Imageability in Subject-Verb Agreement Production

Maureen Gillespie, University of Illinois Urbana-Champaign

Neal J. Pearlmutter, Northeastern University

INTRODUCTION

What sources of information influence verb number during agreement computation?

Grammatical number: Indicates whether a noun or noun phrase is grammatically specified as singular or plural.

Conceptual number: Indicates whether a noun phrase refers to a single thing or multiple things in the real world.

How does conceptual number affect agreement computation?

If conceptual number affects agreement computation, more plural verbs should follow conceptually plural subject NPs (e.g., *the label on the bottle(s)*) than conceptually singular subject NPs (e.g., *the bridge to the island(s)*).

- Conceptual number effects mixed across languages and studies (e.g., Vigliocco et al., 1996)

Effect of conceptual number is modulated by imageability.

Eberhard (1999) examined the effect of imageability on agreement with conceptual number.

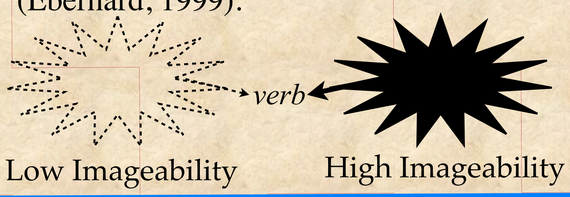
- As subject NP imageability increased, more plural verbs followed conceptually plural subject NPs.

What is the source of the imageability effect?

Direct assignment of conceptual number
Referents that are less imageable are more likely to be assigned a singular conceptual number because they lack clear boundaries and may be conceived of as undifferentiated units (Eberhard et al., 2005).

Low Imageability High Imageability

Weighting of conceptual number
Increased imageability increases the weighting of conceptual number during agreement computation: Speakers are more likely to produce a verb consistent with the conceptual number of the referent (Eberhard, 1999).



Low Imageability High Imageability

EXPERIMENT 1

How does imageability affect agreement in conceptually singular items?

METHOD

Stimuli & Design

High Imageability: The trophy with/that had the fancy design(s)

Low Imageability: The story with/that had the blatant lie(s)

N1 N2

- Semantic integration, number of adjectives, and overall meaning matched across structure
- Singular vs. plural local nouns; head nouns always singular; non-distributive
- 32 critical items (16 High Imageability, 16 Low Imageability); 88 fillers (36 plural head)
- Preambles presented visually, read aloud and completed as full sentences.

AGREEMENT ERROR RATE PREDICTIONS

Direct assignment of conceptual number
Main effect of N2 number: Plural > Singular
Main effect of imageability: High > Low

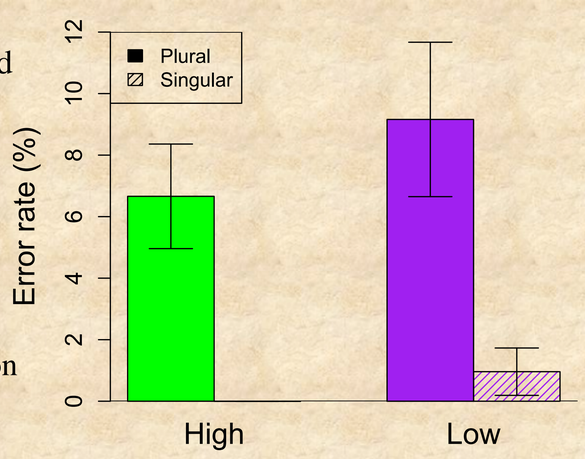
Weighting of conceptual number
Main effect of N2 number: Plural > Singular
Main effect of imageability: High < Low

ANALYSIS

Identical statistical patterns for subject- and item-based analyses, using empirical logit weighted linear regressions (Barr, 2008).

RESULTS

Plural > Singular (mismatch effect)
High < Low
High mismatch = Low mismatch
No significant effects of structure manipulation



SUMMARY

Imageability affects the weighting of conceptual number during agreement computation.
Errors are more likely when conceptually singular preambles are less imageable.

EXPERIMENTS 2 & 3

Does imageability affect error production in sentences with complex modifiers?

