



# Semantic Relatedness and Semantic Integration in Subject-Verb Agreement Errors

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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 (HN) paired with a plural local noun (LN) relative to corresponding singular HN-singular LN controls.

Additional studies have increased the mismatch effect by manipulating conceptual properties unrelated to number.

**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.

**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 occurs is of critical importance.

**Relatedness and Integration:**

- are meaning-based properties not connected to number meaning
- produce similar effects on agreement (possibly via the same mechanisms)
- have not been separately controlled for in previous studies:
  - No control for semantic integration in Barker et al.
  - Implicit control for semantic relatedness in four of five Solomon & Pearlmutter experiments, but overall, relatedness across experiments was uncontrolled

**Goals**

- Investigate the relationship between relatedness and integration, manipulating each factor independently
- 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):

Condition	Example	Relatedness		Integration		Association	
		Ratings		Ratings		Singular LN	Plural LN
Related	Integrated <i>The canoe with the weathered oar(s)</i>	6.18		5.70		0.032	0.004
	Unintegrated <i>The canoe near the weathered oar(s)</i>			4.81			
Unrelated	Integrated <i>The canoe with the weathered flag(s)</i>	2.99		3.66		0.000	0.000
	Unintegrated <i>The canoe near the weathered flag(s)</i>			2.91			

*Note:* Preambles rated for relatedness (1 to 7, 7=*very related*) and integration (1 to 7, 7=*tightly linked*); association scores are the proportion of responses for LNs given in response to HN prompts out of two chances for each condition.

Ns, Adjs, and Ps matched for length in characters, phonemes, 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

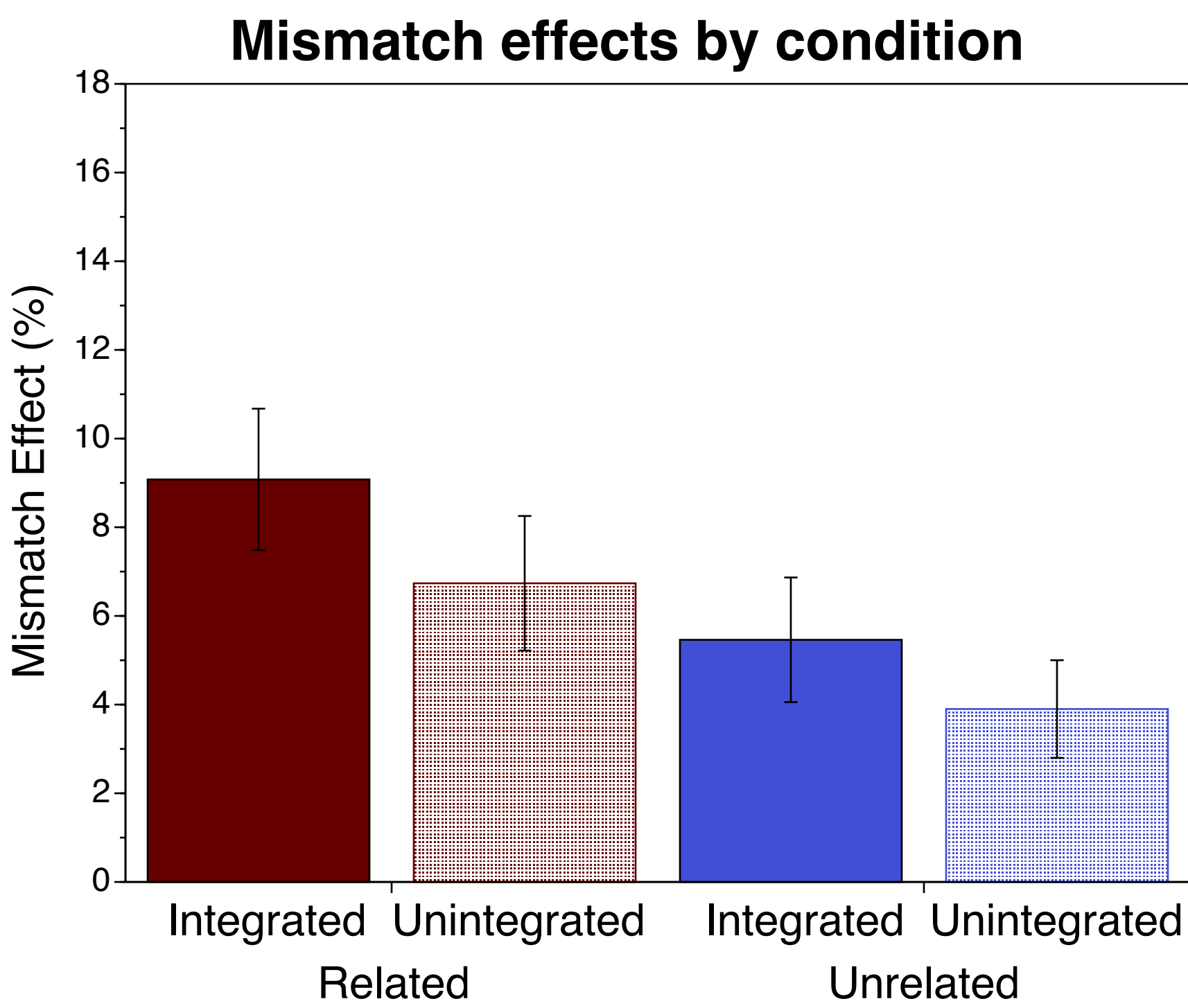
Participants read visually presented preambles aloud and provided a sentence completion.  
Responses were recorded and transcribed.

