Can you think without words?

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Can you think without words?

- Can you think *without words*?
  (Thinking using images, scenes, etc.)
- Can you *think* without words?
  (Does language restrict the way we think?)
Can you think without words?

• Two readings:
  – Can you think *without words*?
    (Thinking using images, scenes, etc.)
  – Can you *think* without words?
    (Does language restrict the way we think?)

• Can you *think* without words?
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  – Can you think *without words*?
    (Thinking using images, scenes, etc.)
  – Can you *think* without words?
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    (Thinking using images, scenes, etc.)
  – Can you *think* without words?
    (Does language restrict the way we think?)

• Can you *think* without words?

• **But first**: A 3-slide intro to linguistics
Fry & Laurie (1989)
The study of language

- Letter/Sound level
- Word Level
- Sentence Level
The study of language

• Letter/Sound level
  – It is not hrad to raed a setcnene lkie tihs!

• Word Level

• Sentence Level
The study of language

• Letter/Sound level
  – It is not hrad to raed a setcnene lkie tihs!

• Word Level
  – Read to not it this like sentence hard is a.

• Sentence Level
The study of language

• Letter/Sound level
  – It is not hrad to raed a setcnene Ikie tihs!

• Word Level
  – Read to not it this like sentence hard is a.

• Sentence Level
  – Hold the newsreader's nose squarely, waiter,
    or friendly milk will countermand my trousers.
The study of language

• Discourse Level
Can you think without words?

• Sapir-Whorf hypothesis:
  – Language shapes/restricts the way we think
  – Different languages impose different restrictions

“The limits of my language mean the limits of my world”

Wittgenstein (Tractatus 5.6)
The case for maths

- Pirahã language – no words for numbers
- “Match-to-sample” tests:
The case for maths

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- Pirahã language – no words for numbers
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• Pirahã language – no words for numbers
• “Match-to-sample” tests:
  • Fail!
The case for maths

• Is it a cultural effect?
  – Language seems to be the key
    (EUSci Podcast #46)
The case for maths

• Is it a cultural effect?
  – Language seems to be the key
    (EUSci Podcast #46)

• Another explanation:
  – Language provides a mental shortcut
  – Recursive functions
Working memory & reference

• Referencing in crowded environments:
  – “The girl”
Working memory & reference

• Referencing in crowded environments:
  – “The girl”
  – “The girl by the bar”
Working memory & reference

• Referencing in crowded environments:
  – “The girl”
  – “The girl by the bar”
  – “The girl by the bar with the black hair”
Working memory & reference

• Referencing in crowded environments:
  – “The girl”
  – “The girl by the bar”
  – “The girl by the bar with the black hair”
  – “The girl by the bar with the black hair and the red dress”
Working memory & reference

• Referencing in crowded environments:
  – “The girl”
  – “The girl by the bar”
  – “The girl by the bar with the black hair”
  – “The girl by the bar with the black hair and the red dress”

  – “Mary”!
Working memory & reference

• How many apples were in the previous slide?
  – Try again
Working memory & reference

• How many apples were in the previous slide?
  – Try again
Working memory & reference

• How many apples where in the previous slide?
  – Try again
Working memory & reference

• How many apples were in the previous slide?
  – Try again
Working memory & reference

• How many apples were in the previous slide?
  – Try again
Working memory & reference

• How many apples were in the previous slide?
  – Try again
  – Limited to a small number of items at a time (<4)
WARNING:

MATHEMATICAL CONTENT AHEAD
(including lambda calculus)
Numbers and counting

A way of defining numbers:

- \( n := \lambda f x. f^{(n)}(x) \) and \( x = 0, \ f(x) = S(x) \)

- \( n := S(S(...(S(0)))) = S^n(0) \)
Numbers and counting

A way of defining numbers:

• \( n := \lambda f x. f^{(n)}(x) \) and \( x = 0, \ f(x) = S(x) \)

\[
n := S(S(...(S(0))) = S^n(0)
\]

• No number “essence”
  – Number of successive actions performed
Numbers and counting

• All you need:
  – A finite set of labels (sounds, fingers, etc.)
  – A recursive function (successor)

• Language provides both
  – Number words (one, seven, -teen, etc.)
  – Recursive constructions
Recursion in language

This is the man all tattered and torn.
Recursion in language

This is the man all tattered and torn
that kissed the maiden all forlorn
Recursion in language

This is the man all tattered and torn
that kissed the maiden all forlorn
that milked the cow with the crumpled horn
Recursion in language

This is the man all tattered and torn
that kissed the maiden all forlorn
that milked the cow with the crumpled horn
that tossed the dog
Recursion in language

This is the man all tattered and torn
that kissed the maiden all forlorn
that milked the cow with the crumpled horn
that tossed the dog
that worried the cat
This is the man all tattered and torn
that kissed the maiden all forlorn
that milked the cow with the crumpled horn
that tossed the dog
that worried the cat
that killed the rat
Recursion in language

This is the man all tattered and torn
that kissed the maiden all forlorn
that milked the cow with the crumpled horn
that tossed the dog
that worried the cat
that killed the rat
that ate the malt
Recursion in language

This is the man all tattered and torn
that kissed the maiden all forlorn
that milked the cow with the crumpled horn
that tossed the dog
that worried the cat
that killed the rat
that ate the malt
that lay in the house
Recursion in language

This is the man all tattered and torn
that kissed the maiden all forlorn
that milked the cow with the crumpled horn
that tossed the dog
that worried the cat
that killed the rat
that ate the malt
that lay in the house
that Jack built.
Recursion and counting

• Pirahã don’t have recursive language
  – Only one level of embedding allowed
  – Therefore they don’t have numbers
    (or is it the other way round?)
Recursion and counting

• Pirahã don’t have recursive language
  – Only one level of embedding allowed
  – Therefore they don’t have numbers
    (or is it the other way round?)

• Can they be taught how to count?
  – Evidence suggests they can’t
  – But can they be taught to use recursions?
Can you think without words?

• YES!
• But you can do much more *with* them...
• Data reduction
Can you think without words?

• YES!
• But you can do much more *with* them...
• Data reduction

Image = 172,000 bytes (compressed)

1000 words = 1,000 bytes