

Sentence Processing Mechanisms Influence Cross-Situational Word Learning

JUDITH KÖHNE (JUDITH@COLI.UNI-SB.DE) & MATTHEW CROCKER, SAARLAND UNIVERSITY



FOREIGN LANGUAGE WORD LEARNING IN THE WILD

• There are important top-down cues for *foreign language (FOL)* learners who encounter novel words in outside-classroom situations

1) The visual context

• Unknown words can be mapped onto referents
• People can even find world-word mappings when relations are ambiguous by keeping track of co-occurrences over situations (cross-situational word learning, CSWL, Yu & Smith, 2007)

2) The linguistic context

• Already gained knowledge about parts of the sentence helps to get more knowledge (bootstrapping effects)
• Sentence processing mechanisms (e.g. prediction) apply to FOL comprehension and may influence FOL acquisition (FOLA)

3) World Knowledge

• Knowledge about real-world action-object relations, for instance, enables making inferences

INTERPLAY OF CUES: HYPOTHESES

- 1) CSWL mechanisms operate successfully for FOL learners when novel nouns are embedded in sentences
- 2) Verb-driven expectations based on semantic verbal restrictions, the visual world, and world knowledge guide learners' (visual) attention (Altman & Kamide, 1999)
- 3) These verb-driven expectations identify subsets of world-referents that novel nouns are likely to denote, constraining CSWL

EXPERIMENT 1

CSWL in natural context & interacting with verb constrains

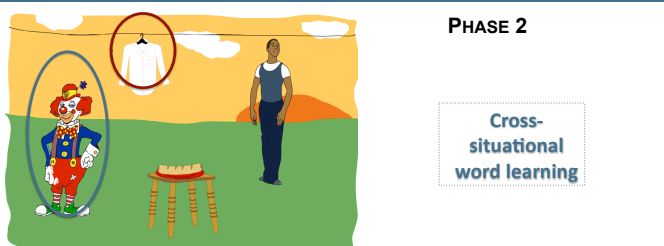
SET-UP

- Ex1: 24 participants
- Miniature semi-natural language, based on Indonesian
- 6 restrictive verbs (3 food & 3 clothing verbs), suffix *-mema*
- 12 nouns: 6 characters & 6 objects (3 food, 3 clothing items)
- Word order SVO, same article for all NPs (*si*)

Phase 1: People learned 6 verbs (& are tested)

Phase 2: Scenes & sentences: comprehension & noun learning

Phase 3: Forced choice vocabulary test



[*Si badut*]_{NP1} [*tambamema*]_{verb} [*Si kemei*]_{NP2}
DET clown sew-MEMA DET shirt
'The clown will sew the shirt.'



[*Si badut*]_{NP1} [*bermamema*]_{verb} [*Si jafek*]_{NP2}
DET clown eat-MEMA DET corn
'The clown will eat the corn.'

RESULTS

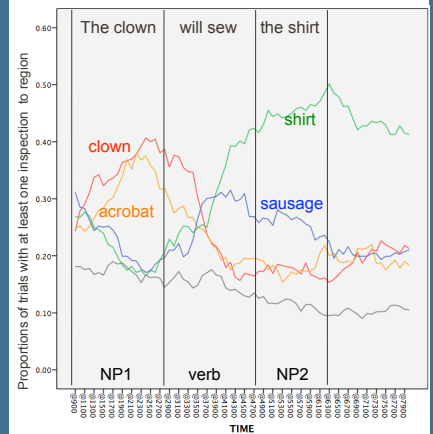
• Sig. bigger difference in looks to **target vs. distractor object in verb & NP2** than difference in looks to **target vs. distractor character in NP1**

⇒ Verb-restrictions enhanced inspections on target object & caused anticipatory looks

⇒ Linguistic context was rapidly exploited & seemed to improve understanding

- Nouns learned sig. better than chance (25%): 55%
- However, objects not learned sig. better than characters
- ⇒ No direct evidence for bootstrapping of noun learning

EYE-MOVEMENTS PHASE 2 (Ex1)



EXPERIMENT 2

Results supported for SVO (72% noun learning) and OVS (51%)

EXPERIMENT 3

Manipulation of the degree of verb restriction to study the interaction of CSWL and verb-derived inference learning

SET-UP

- 32 participants
- 4 restrictive verbs (e.g. eat), 2 non-restrictive verbs (e.g. take)
- 14 nouns: 2 characters & 12 objects (food, clothing, containers)
- SVO

- 1) Verb learning & testing
- 2) Scenes & sentences (object names 1-6); vocabulary test (with confidence ratings)
- 3) Scenes & sentences (object names 7-12); vocabulary test (with confidence ratings)

CONDITIONS (NOUN LEARNING)

1) Verb is rest. & 1 potential referent object (3 distractor objects):
Si laki bermamema si sonis ('The man eats the tomato')
tomato, shirt, skirt, vase, man

1) Verb is rest. & 2 potential referent objects (2 distractors):
Si laki bermamema si sonis ('The man eats the tomato')
tomato, toast, skirt, bucket, man

2) Verb is non-rest. & 4 potential referent objects (1 agent):
Si gadis tambamema si daram ('The woman takes the can')
broccoli, skirt, vase, can, woman

RESULTS

- ✓ Noun learning significantly above chance for all conditions
- ✓ Nouns learned best and confidence ratings highest for Condition 1 and lowest for Condition 3
- ⇒ Verb-restrictions boosted noun learning

SUMMARY

- FOL learners conducted **CSWL with words embedded** in sentences and referents as parts of scenes
- Learners quickly and automatically **exploited linguistic and visual contextual information**, together with their world knowledge > verbal constraints, scene, plausibility
- **Anticipatory identification of plausible world referents substantially reduce the complexity of purely cross-situational word learning**