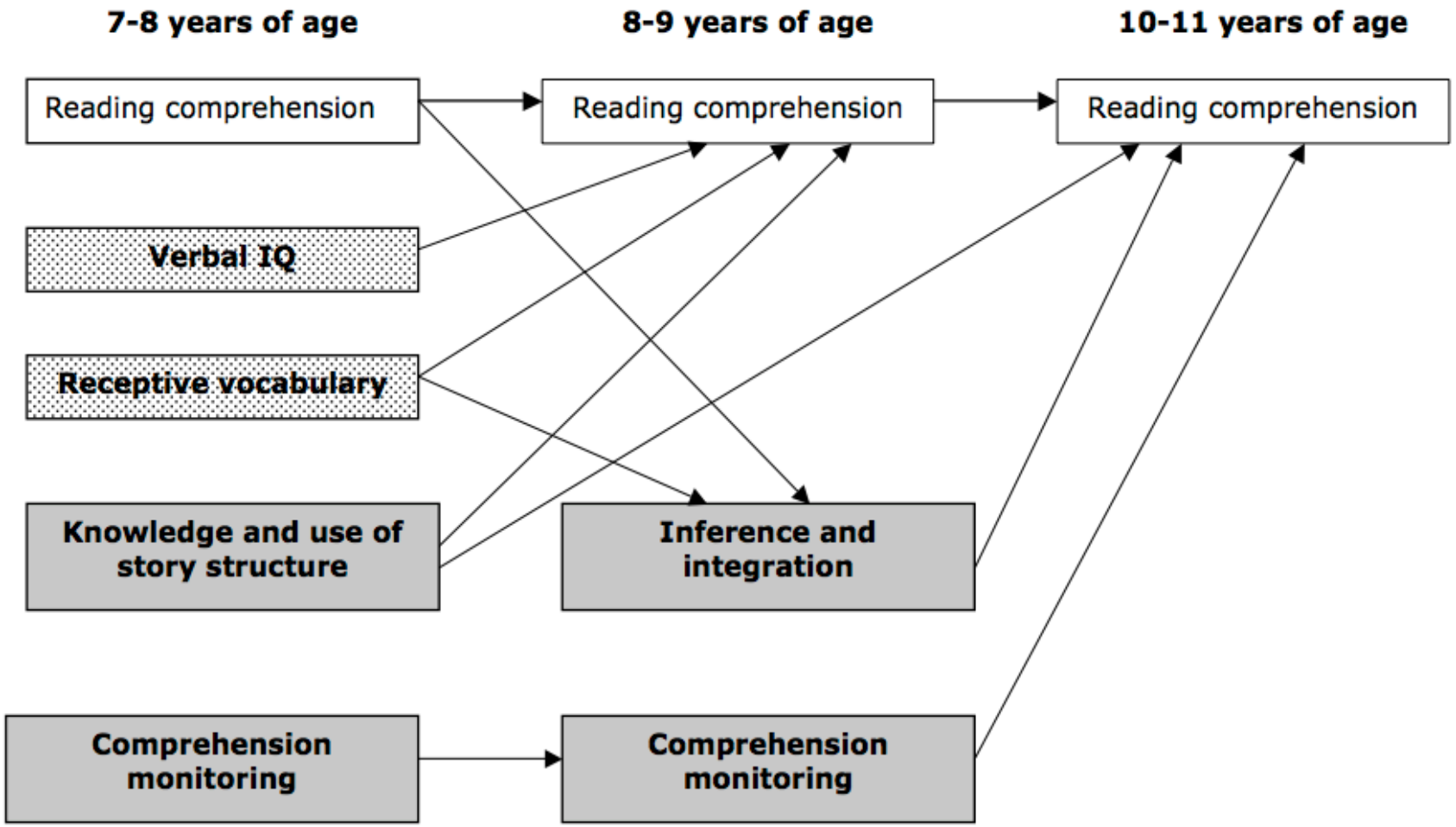
Direction of causality?

- Is there a causal link between better inferences and good comprehension?
- How can we tell?
- Ways to explore causal hypotheses:
  - Comprehension-age match studies
  - Longitudinal studies.
  - Training studies.

