How children learn words and how we can support the early stages of language acquisition

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Learning Language is Difficult

• Speech synthesisers show difficulties in detecting words from speech
• Computational linguistics parsers show complexity of sentences
Learning Language is Difficult

- Time flies like an arrow
  - Time passes quickly
  - A particular sort of fly, a time fly, is very fond of arrows
  - Record the speed of flies like an arrow would record their speed


Children are Astonishingly Good at Learning

So how do children learn?

• Three tasks
  – Identifying words in continuous speech
  – Mapping words to their meanings
  – Learning the grammatical role of words in sentences
• What information do children use for each of these tasks?
• How can we support learning of these tasks?

Task 1: Identifying words

• “Words in a sea of sound” (Saffran, 2001, Cognition, 81, 149-169)
• “How do children recognise speech?”
  – How do children wreck a nice beach???
Identifying words

• Sounds that occur together often go together
• Sesotho child-directed speech:

• nkawena namane kenamonna kena helang hlemonnakena bathobabaholobateng monna monna uahanakebona monna …
Transitional probabilities

• How predictable is the next syllable?
  – peng …
  – cathe …
  – trum …

  – the …
  – it …
  – he …

Transitional probabilities

• Children as young as 6 months can use transitional probabilities to identify words
• But transitional probabilities are not enough on their own

ba-by
ba-con
bay-be…

Multiple information sources for identifying words

• Final syllables of words tend to be slightly longer
• First syllables of words (in English) tend to be stressed
• By 12 months, infants can use these cues

Multiple information sources for identifying words

- **Using known words**
- **Maggie (6 months old) hears:**
  - “Maggie’s bike had big, black wheels. The girl rode Maggie’s bike. The bell on Maggie’s bike was really loud. She knew Maggie’s bike could go very fast…”
- **Using function words:**
  - the bike had big, black wheels. The girl rode the bike. The bell on the bike was really loud. She knew the bike could go very fast…”

https://uk.pinterest.com/pin/456200637225402178/

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How we can support identifying words

- **Increase quantity:**
  - Helps learning the transitional probabilities
  - Supports use of frequent words to “anchor” other word learning
- **Increase quality:**
  - Speech without background noise
    - Identify relevant speech sounds (phonemes)
  - Child-directed speech
    - Emphasis on lengthening and stress information
Task 2: Mapping words to meanings

• How do you learn a word’s meaning?
• Infinite number of possibilities for a word’s meaning
  – “gavagai” problem (Quine, 1960)

Multiple information sources for mapping words to meanings

• Cross-situational statistics
  – Children can keep track of word-object associations at 18 months old (Smith & Yu, 2008)
  – More objects results in poorer learning


Multiple information sources for mapping words to meanings

• Mutual Exclusivity
  – Look at “flerbant”?

  – By 12 months, children can do this
  – More objects makes performance poorer

Kalashnikova, Mattock, & Monaghan (in press). *First Language*.

Multiple information sources for mapping words to meanings

• Object naming is accompanied by gesture 15% of the time
• Object name is emphasised 50% of the time
• Object name in context aids learning (Monaghan & Mattock, 2012)

  – Which is the **FLERBANT**?

How we can support mapping words to meanings

• Keep environment uncluttered
  – Optimal level of stimulation
• Use eye gaze and gesture when describing objects or actions
• Use emphasis of key words
• Use phrases or sentences, not single words
• Use repetition, with varied context

Task 3: Learning the grammatical role of words in sentences

• How do children learn that there are nouns and verbs in language?
• How do children link these words to meanings?
• Problem: objects and actions co-occur
  – “The girl is throwing”
Learning the grammatical role of words in sentences

• These categorising words are exactly those useful also for identifying words
  – You ____
  – I ____
  – The ____
  – Mommy’s ____
• Children can use these contextual cues from 16 months (Sandoval & Gomez, 2013)
• Context words can be used to categorise early in language learning:
  – At the same time as when they are being used for identifying words (Frost et al., 2016)


How can we support learning the grammatical role of words in sentences

• We learn how to use words at the same time as learning what those words are
  – Interdependence of complex language use with very early stages of language learning
  • Early language problems have a snowball effect for complex language skills
• Quantity:
  – Increased exposure increases reliability of information
• Quality:
  – Use words in contexts
  – Vary the context
Summary

• Language learning is hard
• Children are amazingly good at it
• Three tasks
  – Identifying words
  – Linking words to meanings
  – Learning grammatical role of the words
• Parallel not sequential tasks
• Similar information supports all three tasks:
  – Exposure, exposure, exposure
  – Quality of the speech, quality of the environment