

How Deaf Children Learn

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National Institutes of Health
Eunice Kennedy Shriver
National Institute of Child
Health and Human Development



賽馬會手語雙語共融教育計劃
JOCKEY CLUB SIGN BILINGUALISM AND
CO-ENROLMENT IN DEAF EDUCATION PROGRAMME



手語及聾人研究中心
Centre for Sign Linguistics & Deaf Studies



Western Pennsylvania
School for the Deaf



Royal Institute for
Deaf and Blind Children



Preliminaries

- Evidence-based practice in deaf education
- Perspectives, sensitivities, and responsibilities
- Apparent simplicity of research and conclusions
 - Simple relations vs. complex issues
 - Individual differences
 - The population, science, and education are all changing
- Asking the right questions (and living with the answers)

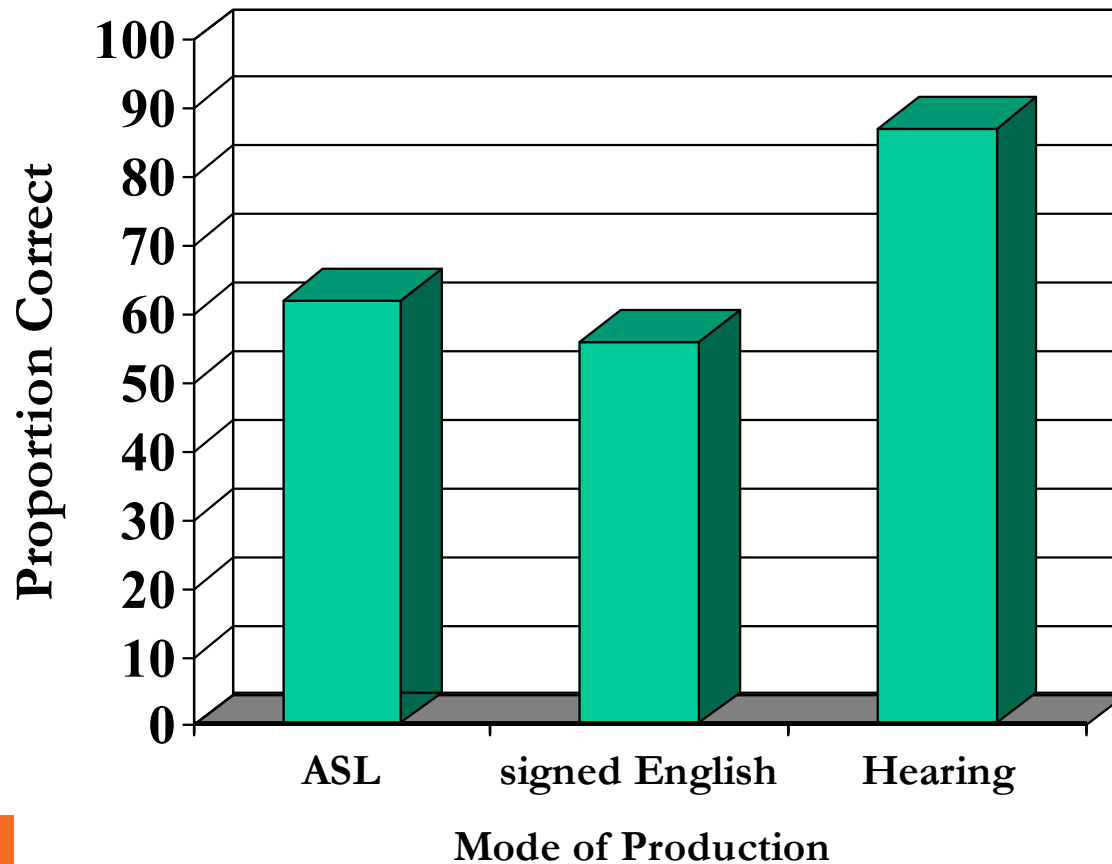


how deaf children *learn*

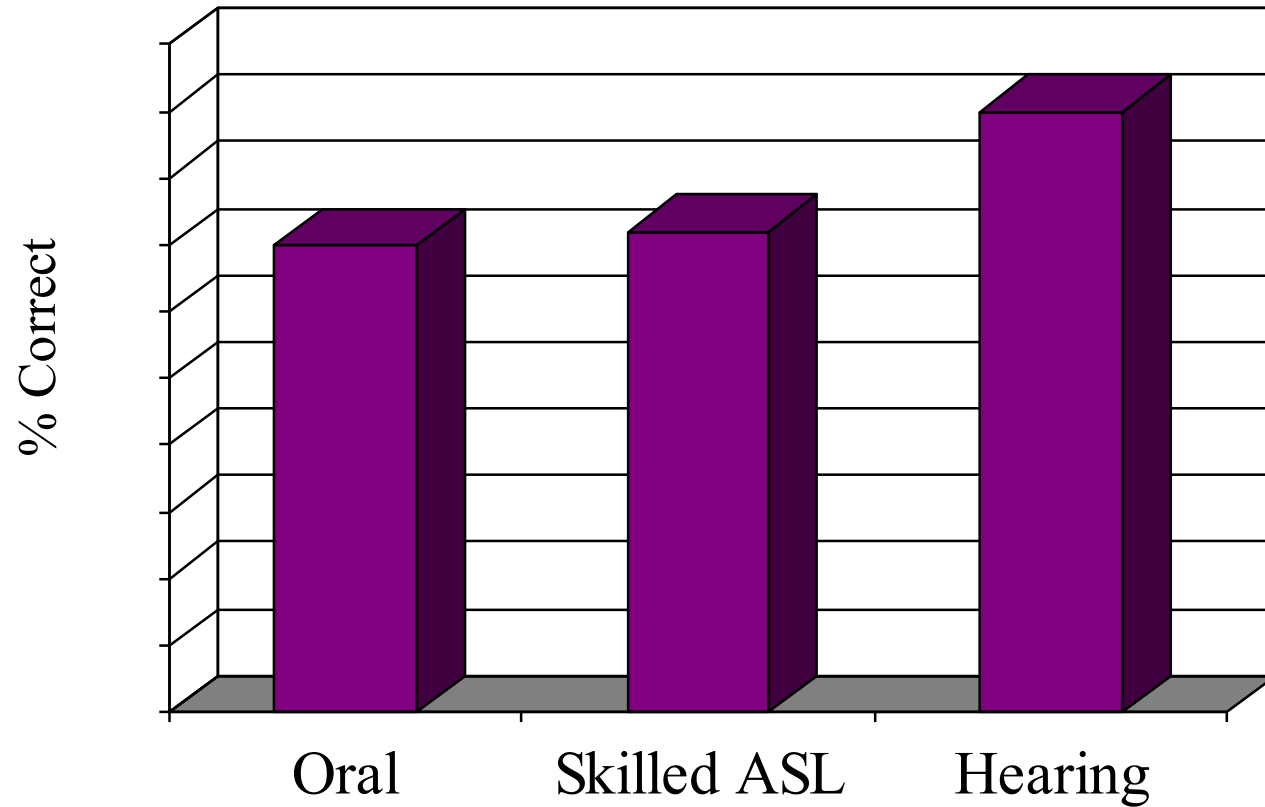
WHAT PARENTS AND TEACHERS
NEED TO KNOW



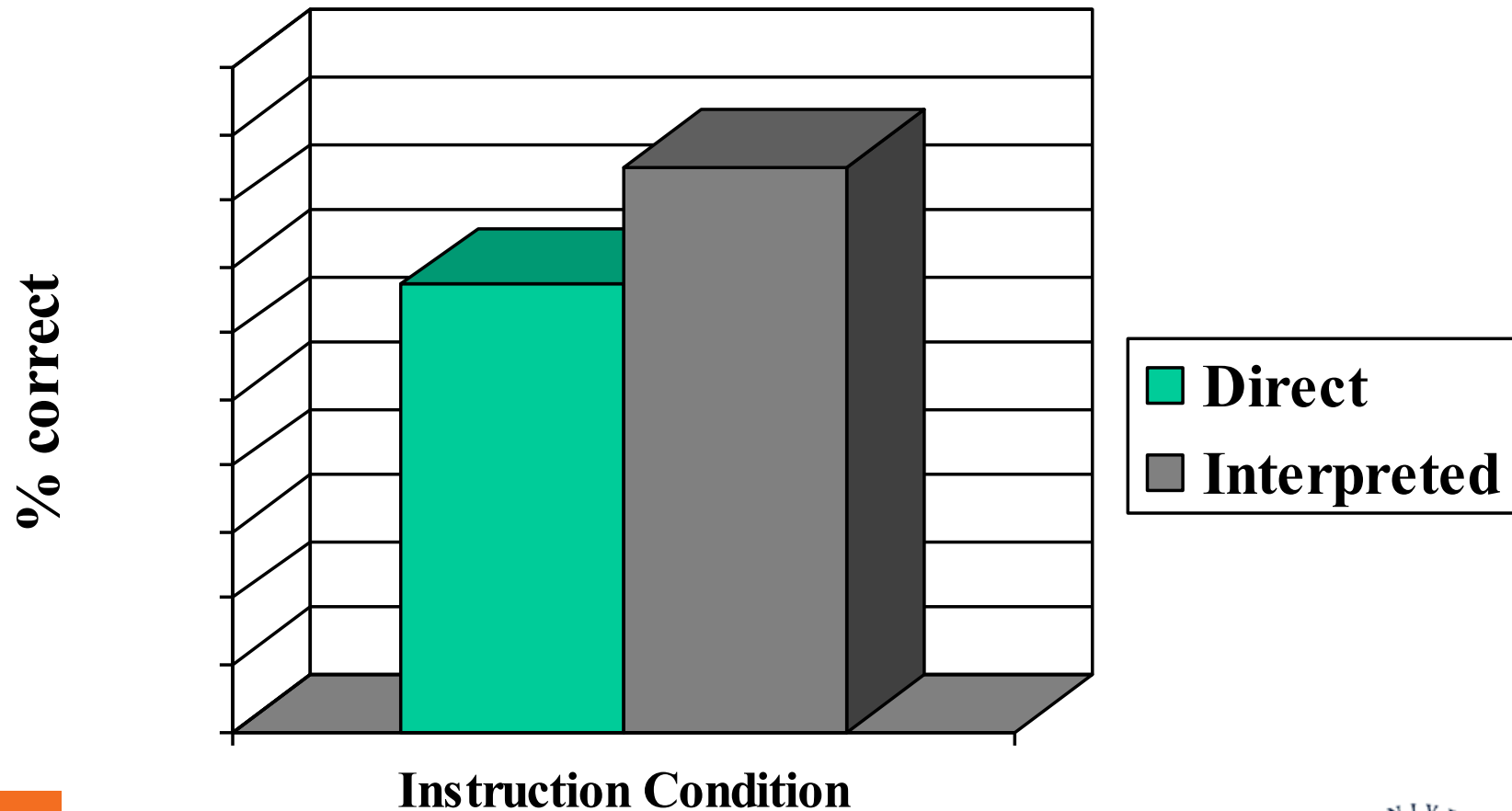
Learning via Sign Language Interpreting



Learning in the Mainstream Classroom



Mediated vs. Direct Instruction by Skilled Instructors - Deaf

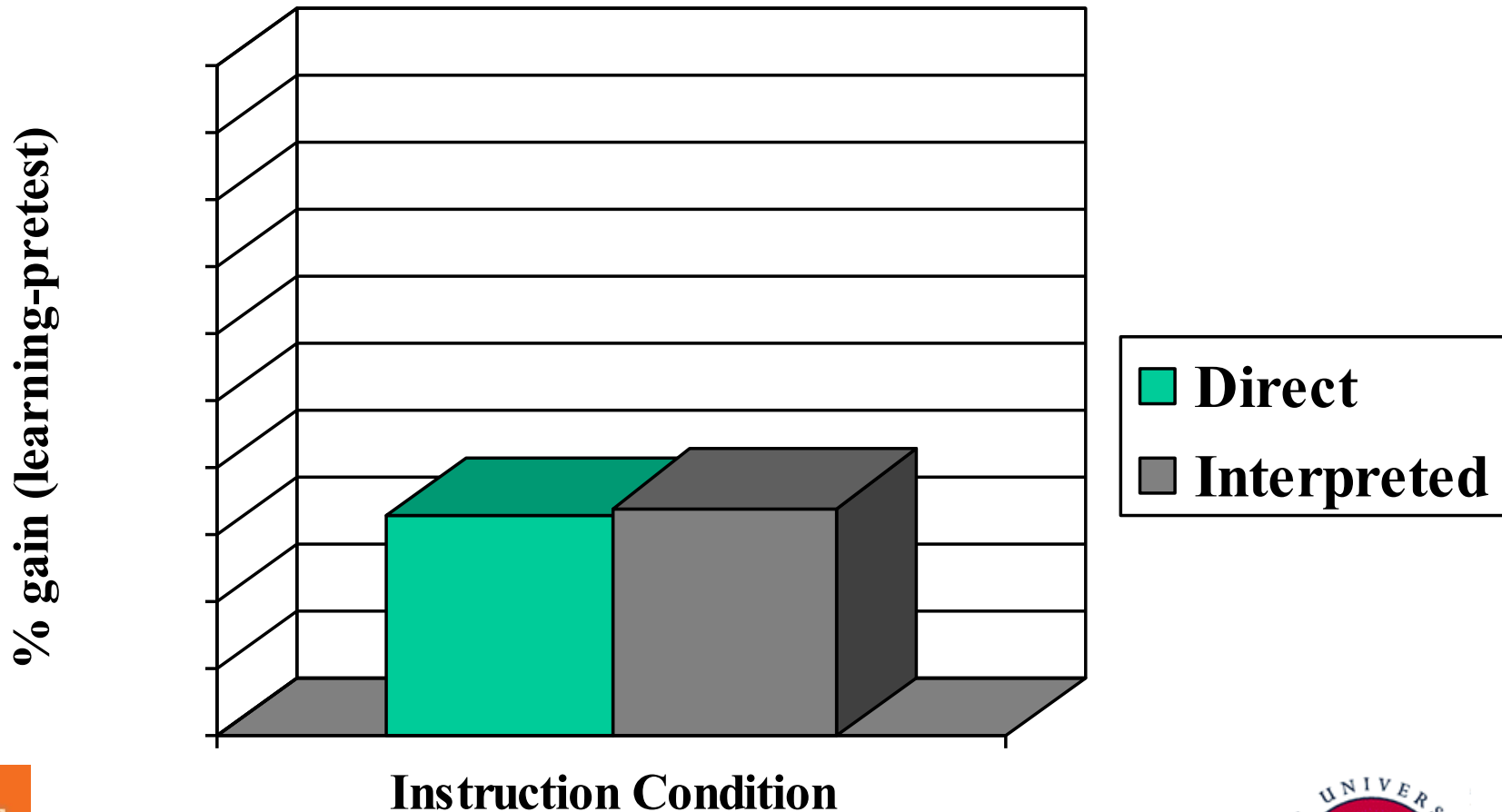


- Research Note -

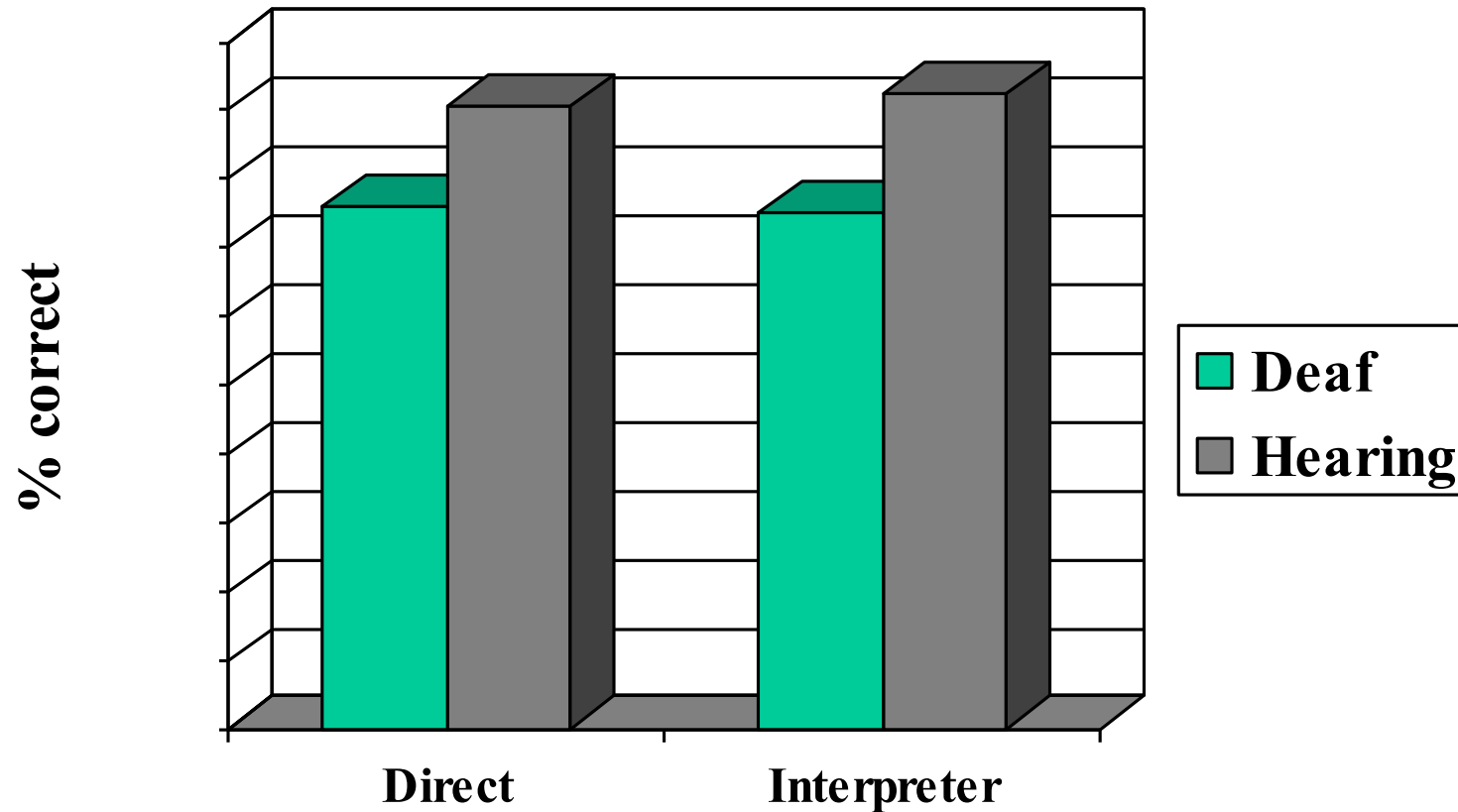
- 1) Pretest
- 2) Post-lecture test
- 3) $\text{Gain} = \text{Posttest} - \text{Pretest}$