#### Scoring

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

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

### Results & Discussion



- **Related** > **Unrelated**
- No effect of integration
  - Pattern of errors is consistent with Solomon & Pearlmutter
  - Integration manipulation was weaker than in previous studies
- No relatedness x integration interaction
- Given effect of relatedness, **Experiment 2** attempts to separate out different kinds of semantic relationships and tests for individual effects on agreement errors.

## EXPERIMENT 2

### Are different semantic relationships similarly capable of increasing mismatch effects?

Different types of semantic 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 relationships based on interesting contrasts.

	Category Coordinate	Attribute	Associate
Example	<i>hammer—saw</i>	<i>strings—violin</i>	<i>rat—cheese</i>
Agreement Research	• Only used in Barker et al. • Increased mismatch effect	• Used in Solomon & Pearlmutter and Experiment 1	• Generally confounded with other semantic relationships
Priming Research	• Most frequently used relationship • Strong priming effects	• Very small priming effect size	• Associations might independently produce effects

### Method

#### Materials

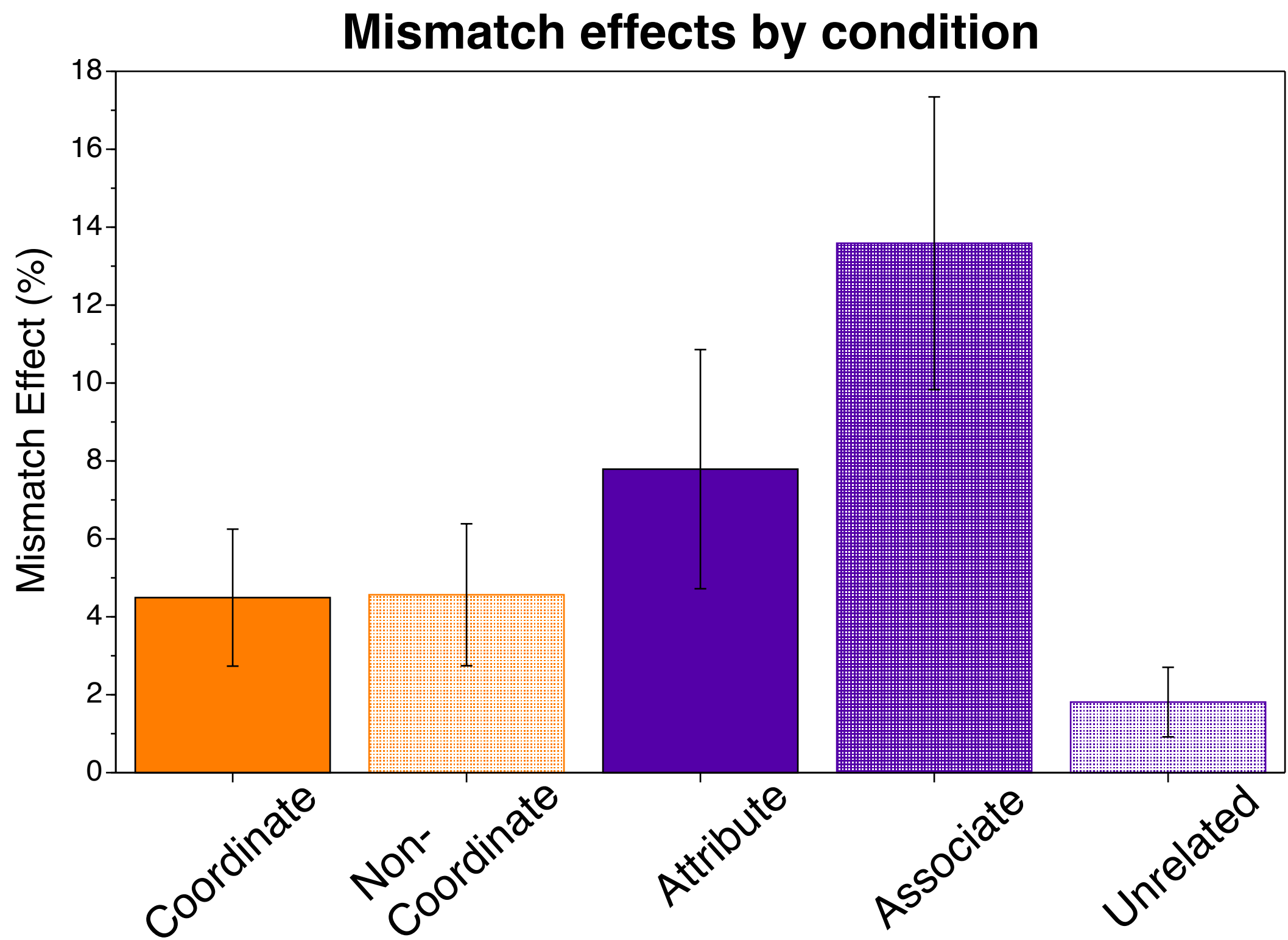
24 preambles varying local noun number category coordinate status  
24 preambles varying local noun number and attribute (attribute vs. associate vs. unrelated)  
120 fillers (36 NP + PP Plural HN fillers)