Longitudinal study: Skills and abilities measured

- Outcomes: Neale Comprehension, Neale Accuracy
- Verbal and performance IQ (T1&T3 only)
- Vocabulary (BPVS)
- Syntax (TROG)
- Phonological skills: phoneme deletion and oddity
- Working memory: sentence span and digit reading task
- Inference skill and literal memory for text
- Comprehension monitoring (inconsistency detection)
- Story structure understanding (anagram task)

Path diagram to show results of longitudinal study (Oakhill & Cain, 2012).



Conclusions from longitudinal study

- Inference ability is predictive (directly or indirectly) of later comprehension skill (but not word reading accuracy) over and above the earlier measure of comprehension, and in competition with general ability measures (VIQ, vocabulary, working memory).
- Does training inference skills improve comprehension?

Training studies

- Our training studies have focused on processing strategies and, in particular, ways to think about the text: if it relates to what one knows, whether understanding is adequate.
- The general idea was to get children more aware of and more involved in their own comprehension -- to encourage inferences and monitoring of comprehension.
- Yuill & Oakhill (1988) showed that training in inference making, prediction and question generation (reciprocal teaching) was effective in improving comprehension scores (standardised test).
- Tony Whatmuff has incorporated these findings – and other research findings – to produce his highly successful Inference Training Programme.

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Inference, memory & vocabulary learning

Written text is an important source of vocabulary acquisition once children become fluent readers *(Cunningham & Stanovich, 1998; Daugaard, Cain & Elbro, in press; Nagy & Scott, 2000)*

•Reading can provide instances to acquire, refine and consolidate vocabulary knowledge through inference from context

•Print affords more learning opportunities than spoken language (because of the range of vocabulary)

Inference, memory, and vocabulary learning

Intro: Lucy was taking her dog, Ben, to the park. First, she had to find Ben's **wut**.

* near: clues appear immediately after novel word

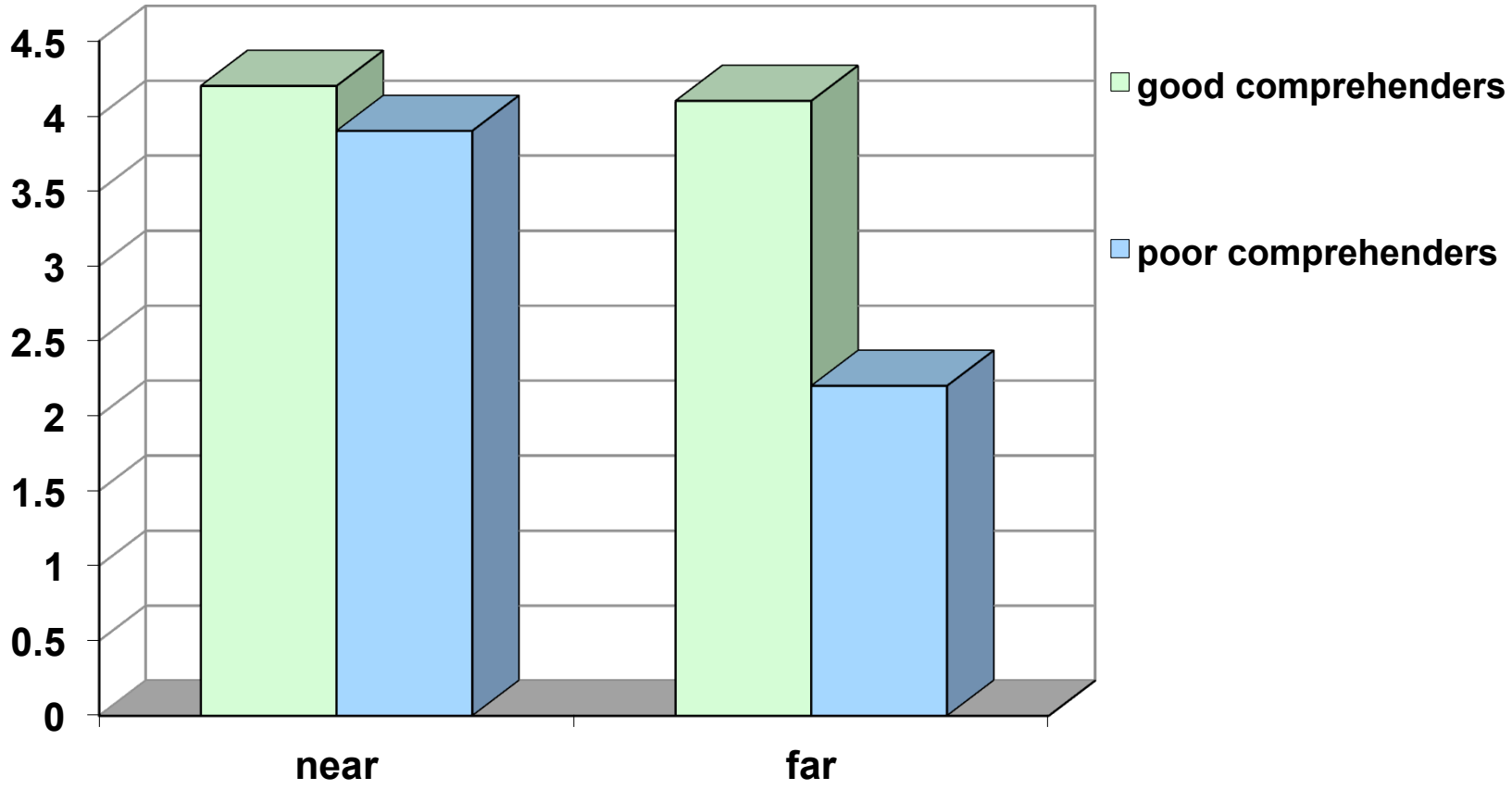
* far: clues appear after the filler text (here)