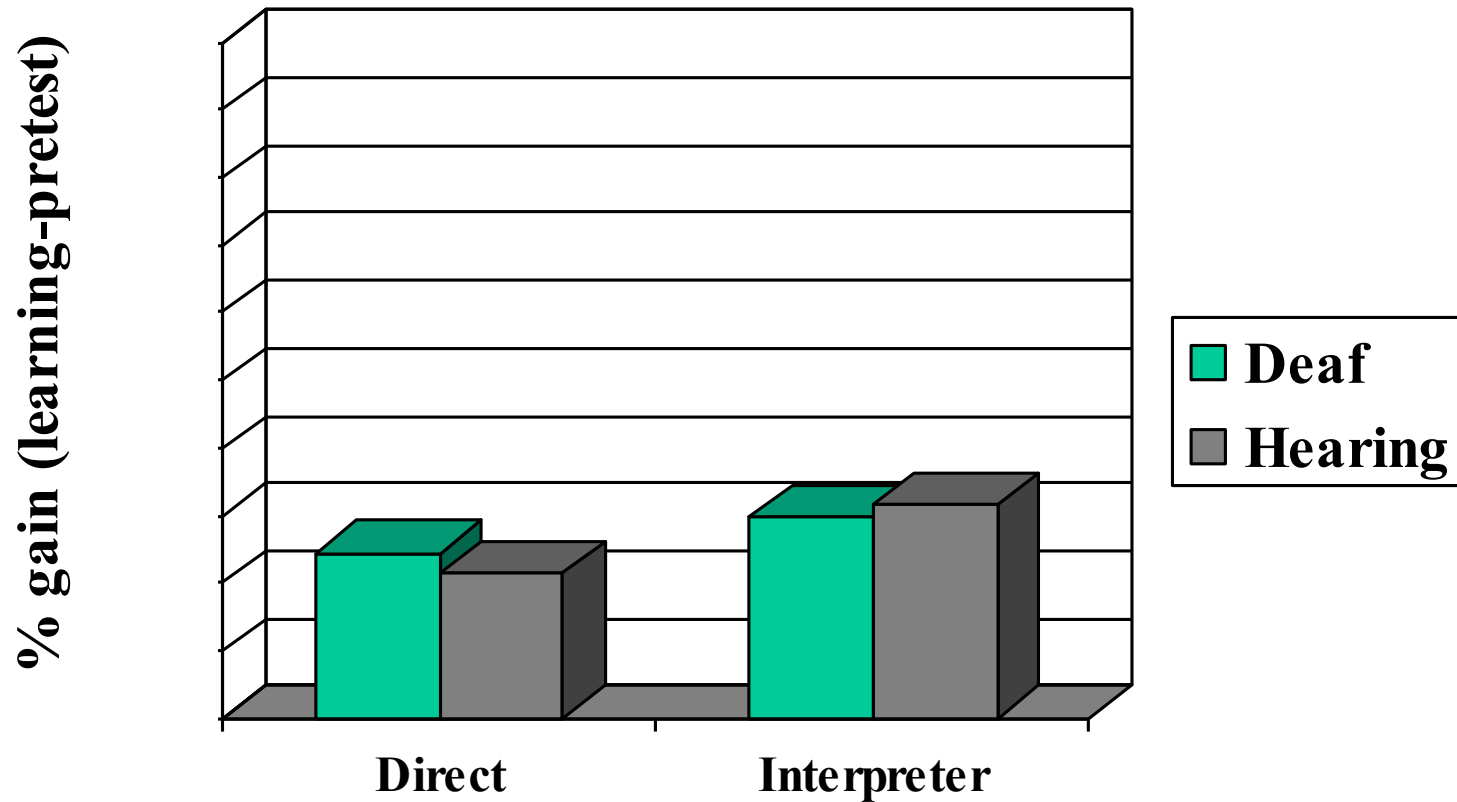
Mediated vs. Direct Instruction by Skilled Instructors - Deaf



Mediated vs. Direct Instruction by Skilled Instructors - Hearing



Mediated vs. Direct Instruction by Skilled Instructors - Hearing



Where Are We?

- Deaf students can learn as much as hearing peers when taught by skilled teachers of the deaf
- What are the cognitive differences between deaf and hearing learners (and among deaf learners)?
- How do cognitive differences affect language comprehension, literacy, and learning?
- How do (some) teachers accommodate those differences in teaching methods and materials?



Cognitive Differences likely to Influence Learning Outcomes for Deaf Students

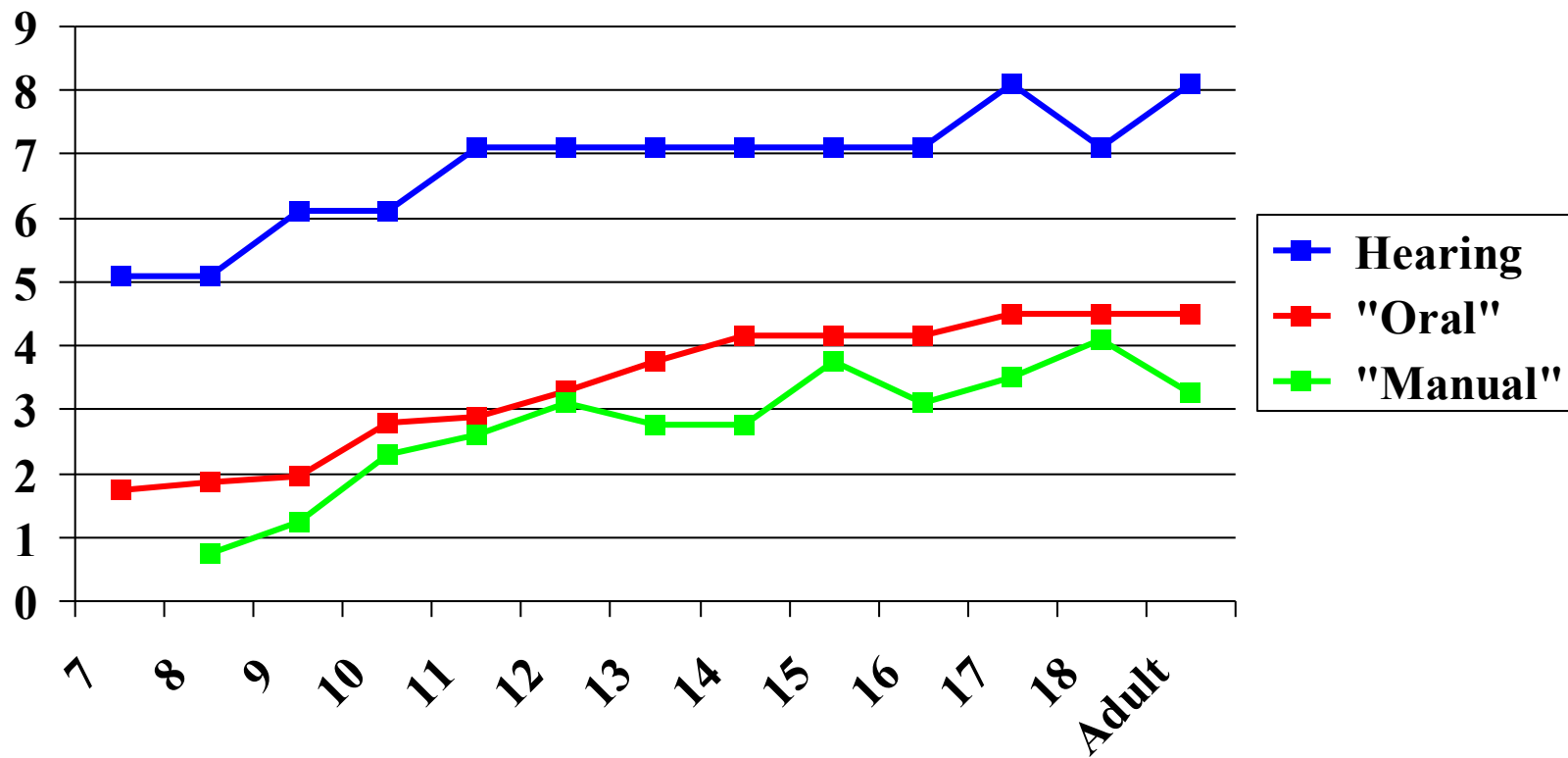
- Memory
- Visual information processing
- Concept learning and knowledge organization
- Executive functioning and metacognition



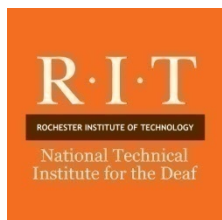
Cognitive Differences likely to Influence Learning Outcomes for Deaf Students

- Memory [*short-term memory* or *working memory*]





Digit span (Pintner & Patterson, 1917)

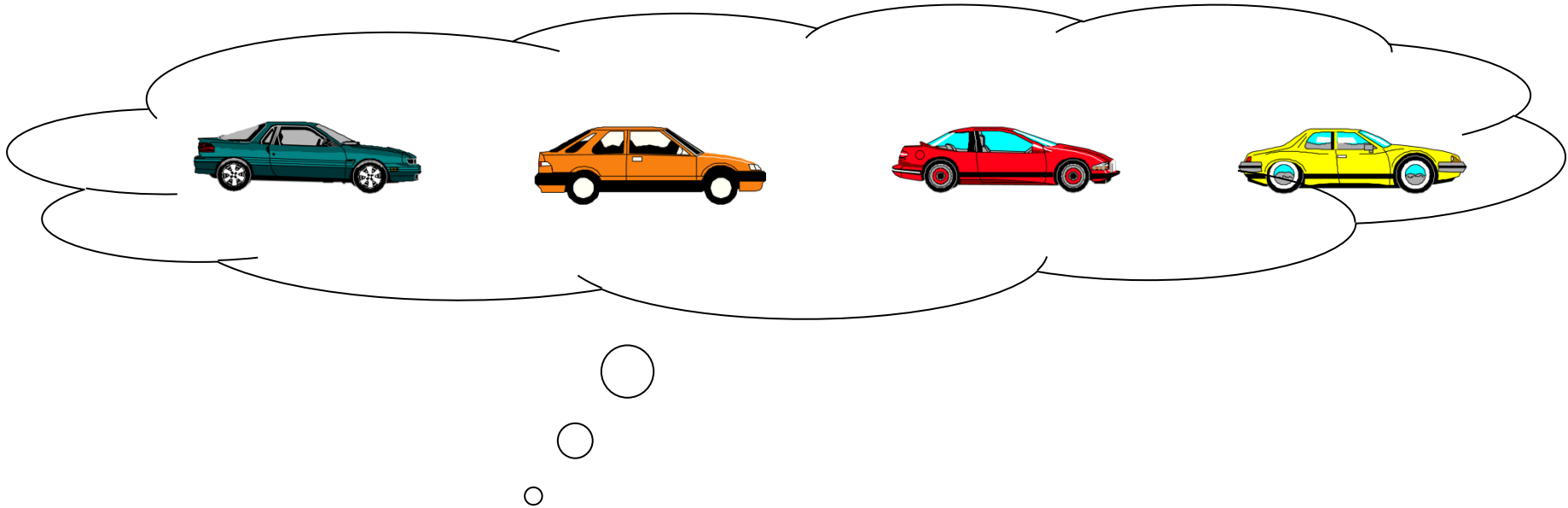


Memory

- Hearing adults and children > deaf adults and children, especially (but not only) when sequential or temporal information is involved
 - Words, signs, text (*Banks et al., 1990; Krakow & Hanson, 1985*)
 - Figures, pictures (*Blair, 1957; Liben, 1979*)

...so it's not just about language
- Native signers have better visual-spatial memory than sequential memory, and better than hearing non-signers (*Hall & Bavelier, 2010*)



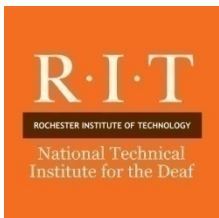


There are 4 cars.

