Language Acquisition: Verb Learning

SS16 - (Embodied) Language Comprehension

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What is learned

- The sounds of a language (phonetics)
- The sound patterns of a language (phonology)
- Lexical items (words, morphemes, idioms, etc)
- Rules of word-formation (morphology)
- How words combine into phrases/sentences (syntax)
- How to derive meaning from a sentence (semantics)
- How to properly use language in context (pragmatics)

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Action-words & the body

- Locke: “Differences in Experience lead to differences in meaning acquired”

- Blind vs. Sighted Children (Landau & Gleitman 1985)

  - Both distinguished exploratory and achievement verbs, i.e. look and see! (“Touch but don’t look…”)

  - Both understood that only physical objects only can have attributes like color (green cows not green ideas)

Action-words & the body

- But experience is sensory and perceptual

“Look up!”

Learning “action-words”

- Observational word learning
  - Visual scenes
  - (Social cues)
  - Labels

“The dog is **running**!”

Difficulties for observational learning

- Scene segmentation, causation, agency etc
- Multiple event interpretations: “push” vs “move”
- Paired verbs: “chase” vs “flee”, “buy” vs “sell”
  - Effect of negative evidence in probabilistic learning?
- How can we ever be 100% sure of a word’s meaning?

Mechanisms

- Scene segmentation
- Semantic boot strapping
- Syntactic boot strapping
- Motherese

Scene segmentation

- How to parse the scene into events, actions?
  - Experience agency, causality etc pre-verbally!

1. Perception (e.g. agency: surprise from noncaused action at 6 months)

2. “Non-verbal vocabulary of meanings” (attention to role changes in movies at 14 months)

3. Linguistic meaning and categorization

(Mandler, 1992)

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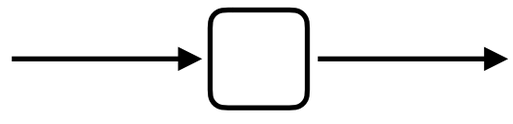
Image-schemas

- Image-schemas:
  - Basic spatial & conceptual analysis
  - “dynamic analog representations of spatial relations and movements in space” (Mandler, 1992)
  - *caused motion* 

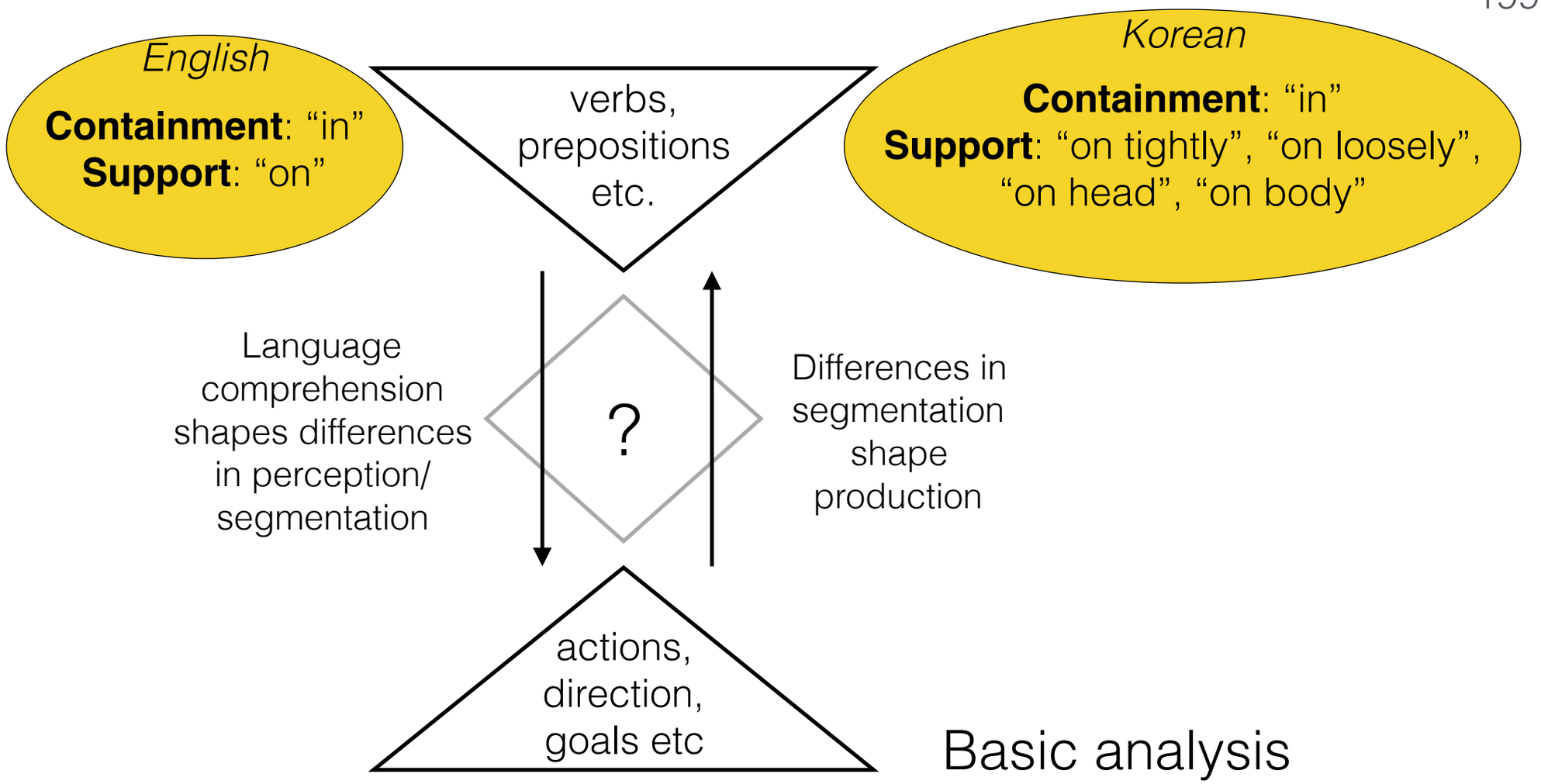
Verbs (motion events)