Clues: Dad suggested taking a football, but that was not quite right. The football was too big to play fetch with and it had lost its bounce.

Filler: She searched all the rooms in the house, even the kitchen. During her hunt, she found all sorts of things….

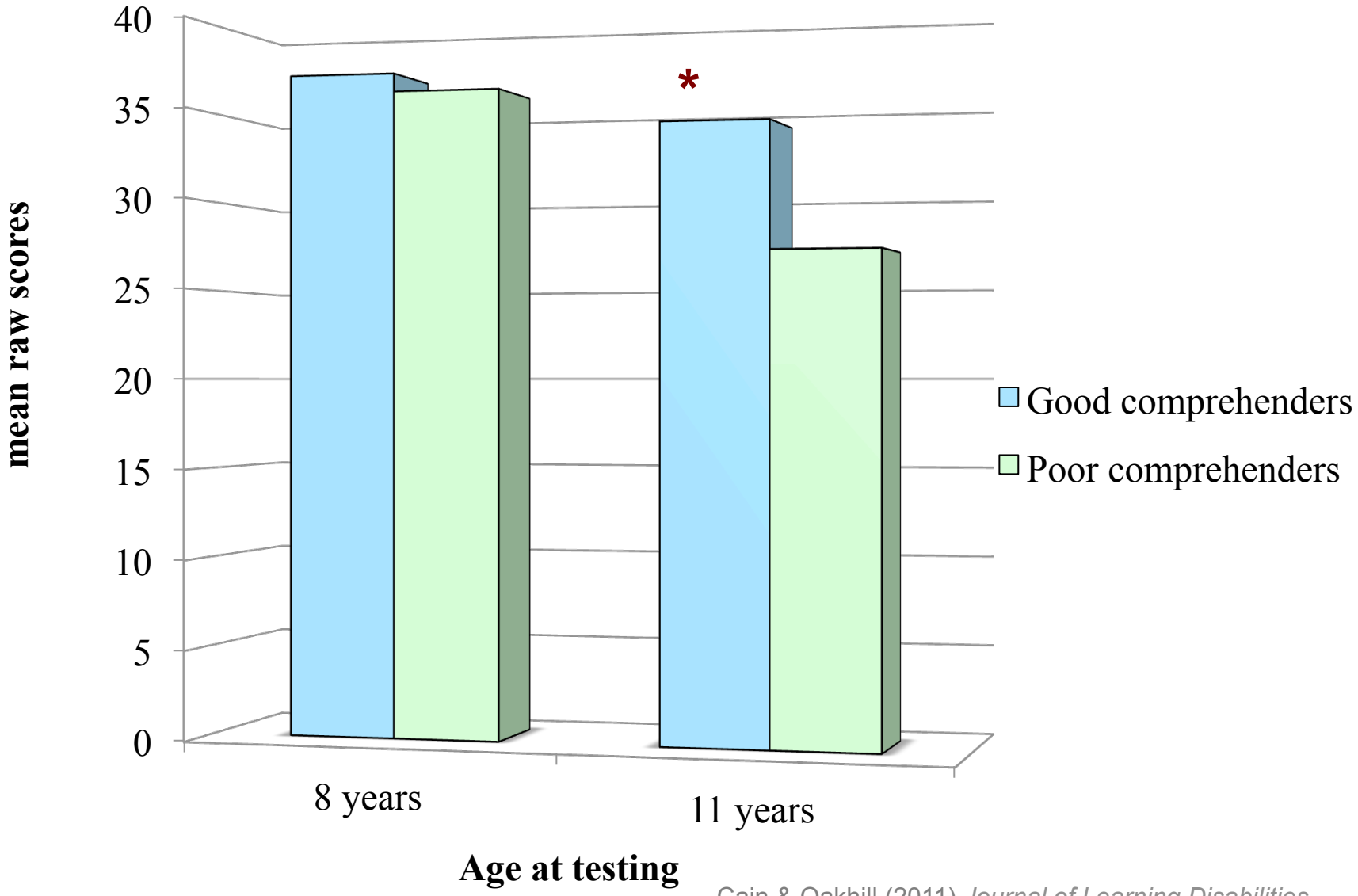
Ending: Lucy decided that she had to be more tidy in the future.

Inference, memory and vocabulary learning: Results



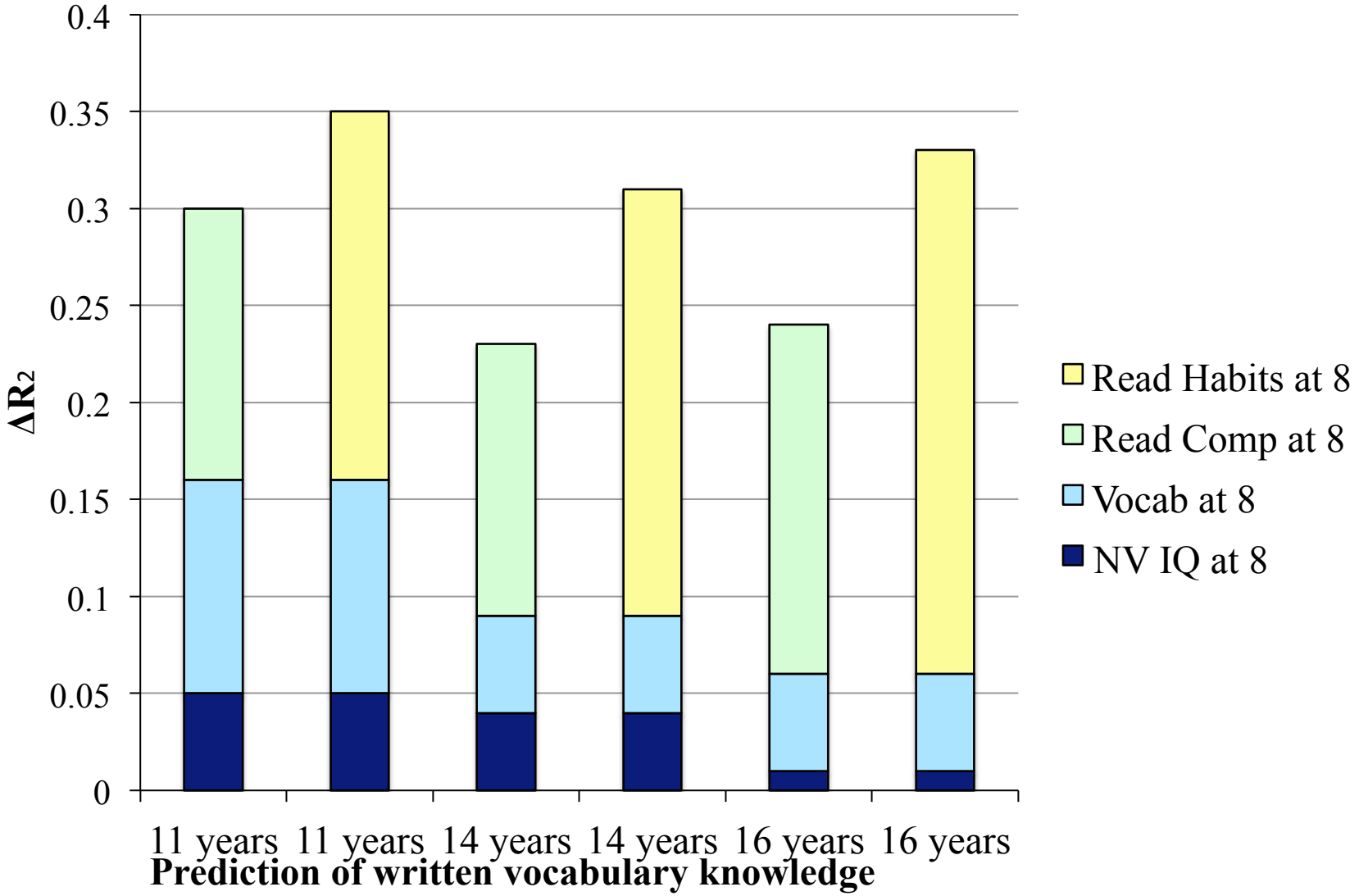
Cain et al (2004), *Journal of Educational Psychology*