The orange car is faster than the green car.

The red car is faster than the orange car.

The yellow car is faster than the red car.

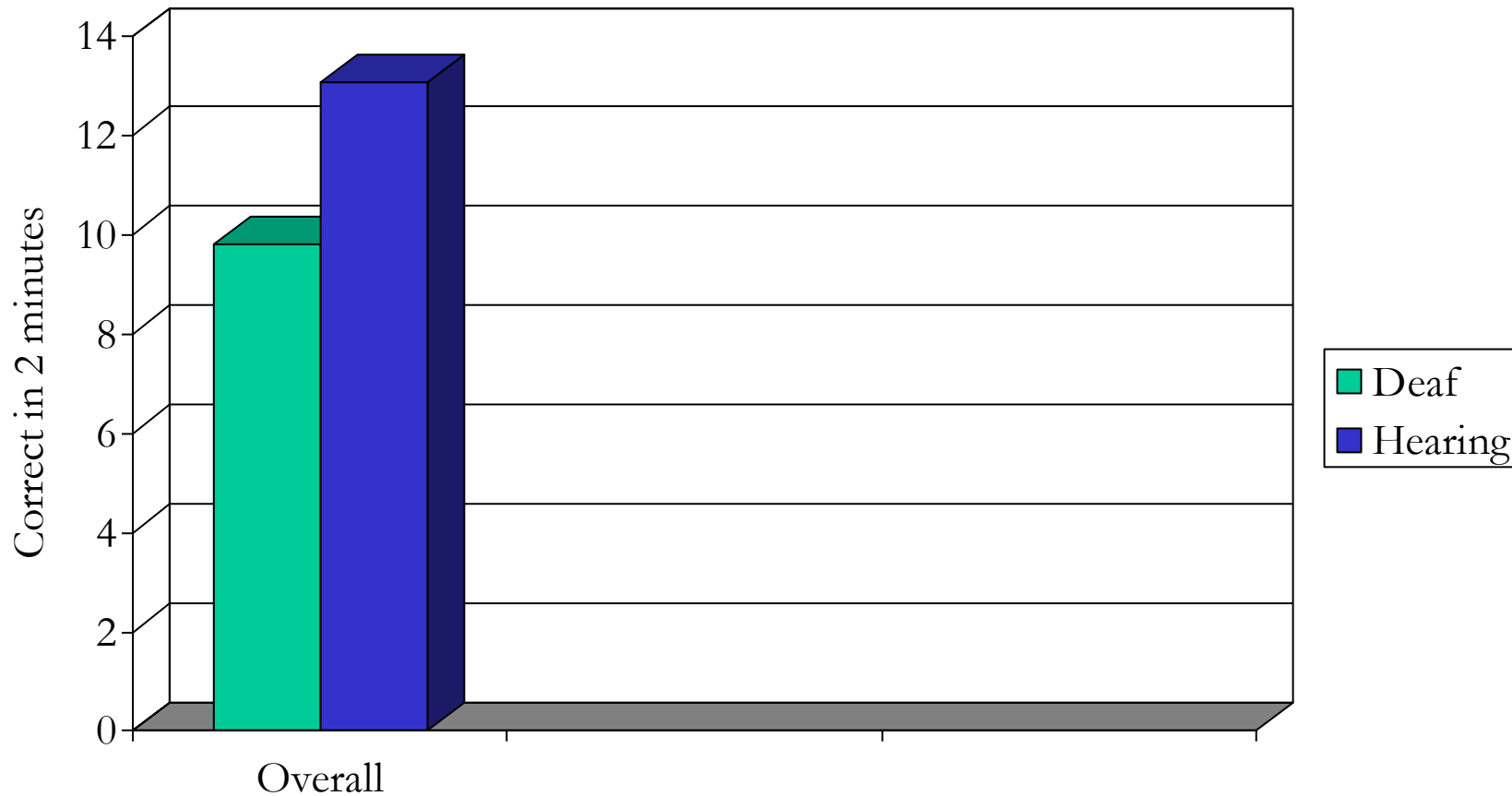


The yellow car is faster than the green car?

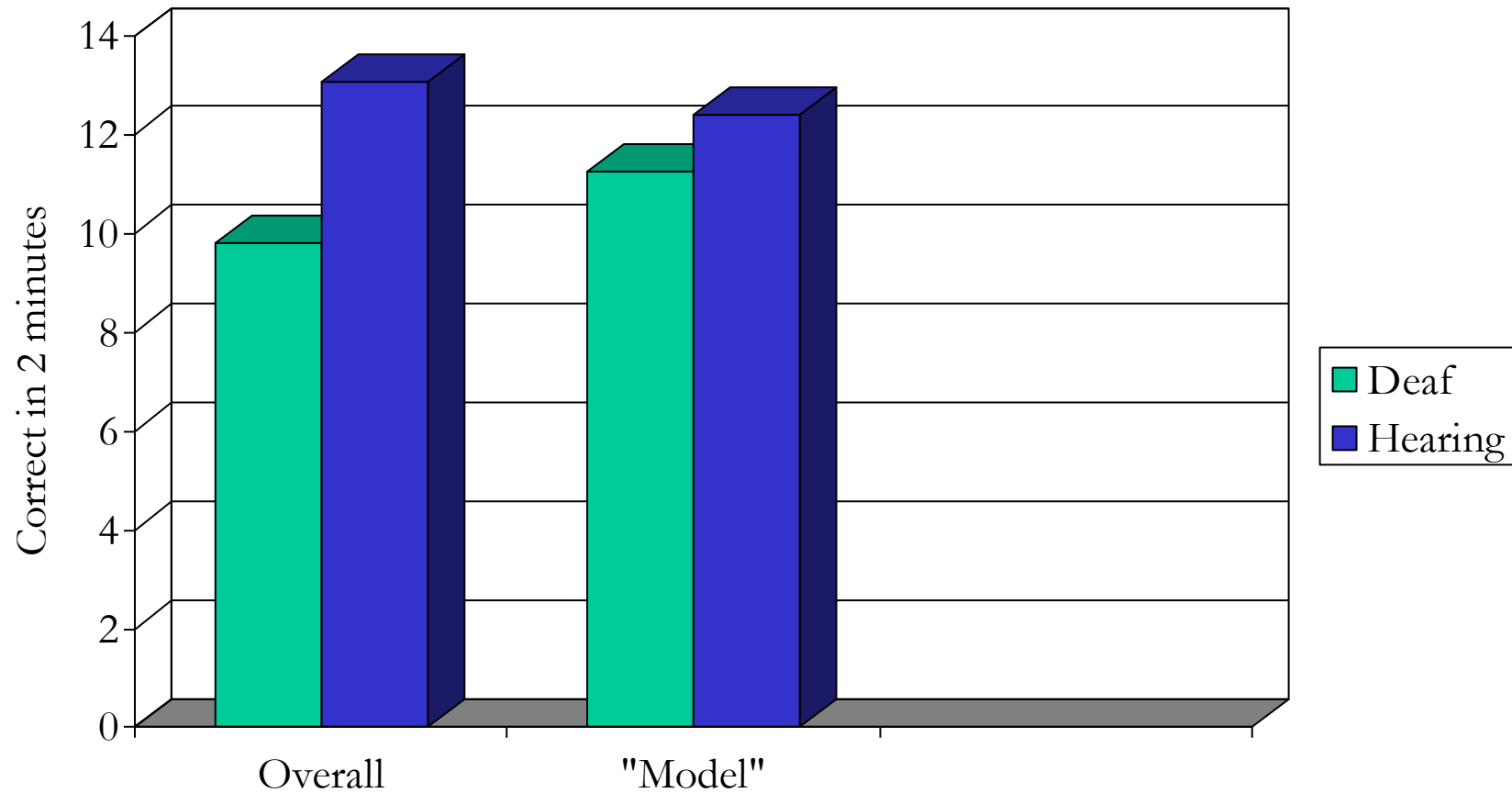
True or false?