- Theme - entity of interest
- Source - origin of motion
- Goal - destination
- Path - trajectory (“along, across”)
- Location - PP phrase
- Cause - “feed” vs “cause to drink”
- Conveyance - means, “by foot”
- Manner - speed/intensity, “hammer”

(Talmy, 1985; Frawley, 1992, Golinkoff et al 1995)

From Image-schemas to language

(Choi & Bowerman, 1992)



Basic analysis

The Lexical Principles Framework

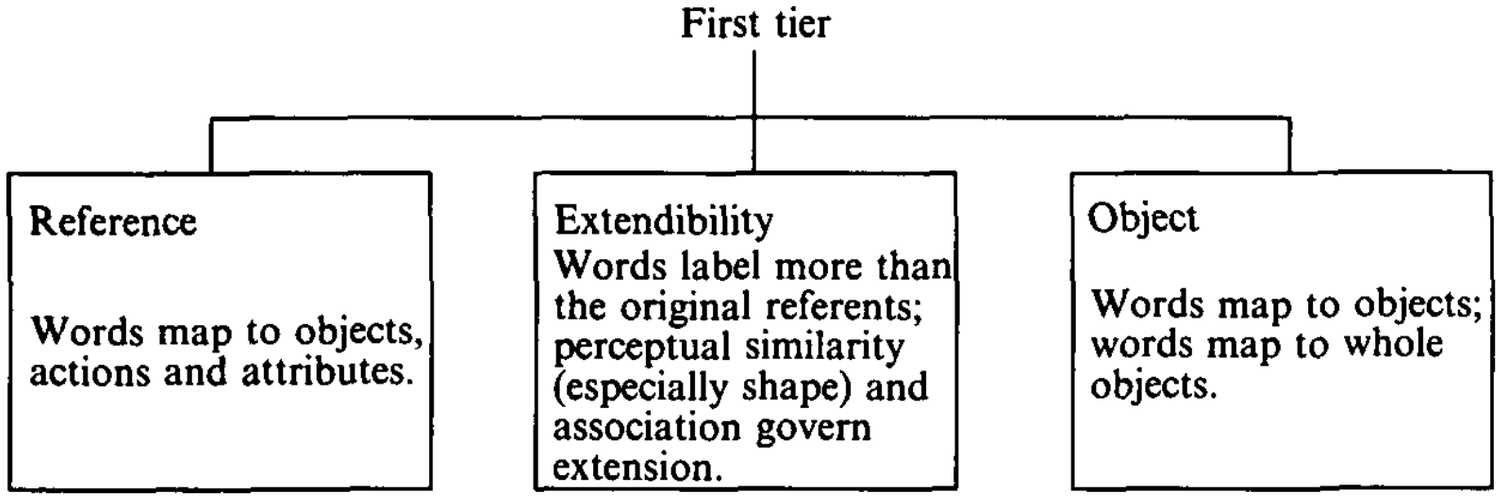
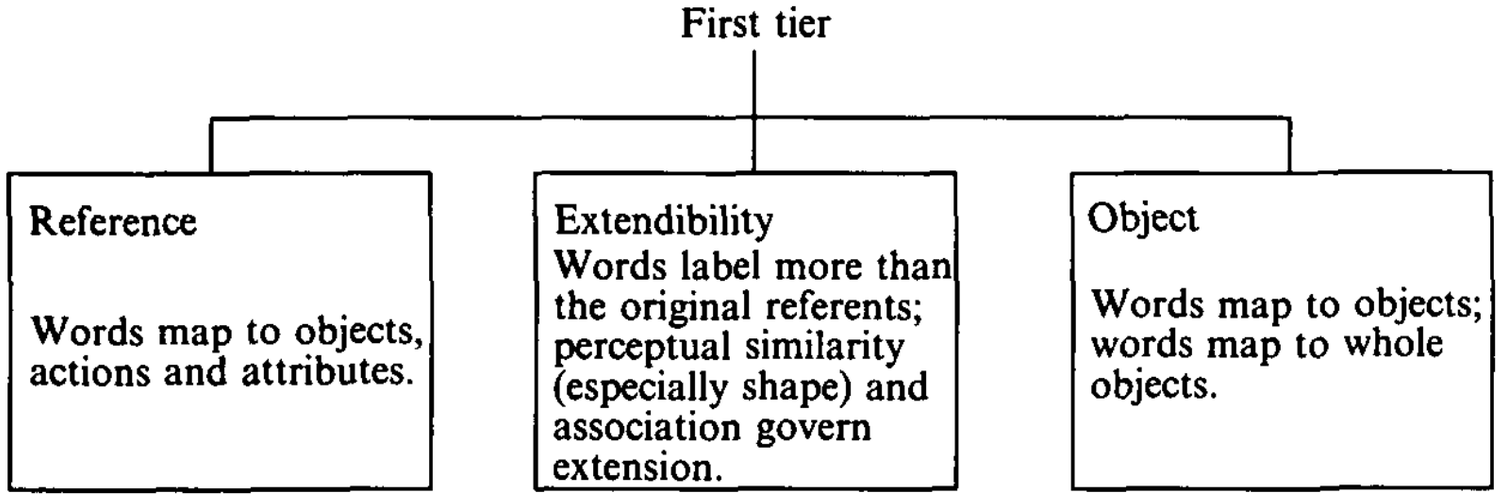