Vocabulary development across time: Gates-MacGinitie (written) vocabulary



Cain & Oakhill (2011) *Journal of Learning Disabilities*

Contributions to vocabulary development over time: Outcome - Gates-MacGinitie vocabulary



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Summary: Vocabulary learning

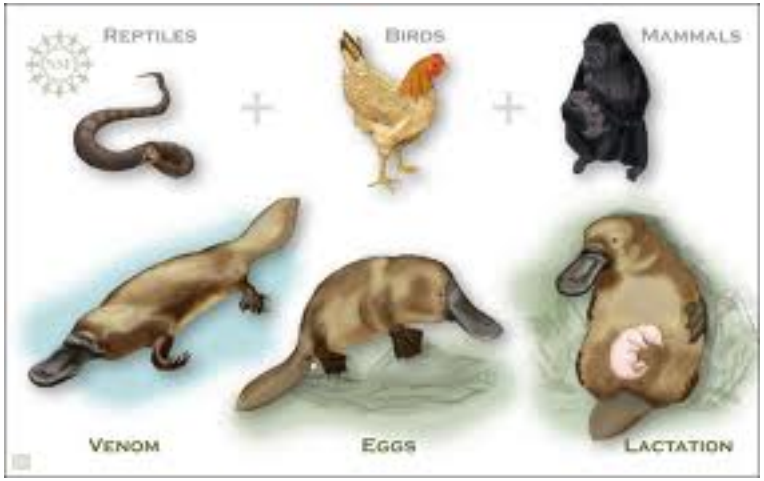
- Poor comprehenders are not so good at learning new vocabulary from context.

- Comprehension influences vocabulary growth:
  - poor reading comprehension/poor reading habits at 8 years are associated with poorer vocabulary 3-8 years later
  - reading comprehension and reading experience predict vocabulary outcomes

The role of vocabulary knowledge in integration and inference

- Recent interest in distinguishing between vocabulary breadth and depth of vocabulary (Ouellette, 2006; Tannenbaum et al., 2006).
- Roughly:
  - Breadth = how many words you know
  - Depth = what you know about those words
- Ouellette and Tannenbaum et al. showed that depth measures were predictive of comprehension skill even when breadth was controlled.
- We have found that depth is more strongly related to making global coherence inferences. Even after breadth of knowledge taken into account (Cain & Oakhill, in press).