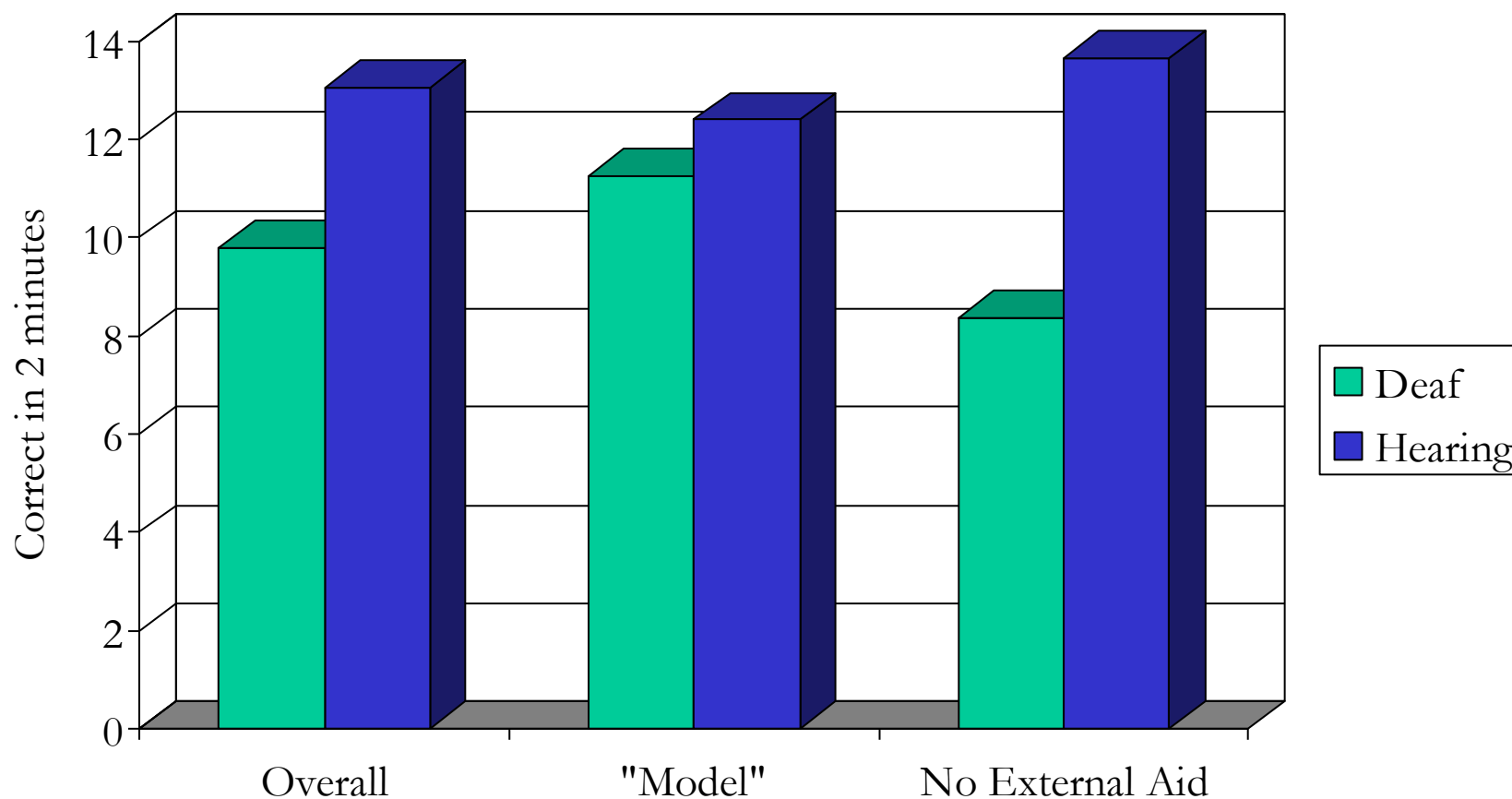
Four-Term Series Problems



Four-Term Series Problems



Four-Term Series Problems



Cognitive Differences likely to Influence Learning Outcomes for Deaf Students

- Memory [*short-term memory* or *working memory*]
- Having an ability (?) is not the same as knowing when and how to use it (*visual processing, metacognition*)
- Can we teach it?
- How can we use it in the classroom?



Cognitive Differences likely to Influence Learning Outcomes for Deaf Students

- Memory
- Visual information processing



What We Know vs. What We Think We Know about Educating Deaf Learners

- Deaf children are “visual learners”

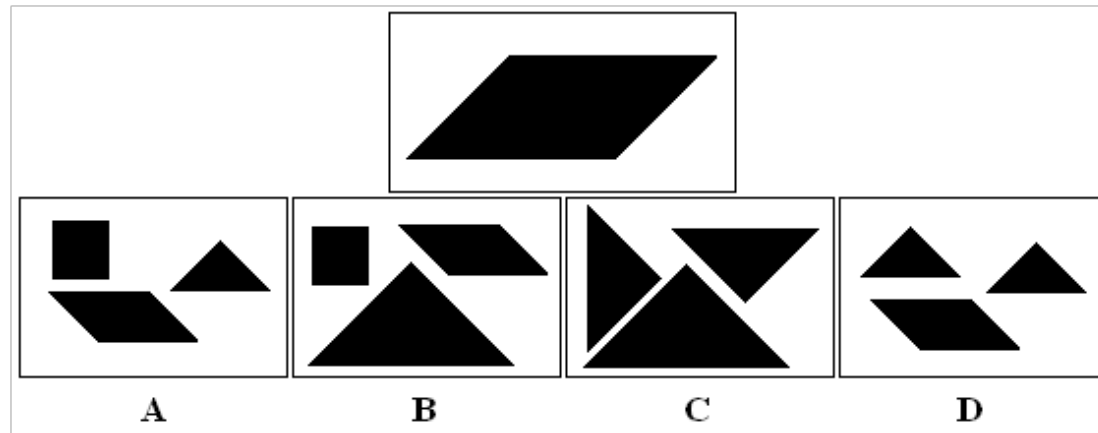
(Marschark & Hauser, 2012)

- Signers faster, more accurate than nonsigners generating complex visual images *(Emmorey et al., 1993)*



Deaf Children are “Visual Learners”

- Deaf learners have better visual-spatial skills
 - Hearing learners \geq deaf learners in visual-spatial skills
(*Blatto-Vallee et al., 2007; Morrison et al., 2012*)



Deaf Children are “Visual Learners”

- Deaf children are “visual learners”
 - Hearing learners \geq deaf learners in visual-spatial skills
(*Blatto-Vallee et al., 2007; Morrison et al., 2012*)
 - No difference between early and late signers
 - Scores are positively related to hearing thresholds
- How does this affect classroom functioning (or not)?
 - Spatial Relations task predicts deaf students’ math scores

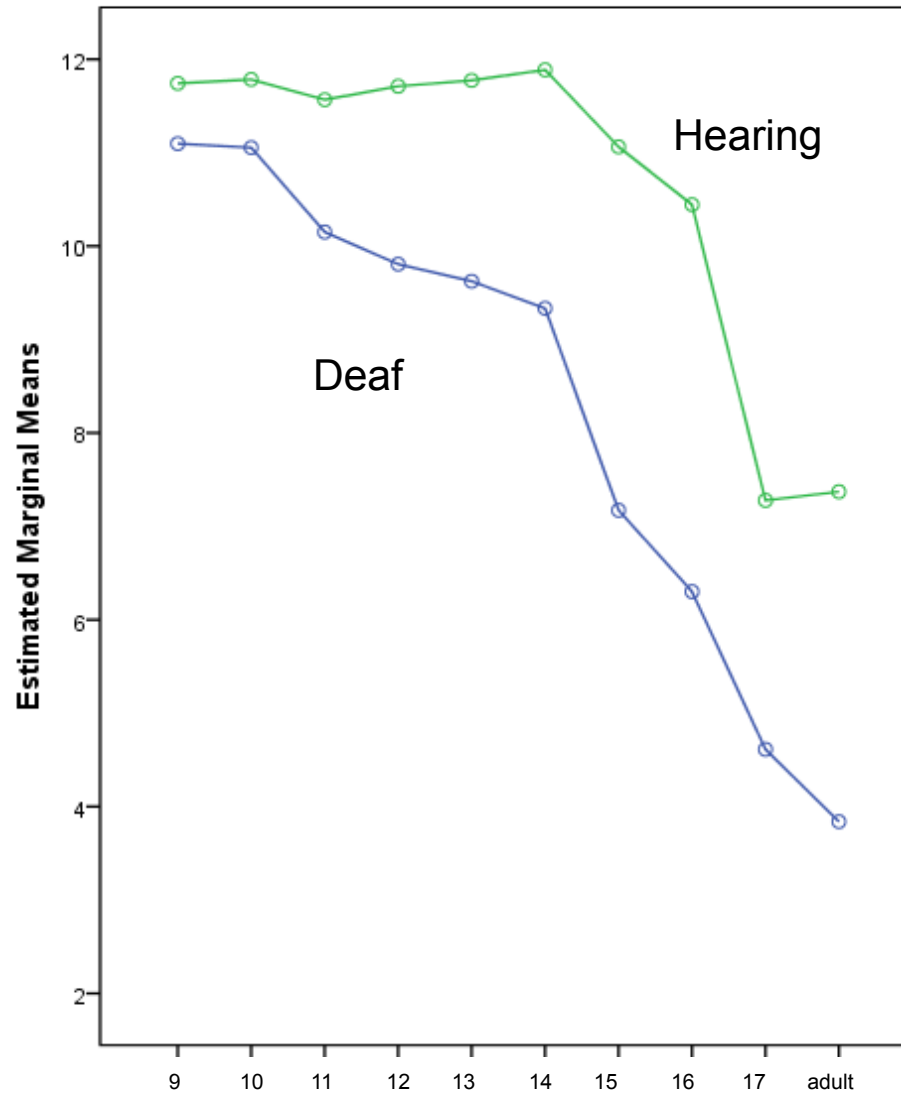


Cognitive Differences likely to Influence Learning Outcomes for Deaf Students

- Memory
- Visual information processing
- Concept learning and knowledge organization
[*Semantic or long-term memory*]