Fig. 1. Principles of lexical acquisition – a summary.

(Golinkoff et al 1994)

The Lexical Principles Framework



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Mechanisms

- Scene segmentation ✓
- Semantic boot strapping
- Syntactic boot strapping
- Motherese

Semantic Bootstrapping

- Similar verbs probably have the same structure!
  (Zwicky 1971; Grimshaw 1981; Pinker 1984)
- E.g. subcategorization frame:
  - “run to <location>” | “walk to <location>” | “stroll to <location>”

Semantic Bootstrapping

> “If you invent a verb, say greem, which refers to an act of communication by speech and describes the physical characteristics of the act (say a loud, hoarse, quality), then you know that . . . it will be possible to greem (i.e., to speak loudly and hoarsely), to greem for someone to get you a glass of water, to greem at your sister about the price of doughnuts, to greem "Ecch" at your enemies, to have your greem frighten the baby, to greem to me that my examples are absurd, and to give a greem when you see the explanation. (p.232)

(Zwicky 1971)

Semantic Bootstrapping

- To understand the meaning of a sentence, the child
  - derives meaning from observation
  - derives structure from prior events/meanings
- But: “Don’t eat the baby - she’s dirty!” (analogous to “sink”)
- (better: “don’t drink the baby” - similar to “feed”)
- Word-to-world cannot get us all meanings…

Mechanisms

- Scene segmentation ✓
- Semantic boot strapping ✓
- Syntactic boot strapping
- Motherese

Syntactic Bootstrapping

(Gleitman 1990)

- Landau and Gleitman (1985): “syntax is source”
- Sentence-to-world instead of word-to-world
  - Verbs dictate syntax
  - Transitivity: subject must represent semantic content

Syntactic Bootstrapping

- Predicate-argument relationship is typically preserved in surface structure, verb = predicate & nominals = arguments

- Unary relation - intransitive verb (“fall”)

- Binary relation - transitive (“push sth/so”)

- Path - prepositional phrase (“put sth on sth”)

- Perception/Cognition - causal complement (“think that …”)

Syntactic Bootstrapping

- Verbal structure is a <u>function of meaning</u>
  - "give" always takes three noun phrases: agent, theme, goal/recipient
- Syntax and Semantics complement each other
- Semantic Bootstrapping: verbs with similar meaning dictate similar sentence structure

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Syntactic Bootstrapping

- Understanding semantic implications of syntax can help to acquire meaning:
  - “John is greeming.”
  - ~~“pull”~~, ~~“chase”~~, “sneeze” …
  - “think”!