What do you know about a platypus?



How does vocabulary influence inference making?

- Perfetti's "Lexical Quality Hypothesis"
- A low quality lexical code, which is retrieved with effort, can interfere with comprehension processes.
- Lexical Quality includes a range of knowledge about word forms (phonology, orthography, grammar) and also meaning.

How does vocabulary influence inference making?

- The focus here is on that last aspect: quality of a word's meaning representation.

- The availability of associative links between words and concepts – the consequence of a rich (deep) vocabulary – might add comprehension by supporting inference making.

Vocabulary and inference making in comprehension

- We hypothesise that rich (deep) vocabulary knowledge might aid inference making in comprehension.
- Why? Because many text-connecting and global inferences in text are dependent on semantic links between words in the text.

Read the following lists of words *once*, slowly, while you try to memorise them:

- bed, rest, tired, dream, wake, snooze, blanket, doze, slumber, snore, nap, peace, yawn, drowsy

- door, glass, pane, shade, ledge, sill, house, open, curtain, frame, view, breeze, sash, screen, shutter

Now, take this memory test:

- Which of the following words were in the word lists? Write them down!

- snore, towel, empty, frame, dream, bottle, sleep, pane, brush, rest, window, ledge

Now, take this memory test:

- Which of the following words were in the word lists? Write them down!

- snore, towel, empty, frame, dream, bottle, sleep, pane, brush, rest, window, ledge

Comprehension skill & thematic links

- We have some evidence that comprehension skill is related to ability to automatically derive themes in word lists.
- Weekes, Hamilton, Oakhill & Holliday (2008) used the DRM (Deese, Roediger, McDermott) false memory paradigm.
- Task is to listen and remember a list like:
  - *rest, bed, snooze, dream, tired, blanket.*
- Good comprehenders were more likely than poor comprehenders to falsely claim that *sleep* had been in the original list.
- Attributed to propensity to derive the list "themes".

Example of thematic links in a short story

Mum and Suzie were almost finished and their trolley was overflowing! Suzie likes going with mum because she enjoys looking at all the tins and packets in each aisle and she likes to make sure mum buys all her favourite treats. When they get to the till, the woman scans each item and then reads out the final price. While mum hands over the money, Suzie is very helpful and packs all the bags. …