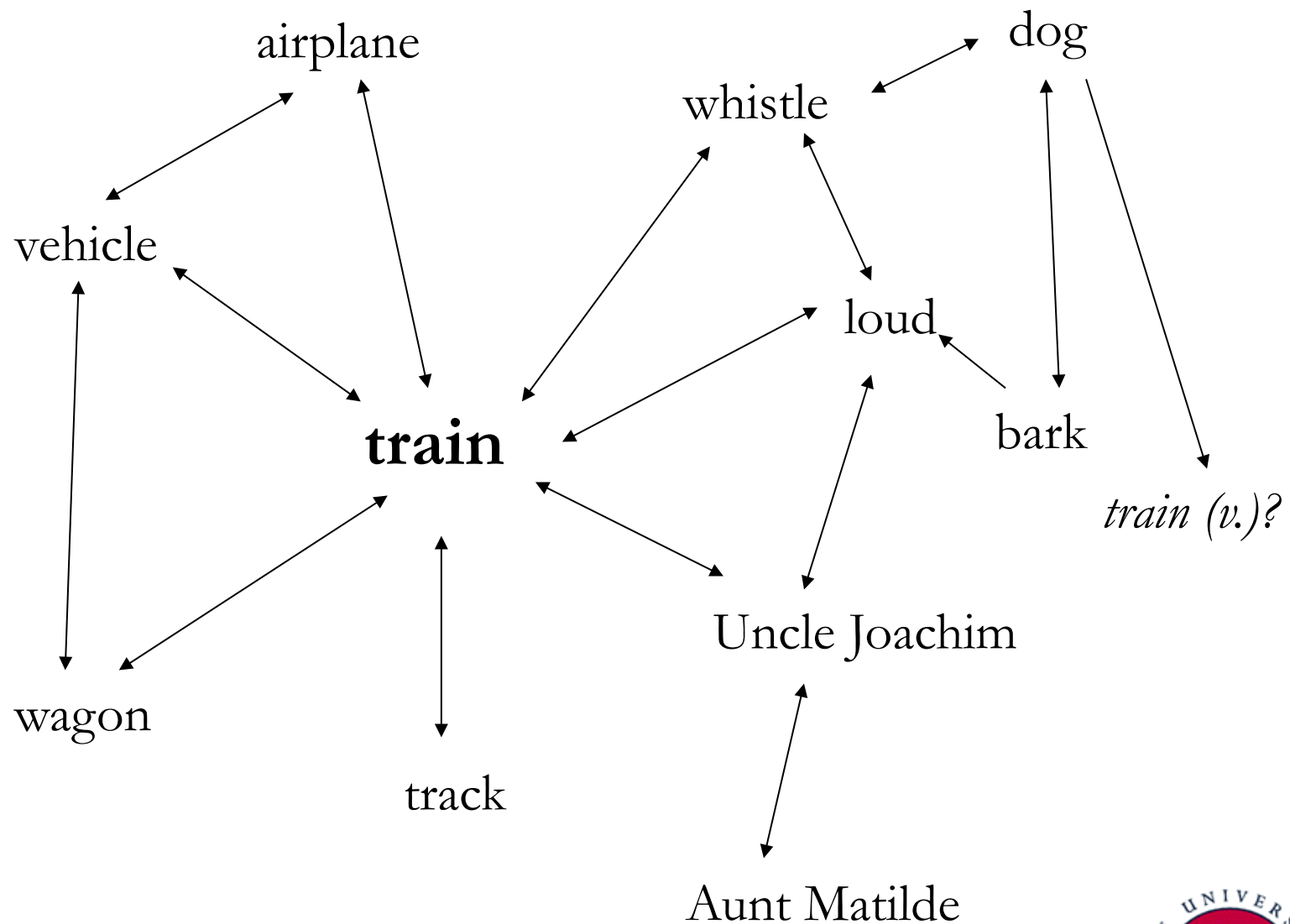


PPVT Scores of University Students



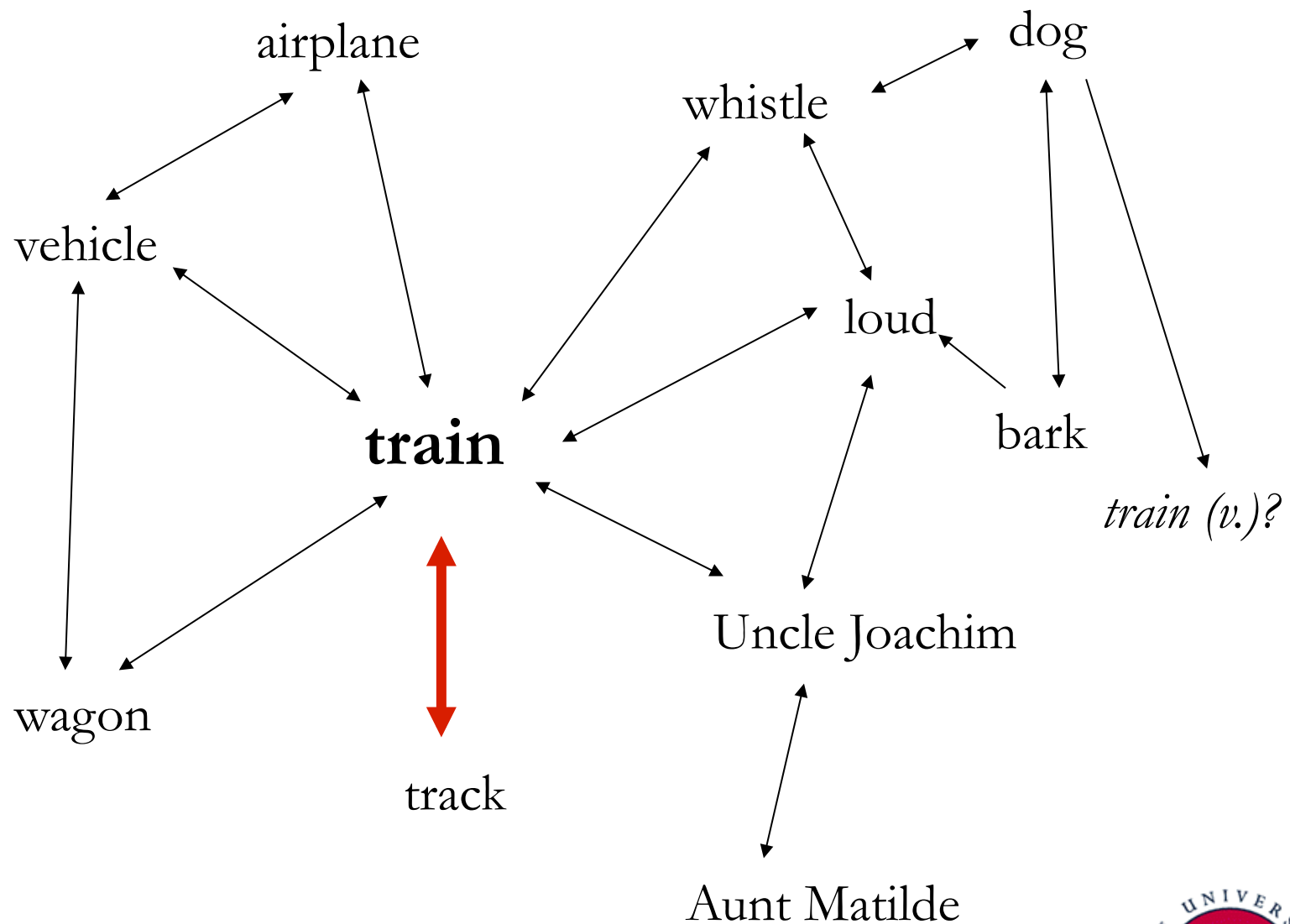
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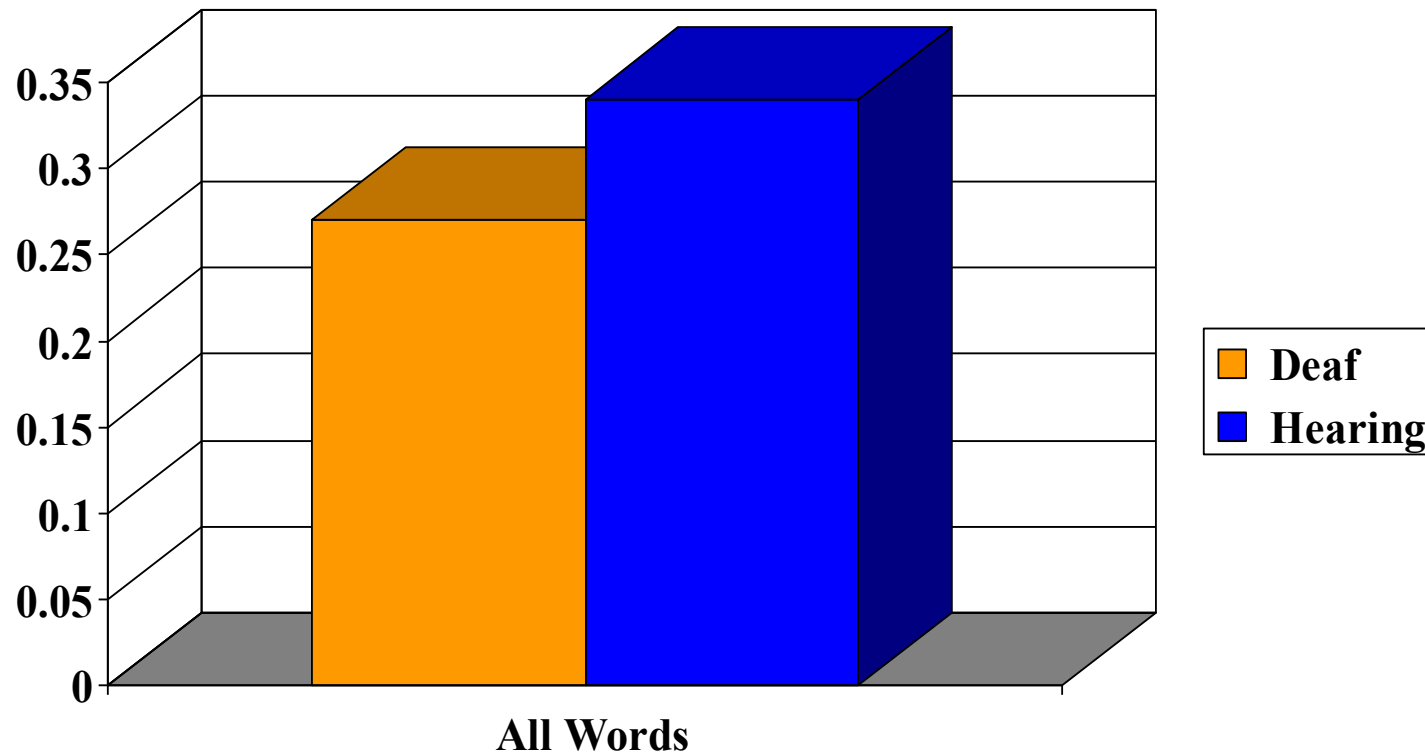