TABLE 4
Scenarios and Their Sentential Descriptions

	Scenario	*Sentence*
no. of arguments	1. (a)Rabbit eating.	The rabbit moaks.
	(b)Elephant feeding rabbit.	The elephant moaks the rabbit.
	2. (a) Monkey pushing elephant.	The monkey pumes the elephant.
	(b) Elephant falling.	The elephant pumes.
canonical structural agent/ patient positions	3. (a) Monkey riding elephant.	The monkey gorms the elephant.
	(b) Elephant carrying monkey.	The elephant gorms the monkey.
	4. (a) Rabbit fleeing skunk.	The rabbit zarps the skunk.
	(b) Skunk chasing rabbit.	The skunk zarps the rabbit.
structural positions with preps	5. (a) Rabbit giving a ball to elephant.	The rabbit ziffs a ball to the elephant.
	(b) Elephant taking a ball from rabbit.	The elephant ziffs a ball from the rabbit.
	6. (a) Skunk putting blanket on monkey.	The skunk is biffing a blanket on the monkey.
	(b) Skunk covering monkey with a blanket.	The skunk is biffing the monkey with a blanket.

Note. All children were exposed to the same six scenes (each scene has two plausible interpretations, called (a) and (b) in the left-hand column). Along with these scenes, half of the children heard (a) stimulus sentences and half heard (b) stimulus sentences (with appropriate counterbalancing across children and stimuli).

85% congruent responses with canonical semantic interpretation

Mechanisms

- Scene segmentation ✓
- Semantic boot strapping ✓
- Syntactic boot strapping ✓
- Motherese

Motherese

- Sentence-to-world still too weak?
- Many verbs share surface structure AND context not disambiguating
- “Do you want a cookie?” vs “Did you eat the cookie?”
  - Physical actions preferred over mental terms (Gillette 1992)
- But: “Did vany GORP to blitso the ribenflak?”

Motherese

- Do mothers produce (mainly) helpful syntax?
  - (so that this could indeed be a useful learning cue for young children)

Motherese

- Data collection:
  - 8 mothers
    - 1 hour interaction with child (12-25 months)
    - Children’s utterance 1.2-1.6 words long, no verbs
- 24 verbs occurring 32x from min 4 mothers

Motherese

	Verbs		
	know	**get**	**put**
V NP PP		+	+
V NP	+	+	
V	+		
V S	+		

- 7 syntactic clusters detected
- Verb similarity judgments revealed 7 semantic clusters
- Verb overlap in synt./ sem. cluster

Motherese

	Syntactic clusters		
Semantic Clusters	**1 (V PP) - 3**	**2 (V S) - 2**	**3 (V NP PP) - 6**
1 (Cognition/ Perception)	1	2	0
2 (Active)	2	0	6
3 (Communication)	1	1	1
4 (Mental)	0	2	1

Motherese

- Results:
  - Predict correct meaning without semantic information
  - Compare to prediction based on semantic cluster
  - ➡ Significantly better prediction

But still …

- Maternal utterances often don't directly refer to an ongoing action (Tomasello, 1995)

  - Impending (65%), ongoing (31%), completed (5%)

Learning from “context”

- Syntactic & semantic cues
- Word/Sentence-to-World mapping
  - Referent action visible
  - Referent action NOT visible!
  - Children learning meaning of “plunk” in 3 conditions (impeding, ongoing, completed) - better performance in the “impeding” condition

Upcoming actions

- Context extends to upcoming events
- Children hold a new verb in mind and form an *expectation* for an upcoming event:
  - 24-months old watch an action including a catapult with neutral language
  - Later are shown the catapult and hear “Now let’s *meek* Big Bird”
  - Performed vs not-performed action
  - Similarly good verb learning performance!

Summary

- Verb learning requires
  - Scene segmentation and basic action comprehension
  - Initial language competence
    - Semantic bootstrapping
    - Syntactic bootstrapping
    - (Mothers to be considerate)
    - Memory and anticipation for word mapping

References

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- Tomasello, M. and Merriman, W., ed. (1995). Beyond names for things - Young children's acquisition of verbs. Psychology Press.

  - Tomasello, M. "Pragmatic contexts for early verb learning" p.115-146.

  - Golinkoff, R. et al. "Lexical principles can be extended to the acquisition of verbs" p.185-221

  - Lederer, A. et al. "Verbs of a feather flock together: Semantic information in the structure of maternal speech" p. 277-297