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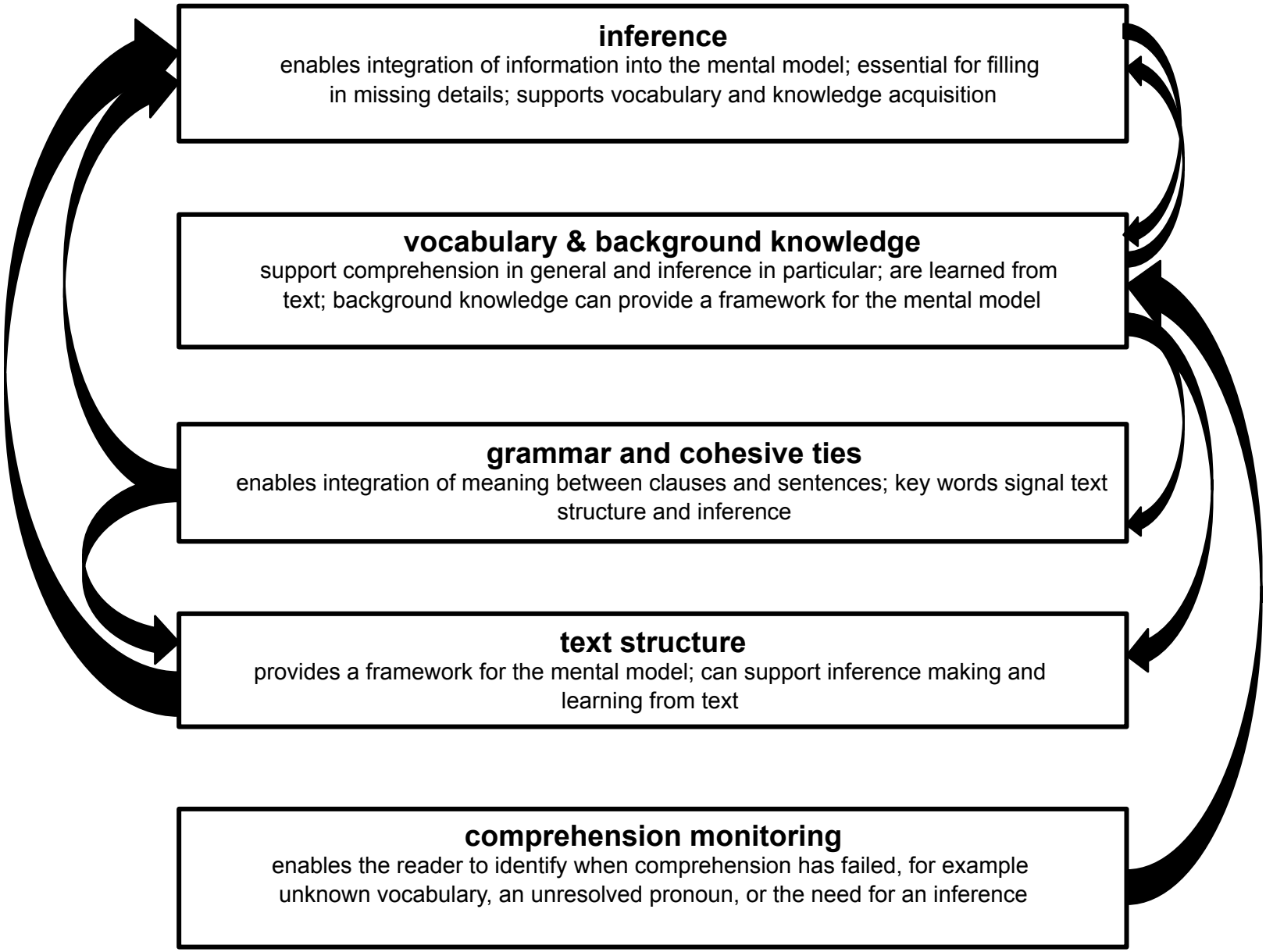
Summary and conclusions

- Poor comprehenders have difficulties with making inferences
- There is evidence that this relation is causal
- Their difficulties with inference do not appear to be because of lack of knowledge *per se*.
- Inference skills not only affect comprehension, but also vocabulary learning
- And vocabulary supports comprehension and inference skills

Educational Implications

- Comprehension skills often need to be taught. They don't just develop in all children.
- Training in skills that encourage readers to integrate information in text, and to figure out meaning, by making inferences and activating and using appropriate knowledge (even from single words) improves comprehension.
- Inference skills also support vocabulary development, so children can be encouraged to develop their vocabulary through inferential reasoning.
- And depth of vocabulary knowledge in particular is related to comprehension and inference skill, so rich vocabulary knowledge should be developed and activated in comprehension.


inference
enables integration of information into the mental model; essential for filling in missing details; supports vocabulary and knowledge acquisition
vocabulary & background knowledge
support comprehension in general and inference in particular; are learned from text; background knowledge can provide a framework for the mental model
grammar and cohesive ties
enables integration of meaning between clauses and sentences; key words signal text structure and inference
text structure
provides a framework for the mental model; can support inference making and learning from text
comprehension monitoring
enables the reader to identify when comprehension has failed, for example unknown vocabulary, an unresolved pronoun, or the need for an inference

Final thoughts

- Teaching comprehension is not easy and does not have a quick "one size fits all" solution. For example what we need to teach is not vocabulary, inference skills, metacognitive skills…
- … the interrelations between these skills need to be understood
- Teachers need the knowledge of comprehension processes so that…
- ….they can teach flexibly and inculcate in children the skills that they need to work thing out for themselves.

Thank you

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