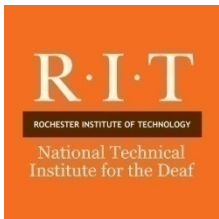
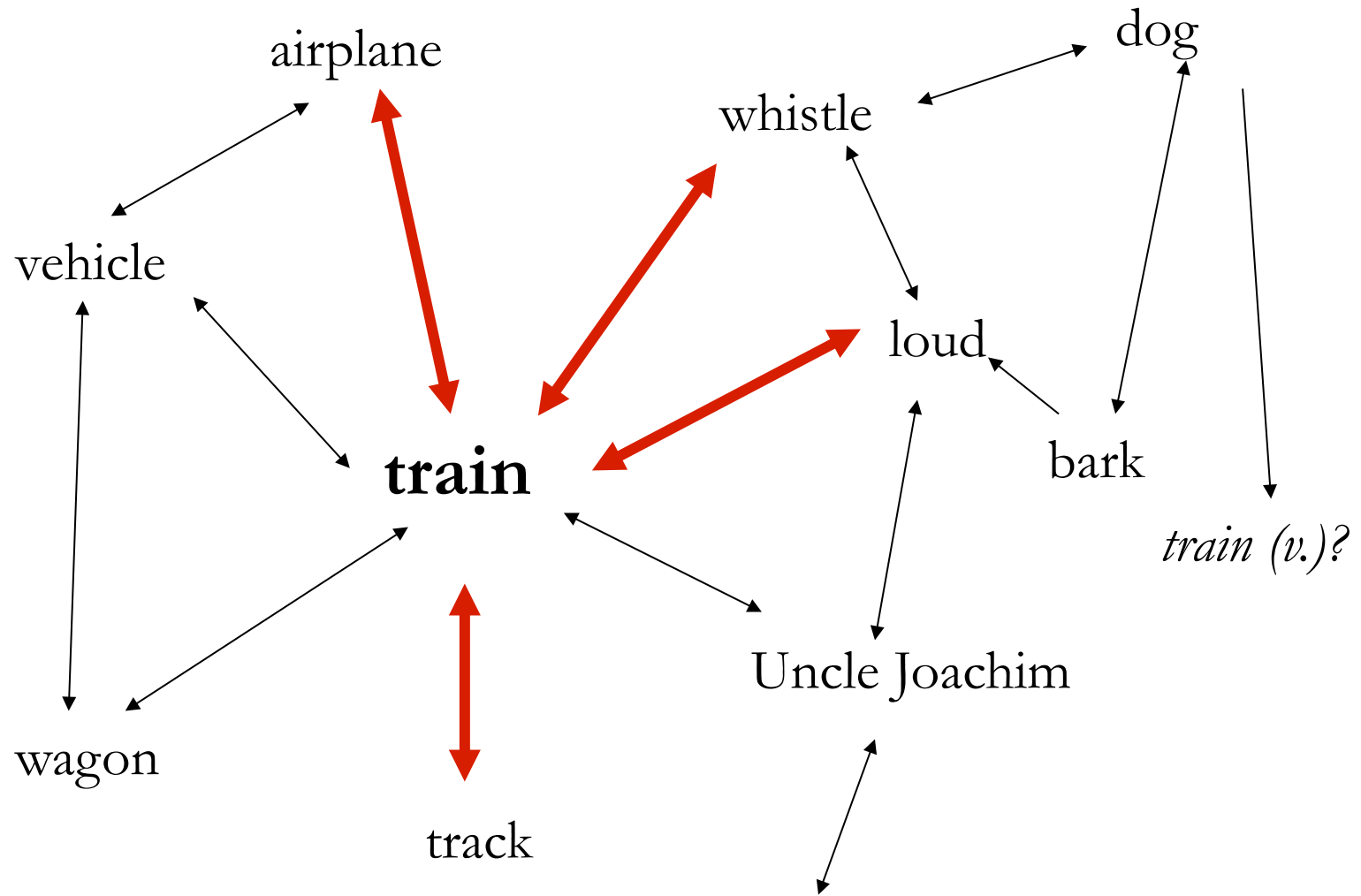
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Primary Associate Strength

(Proportion giving the most common response)





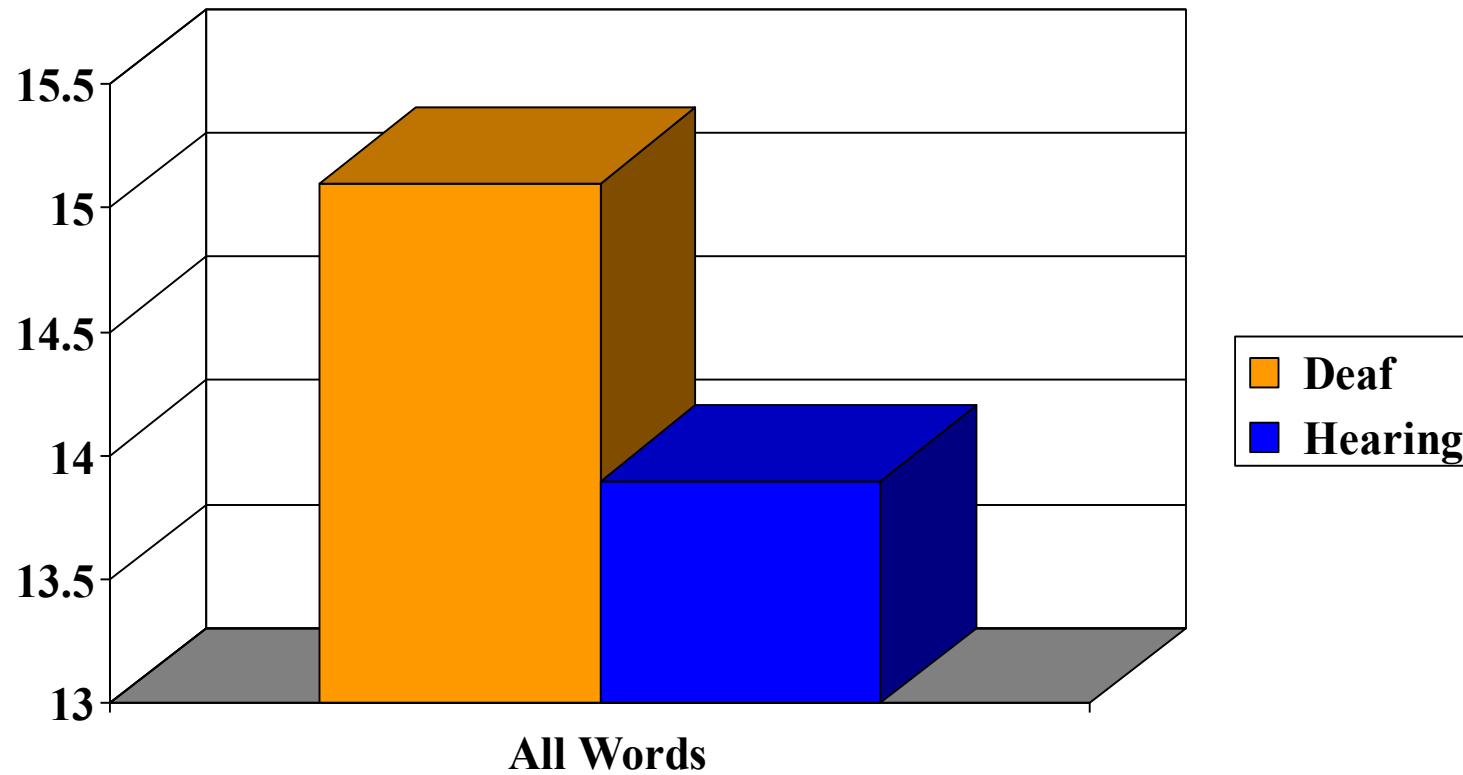
Aunt Matilde

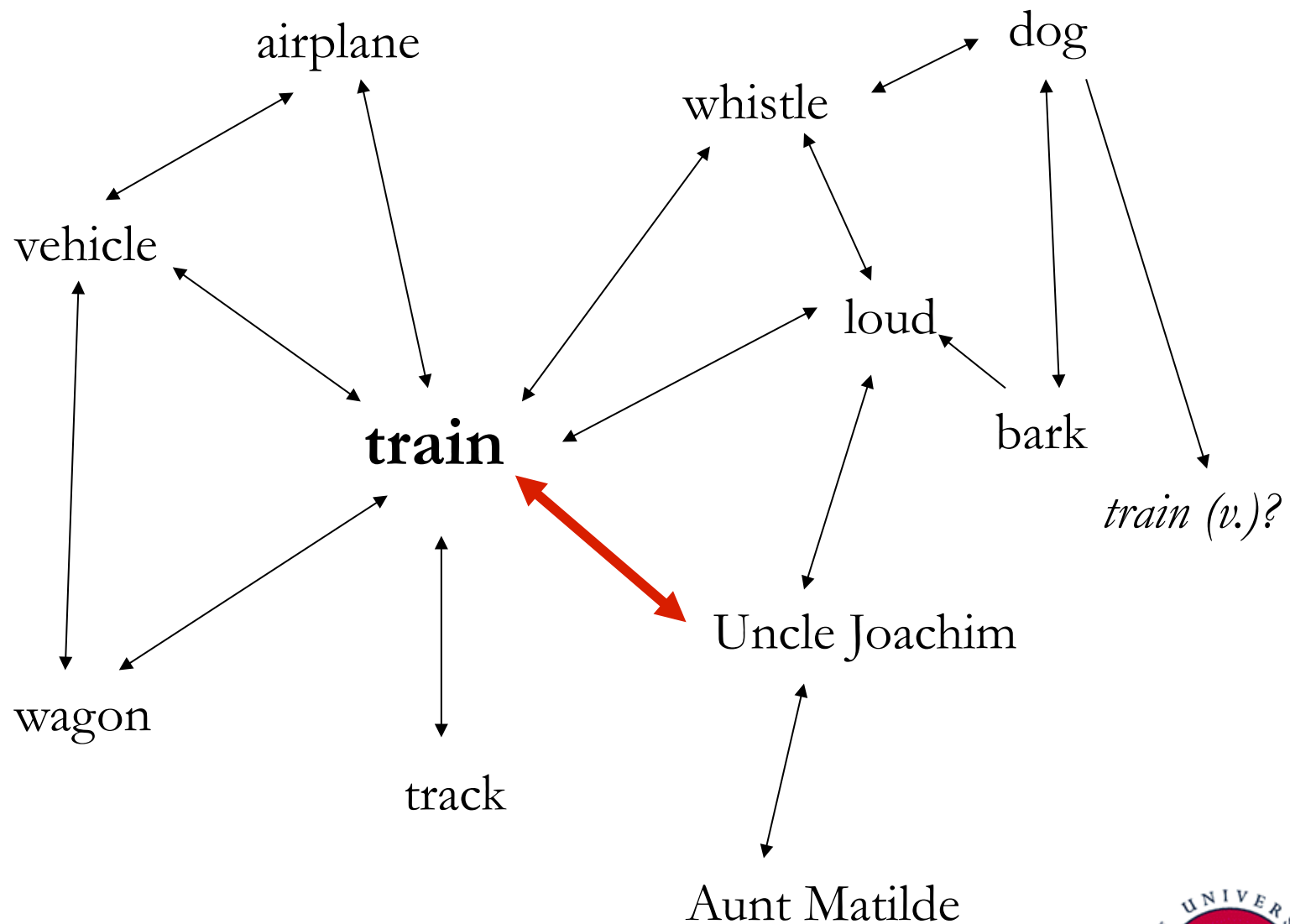
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Set Size

