



# On the Road to Conventionalization: Analyses of Nominal Coercion

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## Introduction

### Coercion

- We can redeem apparently anomalous word combinations via non-compositional semantic adjustments referred to as COERCION [3,10]
- MASS-TO-COUNT NOMINAL COERCION – Resolution of conflict between a mass noun and an article preferring count nouns by imposing a unit (portion or variety) construal on the noun [8]:
  1. Andy asked the bartender for a **beer**. *conventionalized*
  2. McDonald's now charges 25 cents for a **ketchup**. *intermediate*
  3. She considered her options at the spa and chose a **nud**. *novel*

### Conventionalization Hypothesis

- Coercive determiner-noun combinations vary widely in frequency
- Novel cases like (3) resolved by creating an innovative meaning (e.g., a type or brand of mud)
- Conventionalized cases like (1) so entrenched that we no longer recognize them as non-compositional
- Coercion more frequent within certain semantic frames (e.g., RESTAURANT frame: Portions and/or varieties of foods/beverages)
- Processing a coercion instance strongly shaped by frequency

### Previous Research

- No studies of nominal coercion
- Neuropsychological and psycholinguistic studies of other coercion classes (e.g., compilation, aspectual) show additional processing costs [4,6,7,11,12]
- None have examined whether processing effect is modulated by conventionalization

### Questions

- Does the brain process apparent determiner-noun mismatch like "a mud" as a syntactic anomaly or semantic anomaly?
- Are novel and conventionalized instances processed differently?

### Goal

- Understand distributional properties of nominal coercion in natural language via corpus analysis
- Conduct behavioral and ERP studies of nominal coercion processing

## References

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## Corpus Analysis

### Specific Questions

- What are the distributional properties of MASS-TO-COUNT nominal coercion in natural language?
  - Continuous or discrete frequency distribution?
  - Clear semantic distinction(s) between words that are commonly vs. rarely/never coerced? (e.g., BEVERAGES vs ABSTRACT?)

### Methods

#### Target Words

~200 common mass nouns (singular and plural forms)

#### Dependency-Parsed Input Corpora

- English Gigaword [1]: 2.1B words
- Reuters Corpus Volume 1 [5]: 170M words
- TIPSTER [2]: 260M words

*N.B. Newspaper corpora may be less than ideal for assessing a predominantly informal phenomenon*

### The Boulder Coercion Corpus (BoCoR)

- All sentences from input corpora containing target words
- ~420M words
- Average instances per target word: 94,331

### Automatic Coercion Identification

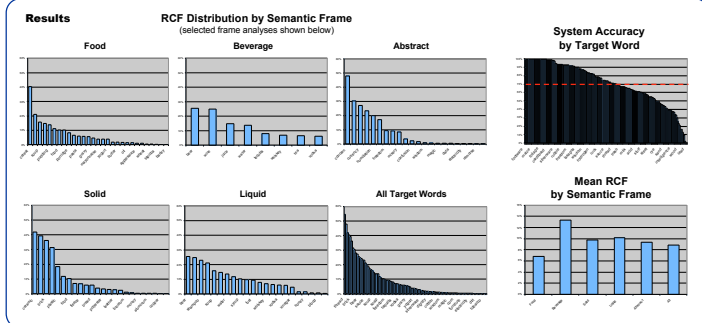
- Coercion tokens identified via automatic pattern matching

### Relative Coercion Frequency (RCF)

- RCF<sub>i</sub> = Coerced<sub>i</sub> / Total Instances<sub>i</sub>

### Annotation

- ~12,000 instances (60 per target word) randomly selected and hand annotated to create gold standard
- System's output compared against gold standard to assess accuracy
  - Overall system accuracy: 77.1%
  - Inter-rater agreement: 78.4% ( $\chi^2 = 0.62$ , substantial agreement)



### Discussion

- 106 words removed because system's agreement with gold standard below 70% (low agreement largely related to polysemy)
- Only the BEVERAGE frame appears to be coerced more frequently than others or than the mean RCF of all target words
- Coercion frequency may be increased by semantic category membership (e.g., gang effects)

## ERP Study (pilot)

### Specific Questions

- Does nominal coercion elicit N400 effect associated with semantic integration difficulty?
- Or does it elicit P600 effect associated with syntactic or structural anomalies?
- Does the brain respond differently to conventionalized and novel coercions?
- Can MASS-TO-COUNT nominal coercion construction be primed?

### Predictions

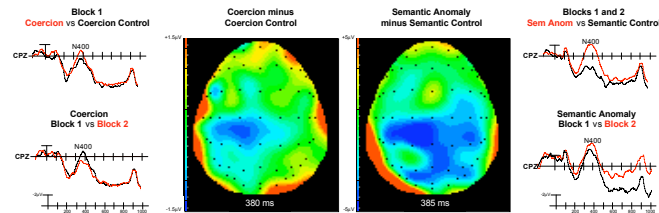
- Kuperberg (2008) showed complement coercion leads to widely distributed N400 effect
- We predicted a similar N400 effect for nominal coercion
- However we predicted that the N400 effect would diminish with increased exposure to the MASS-TO-COUNT coercion construction

### Methods

- 29 right-handed native English speakers
- Plausibility rating task
- 240 sentences (40 per condition) visually presented word-by-word (300/200 ms ISI)
- ERP: 64 sintered Ag/AgCl electrodes, continuously sampled at 200 Hz, 0.01-40 Hz bandpass filter, online vertex reference, re-referenced to averaged mastoids

### Results

- No P600 effect found in any coercion conditions
- N400 effect for coercion found in Block 1 but diminished in Block 2
- N400 effect for coercion surprisingly smaller than classic N400 effect for Semantic Anomaly



### Conditions

- Easy Coercion
- Easy Control
- Hard Coercion
- Hard Control
- Semantic Anomaly
- Semantic Control

Andy asked the bartender for a **beer**.  
 Andy asked the bartender for **some beer**.  
 For exterior siding try an **aluminum**.  
 For exterior siding try **some aluminum**.  
 The hunter put down his bow and **apple**.  
 The hunter put down his bow and **arrow**.

### Discussion

- Absence of P600 effect suggests that stimuli are not treated in the same way as grammatical anomalies
- N400 effect (in Block 1) suggests that stimuli do recruit processes similar to those involved in semantically challenging situations
- Possible explanation for small size of N400 effect is that each target word in coercion conditions is close lexical associate of other content words in the sentence and is therefore readily integrated into semantic context
- While N400 effect for semantic anomalies becomes larger over course of experiment, N400 effect for coercion is reduced
- It appears that the MASS-TO-COUNT coercion construction can be primed and thereby facilitates coercion processing

- Reduction in N400 effect to novel instances of nominal coercion over short period of time (i.e., 30 min) provides evidence for language change on micro scale

### Conclusion

It appears that the brain can respond to a potential syntactic mismatch by producing a creative (coercive) interpretation that "redeems" the mismatch. This process appears to be relatively low-cost and primable.

## Future Directions

- Corpus study to be extended to spoken-language data and COUNT-to-MASS coercions
- Follow-up ERP study will compare conventionalized coercion instances (RCF > 40%) to novel instances (RCF < 5%)