Semantic Density in Word Learning: A Preliminary Report

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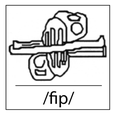
Types of Representations

- Phonological: individual sounds (e.g., /f/, /i/, /t/)
- Lexical: whole-word form (e.g., /fit/)
- Semantic: meaning or referent 

Word Learning

- Hear a novel word paired with a novel object



- Activate existing phonological representations (e.g., /f/ /i/ /p/)
- Activate existing lexical representations (e.g., /fit/, /lip/) but no exact match
  - Formation of new lexical representation triggered (i.e., word learning)
  - Number of existing lexical representations, namely lexical density, influences learning by children and adults (Storkel, 2001, 2004; Storkel, Armbruster, & Hogan, 2006; Storkel & Rogers, 2000)
  - Many lexical neighbors > few lexical neighbors
- Activate existing semantic representations (e.g., trumpet, horn) but no exact match
  - Formation of new semantic representation triggered (i.e., word learning)
  - Does the number of existing semantic representations, namely semantic density, influence learning?

Purpose

- Study 1: Determine semantic neighbors for a set of novel objects
- Study 2: Compare learning of novel objects with many versus few semantic neighbors

Study 1

- Participants: 82 adults (M = 19 years; SD = 1.3 years) & 92 preschool children (M = 4; 6; SD = 0; 8)
- Stimuli: Nonobjects developed by Kroll & Potter (1984)
- Procedure: Discrete association task
  - Show picture → Report first word that comes to mind
  - Responses reported by 2+ participants in the same group (adult vs. child) = semantic neighbor for that group
- Results: Similarity between adult and child semantic neighbors
  - Adult semantic density positively correlated with child semantic density, $r(1, 47) = 0.33$, $p < 0.05$, $r^2 = 0.11$
  - No significant difference in number of semantic neighbors reported by adults or children, $t(1, 46) = 0.61$, $p > 0.50$
  - 30% of child semantic neighbors also were adult semantic neighbors but variability across neighbors
    - Semantic neighbors reported by 4 or fewer children rarely were reported by adults as semantic neighbors
    - Semantic neighbors reported by 5 or more children frequently were reported by adults as semantic neighbors

Study 2

- Participants: 18 adults (M= 22 years); 36 preschool children (M = 4;8; SD = 0;7)
- Stimuli:

Few Semantic Neighbors (i.e., 10th-25th percentile)			Many Semantic Neighbors (i.e., 50th-75th percentile)		
Nonobject	Objectlikeness Rating	Adult Semantic Density	Nonobject	Objectlikeness Rating	Adult Semantic Density
(71) 	4.6	7	(29) 	3.3	12
(75) 	3.3	8	(59) 	4.3	11
(48) 	3.1	8	(52) 	3.3	12
(68) 	3.2	8	(80) 	4.8	12
(79) 	3.6	8	(13) 	3.6	12
M	3.6	8	*M*	3.9	12
SD	0.6	0.4	*SD*	0.7	0.4

Objectlikeness ratings are from Kroll & Potter (1984).
Rating of 1 = "looked very much like a real object."Rating of 7 = "looked nothing like a real object."

Set A Nonwords			Set B Nonwords		
Nonword	Positional Segment Sum	Lexical Density	Nonword	Positional Segment Sum	Lexical Density
hɛg	0.13	13	meɪb	0.11	13
fip	0.12	13	jʌt	0.11	12
jeɪn	0.13	12	boʊg	0.12	12
maɪf	0.11	11	wun	0.14	11
goʊm	0.12	11	pig	0.13	11
M	0.12	12	*M*	0.12	12
SD	0.01	1	*SD*	0.01	1

Pairing of nonword sets with nonobjects was counterbalanced across participants.

- Procedure:
  - Exposure: Nonobject-nonword pairs presented in a game format
  - Measures of learning: Picture naming and referent identification
- Results: No significant effects for adults yet (power) but significant interactions for children

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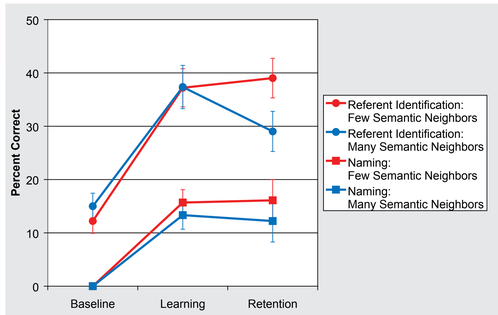
Study 2 cont.

- Child Results:
  - 2 semantic density (low vs. high) x 2 measures of learning (naming vs. referent identification) x 2 time (learning vs. retention) ANOVA
  - Semantic density x time significant, $F(1, 35) = 4.15$, $p = 0.05$, $\eta_p^2 = 0.11$
  - No effect of semantic density during learning, $F(1, 35) = 0.15$, $p > 0.60$, $\eta_p^2 < 0.01$
    - Few semantic neighbors = Many semantic neighbors
  - Significant effect of semantic density at retention, $F(1, 35) = 8.65$, $p < 0.01$, $\eta_p^2 = 0.20$
    - Few semantic neighbors > Many semantic neighbors



Summary and Conclusions

- Similarity to existing representations influences word learning, regardless of whether similarity involves lexical or semantic representations
- Direction of effect of similarity varies by type of representation
  - Many lexical neighbors facilitates learning
  - Many semantic neighbors impedes learning
- Similarity influences retention
  - More research needed for influence during immediate learning

References

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