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Effects of Non-Notional-Number Semantic Relations On Subject-Verb Agreement Errors during Sentence Production

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INTRODUCTION

What is the relationship between semantic relatedness and semantic integration—two overlapping meaning-based factors affecting S-V agreement?

Bock & Miller (1991) established the mismatch effect: Participants produced more subject-verb agreement errors while making sentence completions for preambles containing a singular head noun paired with a plural local noun relative to corresponding singular head noun-singular local noun controls. Although grammatical number factors prominently in agreement, some studies have increased the mismatch effect by manipulating conceptual number separately from grammatical number (e.g., Bock et al., 2001). Other studies have manipulated conceptual properties unrelated to number, including semantic relatedness and semantic integration. One possibility is that these latter properties influence agreement processes to the extent that more integrated/related elements are planned closer together in time.

Semantic Relatedness

Barker, Nicol, & Garrett (2001) increased the mismatch effect by manipulating semantic relatedness, a general meaning-based relationship between two words irrespective of context. Numerous priming studies have reported faster response times when primes and targets are semantically or associatively related (e.g., Balota et al., 2006); this is consistent with the assumption that relatedness between alter the timing of planning during production.

Semantic Integration

Solomon & Pearlmutter (2004) increased the mismatch effect by manipulating semantic integration, operationally defined as the degree to which constituent elements of a to-be-uttered phrase are tightly linked at the conceptual level, where the context in which the words occur is of critical importance. Separate studies have reported influences of integration on production that are consistent with the timing-based account, such as shorter duration for spoken words intervening between head and local nouns in more integrated vs. unintegrated preambles (Gillespie et al., 2013).

Goals

- Exp. 1: Investigate the relationship between relatedness and integration, manipulating each factor independently
- Exp. 2: Investigate potential component aspects of relatedness

EXPERIMENT 1

Method

Materials

24 NP + PP sentence preambles in eight versions, crossing local noun number (singular vs. plural), semantic relatedness (related vs. unrelated), and semantic integration (integrated vs. unintegrated):

Relatedness	Integration	Example
Related	Integrated	*The canoe with the weathered oar(s)*
	Unintegrated	*The canoe near the weathered oar(s)*
Unrelated	Integrated	*The canoe with the weathered flag(s)*
	Unintegrated	*The canoe near the weathered flag(s)*

Ns, Adjs, and Ps matched for length in characters, phonemes, and syllables; and for frequency

72 filler preambles (including 24 Plural Head NP + PP preambles)

Participants

269 native-English speakers

Analyses conducted on data from 235 subjects

Procedure

Participants read visually presented preambles aloud and provided a sentence completion.

Responses were recorded and transcribed.

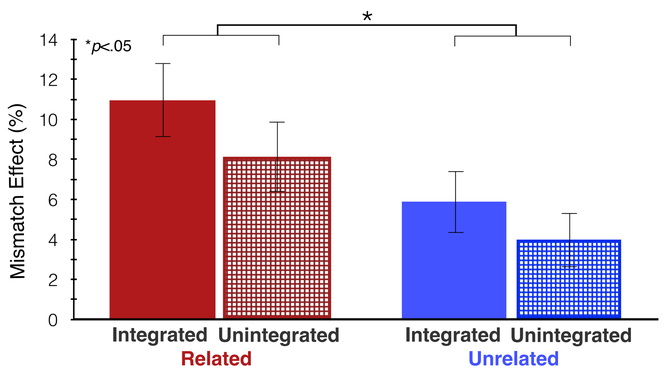
Scoring

- Correct- Correct preamble and appropriately inflected verb
- Error- Same as Correct but with agreement error on a verb
- Other (e.g., preamble error, use of uninflected verb)

Subject-verb agreement error rate = Error/(Error+Correct)

Mismatch Effect = Plural local noun error rate - singular local noun error rate

Results & Discussion



- Related > Unrelated
- No effect of integration
  - Numeric pattern of errors is consistent with Solomon & Pearlmutter (2004)
  - Integration manipulation was weaker than in previous studies
- No relatedness x integration interaction
- Given effect of relatedness, **Experiment 2** attempted to separate out different kinds of semantic relationships and test for differential effects on agreement errors.

EXPERIMENT 2

Are different semantic relationships similarly capable of increasing mismatch effects?

Different types of semantic and associative relationships have been manipulated in priming studies (Lucas, 2000); effect sizes vary as a function of relationship type, suggesting possible differences in error-inducing abilities.

Experiment 2 manipulated various semantic and associative relationships based on most useful contrasts.