Condition	Example	Category Coordinate	Attribute	Associate	Relatedness Integration Association			
					Ratings	Ratings	Sing. LN	Plur. HN
Coordinate	<i>The saw by the oily wrench(es)</i>	+	—	—	4.23	3.17	0.000	0.000
Non-Coordinate	<i>The saw by the oily rag(s)</i>	—	—	—	2.26	2.68	0.000	0.000
Attribute	<i>The jar near the sticky lid(s)</i>	—	+	+	5.68	5.00	0.026	0.006
Associate	<i>The jar near the sticky cookie(s)</i>	—	—	+	4.66	4.16	0.015	0.008
Unrelated	<i>The jar near the stale bagel(s)</i>	—	—	—			0.000	0.000

*Note:* Relatedness, integration, and association ratings as in **Experiment 1**.

**Participants:** 47 subjects to date; data from 46 used in analysis      **Procedure & Scoring:** Same as **Experiment 1**

### Results & Discussion



- **Coordinate** = Non-Coordinate
  - In contrast to Barker et al.
- **Attribute** = **Associate**
- **Attribute** > Unrelated
- **Associate** > Unrelated

## GENERAL DISCUSSION

- Category coordinate relations appear not to increase mismatch effects in Experiment 2, contra Barker et al.
  - Coordinate items in Barker et al. may have also been associated, integrated, or confounded with alternative factors.
- Attribute relations may account for part of the effect of relatedness on agreement in Experiment 1, as well as part of the reported effects of integration in previous research.
- Likewise, Experiment 2 shows that association in the absence of other kinds of semantic relationships may be sufficient on its own to increase the mismatch effect.

#### Limitations & Future Directions

- Weak manipulation of integration in Experiment 1; future studies could attempt a stronger manipulation.
- Attribute effect in Experiment 1 and 2 may be driven, in part, by association; additional analyses partialing out the effects of each type of relationship on the others are planned.
- A separate study is assessing applicability of timing-based explanation for effects of relatedness, consistent with Solomon & Pearlmutter, who proposed that integration speeds up the activation of LNs in a to-be-uttered phrase. This mechanism parallels explanations for priming effects of relatedness, which hinge on “boosted” activation for targets, given a related prime.

## REFERENCES & ACKNOWLEDGMENTS

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