(Number of responses given by at least two people)



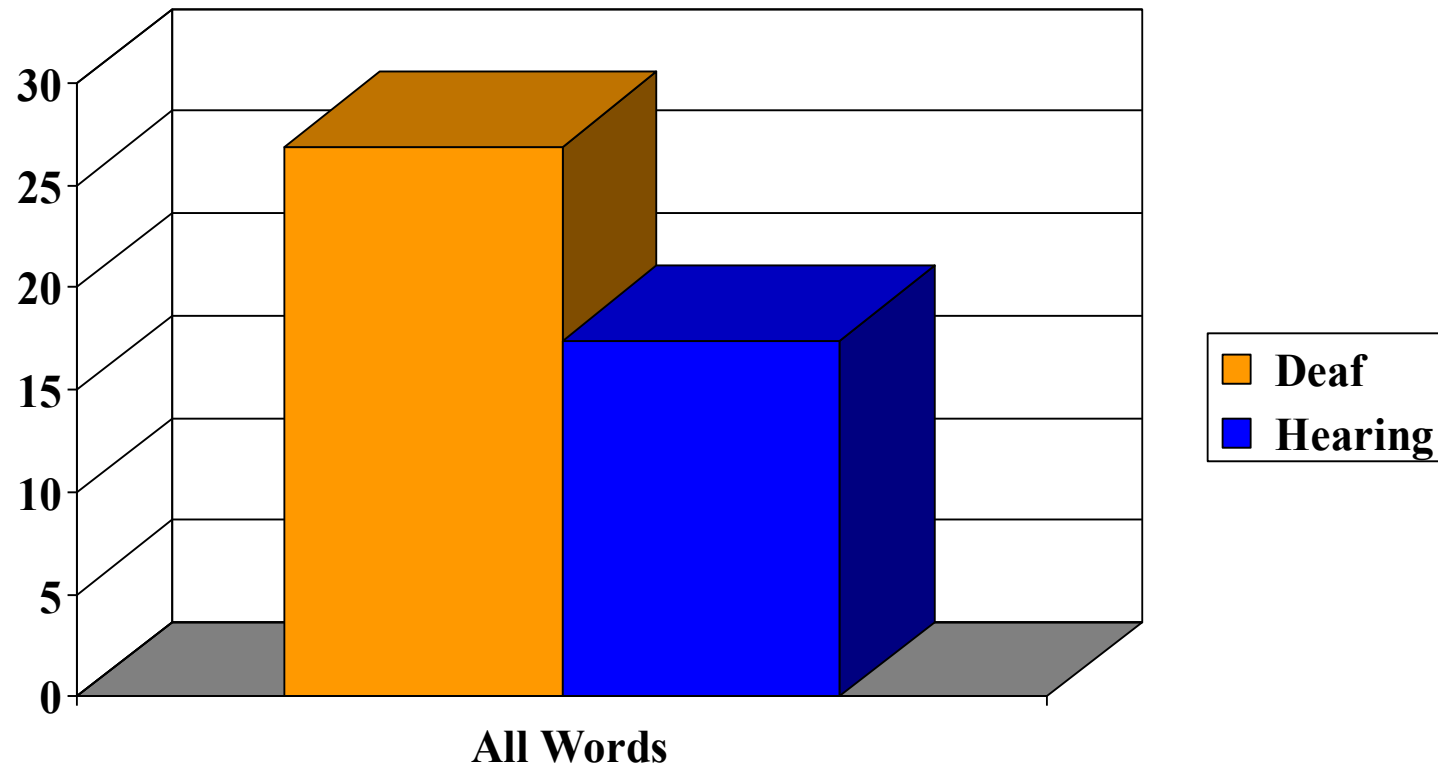


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Idiosyncratic Responses

(Number of responses given by only one person)



Cognitive Differences likely to Influence Learning Outcomes for Deaf Students

- Concept learning and knowledge organization
- Do deaf and hearing learners acquire concepts in similar ways? (*Marschark & Woll, 2012*)
- How are concepts activated by signs, words, and things? (*Moita, 2012*)
- How do these differences affect their use in the classroom?



Cognitive Differences likely to Influence Learning Outcomes for Deaf Students

- Memory
- Visual information processing
- Concept learning and knowledge organization
- Executive functioning and metacognition



Executive Functioning and Metacognition

- “Higher-order cognition,” using output from lower levels
 - Controlling of one’s own behavior
 - Self-monitoring of comprehension and learning
 - Knowing when to use context and prior knowledge



Bottom-up and Top-down Aspects of Reading

TOP

Knowledge

conceptual
(words, things)

strategic
(problem solving)

metacognitive / metalinguistic

discourse structure

grammar

vocabulary

morphology

phonology/orthography

BOTTOM

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Language Comprehension Involves Bottom-up and Top-down Processing

TOP

Knowledge

conceptual
(words, things)

strategic
(problem solving)

metacognitive / metalinguistic

discourse structure

grammar

vocabulary

morphology

phonology/orthography

BOTTOM

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Learning (Concepts, Language, Academic, and Social) Involves Bottom-up and Top-down Processing

TOP

Knowledge

conceptual
(words, things)

strategic
(problem solving)

metacognitive / metalinguistic

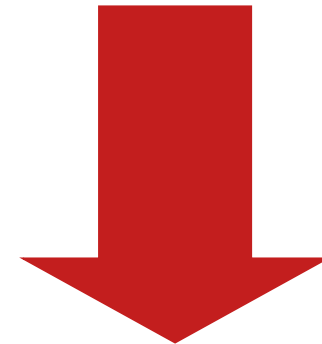
“ discourse structure

grammar

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BOTTOM

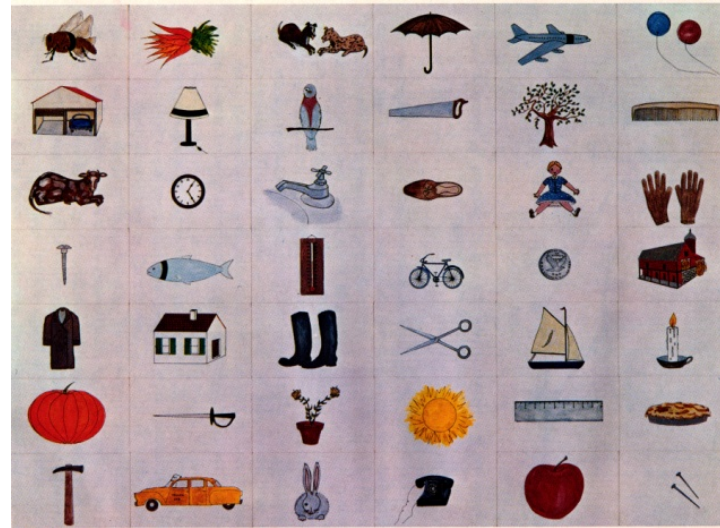
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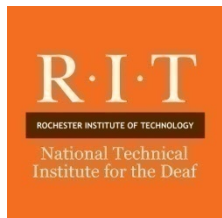




Liben (1979)



Marschark & Everhart (1999)



Executive Functioning and Metacognition

- Executive functioning, relational processing, and learning
- Having knowledge is not the same as knowing when and how to use it
- How can we teach deaf learners to better monitor language comprehension and learning?
- How can we increase automaticity in knowledge retrieval and application?





The TERENCE Project

FP7- ICT-257410

<http://www.terenceproject.eu>

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What Does It All Mean?

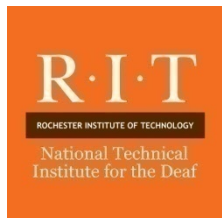


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What Does It All Mean?

- Deaf learners' academic challenges are related to differences in language comprehension, cognition, and learning strategies, not just language modality
- Deaf and hearing children have different knowledge, backgrounds, experiences, and learning strategies



What Does It All Mean?

- Differences \neq deficiencies
 - Cognitive differences can be strengths, weaknesses, or just differences, but all add to diversity in the classroom
 - Students and teachers must recognize those differences
- Deaf students can learn as much as hearing peers when taught by skilled teachers of the deaf
 - So, its likely because those teachers understand the differences and match them (explicitly or implicitly)



Take-Home Messages



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Take-Home Messages

- Don't believe everything you read
- Beware generalizations (and simple answers)
- Deaf children aren't hearing children who can't hear
- If we want to improve literacy and academic outcomes, it's not just about language
- We need to ask the right questions, even if they are difficult questions





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www.educatingdeafchildren.org