	Category Coordinate	Attribute	Associate
Example	*hammer—saw*	*strings—violin*	*rat—cheese*
Agreement Research	• Increased mismatch effect in Barker et al.	• Used in Solomon & Pearlmutter and Experiment 1	• Semantic and associative relations often co-occur
Priming Research	• Strong priming effects	• Very small priming effect size	• Capable of priming on its own

Method

Materials

24 preambles varying local noun number and category coordinate status

24 preambles varying local noun number and semantic-associative relation (attribute vs. associate vs. unrelated)

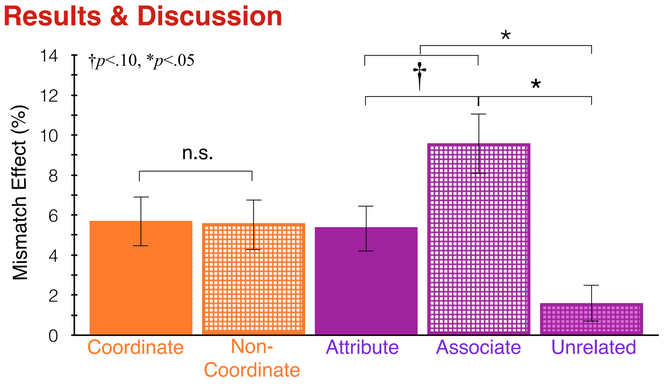
120 fillers (including 36 Plural Head NP + PP fillers)

Condition	Example	Category Coordinate	Attribute	Associate
Coordinate	*The saw by the oily wrench(es)*	+	–	–
Non-Coordinate	*The saw by the oily rag(s)*	–	–	–
Attribute	*The jar near the sticky lid(s)*	–	+	+
Associate	*The jar near the sticky cookie(s)*	–	–	+
Unrelated	*The jar near the stale bagel(s)*	–	–	–

Participants: 139 subjects; data from 133 used in analysis

Procedure & Scoring: Same as **Experiment 1**

Results & Discussion

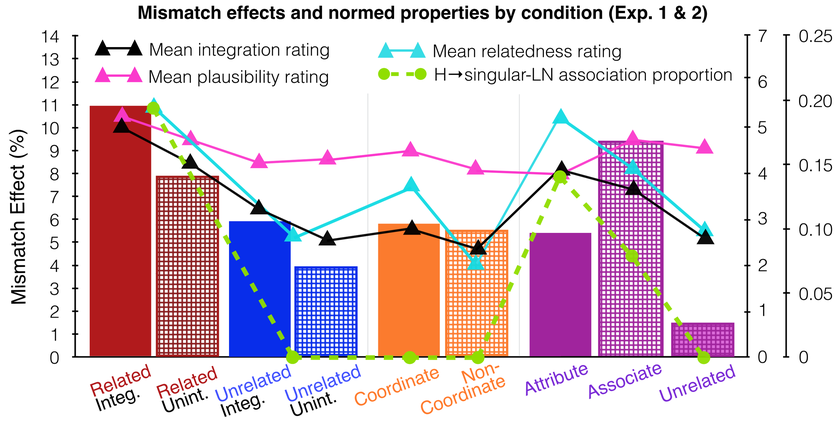


- Coordinate = Non-Coordinate, contra Barker et al.
  - Coordinate items in Barker et al. may have also been associated, integrated, or confounded with other factors.
- Associate > Attribute > Unrelated
- No additive effect of attribute relationship above and beyond association.

GENERAL DISCUSSION

- Presence or absence of association appears to best predict of error rates across Experiments 1 & 2.
- Multiple logistic regression analyses will examine further predicting error effects from integration, relatedness, and plausibility ratings (1-7 scales, 7= more integrated, related, or plausible), and from word-to-word associations (proportions of singular-local noun responses given to head noun prompts).

Mismatch effects and normed properties by condition (Exp. 1 & 2)



- Mismatch effects follow integration ratings in Exp.1; in Exp. 2, both relatedness and association predict larger effects for attributes vs. associates. How well do these and other factors (e.g., plausibility, frequency) account for our data?
- Do semantic-associative relations speed up the timing of planning? To the extent that a timing-based mechanism can induce agreement errors, these data suggest association might cause elements to be planned closer together. However, in the absence of association, semantic relationships may not have the same capacity.
  - We are currently analyzing participants' utterances (Exp 1.) to determine whether the spoken duration of words intervening between HN and LNs is shorter for related vs. unrelated preambles, consistent with previous findings for integrated vs. unintegrated preambles (Gillespie et al., 2013).
  - A word-list priming study featuring Exp. 1 & 2 critical item noun pairings is also running. We expect to see speeded production (i.e., priming effects) for associates. Will coordinates and attributes also show priming?

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