METHOD

Experiment 2 Stimuli (Verb frequency manipulation)

Experiment 2A (High Imageability): The farmer that pushed/poked the stubborn goat(s)

Experiment 2B (Low Imageability): The evidence that confused/puzzled the witness(es)

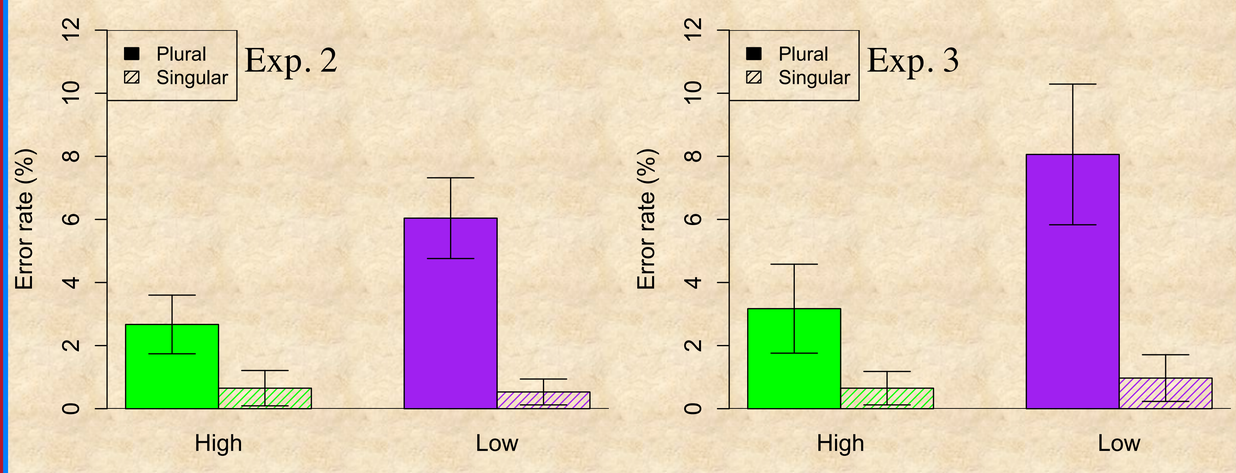
Experiment 3 Stimuli (Verb transitivity manipulation)

Experiment 3A (High Imageability): The actor who yelled/quoted the line(s)

Experiment 3B (Low Imageability): The memoir that denied/confessed the transgression(s)

- Singular vs. plural local nouns; head nouns always singular; non-distributive
- 24-36 critical items; 80-88 fillers (24-36 plural head)
- Frequency (Exp. 2) and transitivity (Exp. 3) manipulations - no effects
- Preambles presented visually, read aloud and completed as full sentences.

RESULTS & SUMMARY



Errors were more common when preambles referred to less imageable referents.
Mismatch effects were larger for low imageability than high imageability referents.
Similar to the imageability findings of Experiment 1 in preambles with complex clauses.

META-ANALYSIS

Does overall imageability and/or individual noun imageability affect subject-verb agreement computation?

METHOD

Experiments included

- Experiment 1
- Experiments 2A&B
- Experiments 3A&B
- Solomon & Pearlmutter (2004, Exp. 5)
- Gillespie & Pearlmutter (2011; Exp. 1A&B)

Obtained overall imageability ratings and N2-N1 relative imageability ratings for all preambles.

Analyses

Empirical logit weighted linear regression on by-item error rates (plural N2 conditions).

RESULTS

- Increasing overall imageability ⇨ Lower error rates ($p < .001$)
- Increasing N2-N1 imageability did not affect error rates

SUMMARY

- Increasing imageability of the full preamble (i.e., the referent) reduces error rates for conceptually singular items.
- Relative imageability of nouns within the preamble does not affect agreement computation.

DISCUSSION

Imageability affects the weighting of conceptual number during agreement computation.

Increased overall imageability leads to lower error rates for conceptually singular preambles, while increased imageability leads to higher error rates for conceptually plural preambles (Eberhard, 1999).

- Increased overall imageability leads to more verb agreement with the conceptual number of the subject NP.

Implications for models of agreement computation

The influence of conceptual number (Marking) on the verb should be weighted by imageability (cf. Eberhard et al., 2005).

- Interference from other sources of noise in the system (e.g., N2 number) is more likely when conceptual number has less of an influence on agreement computation.

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