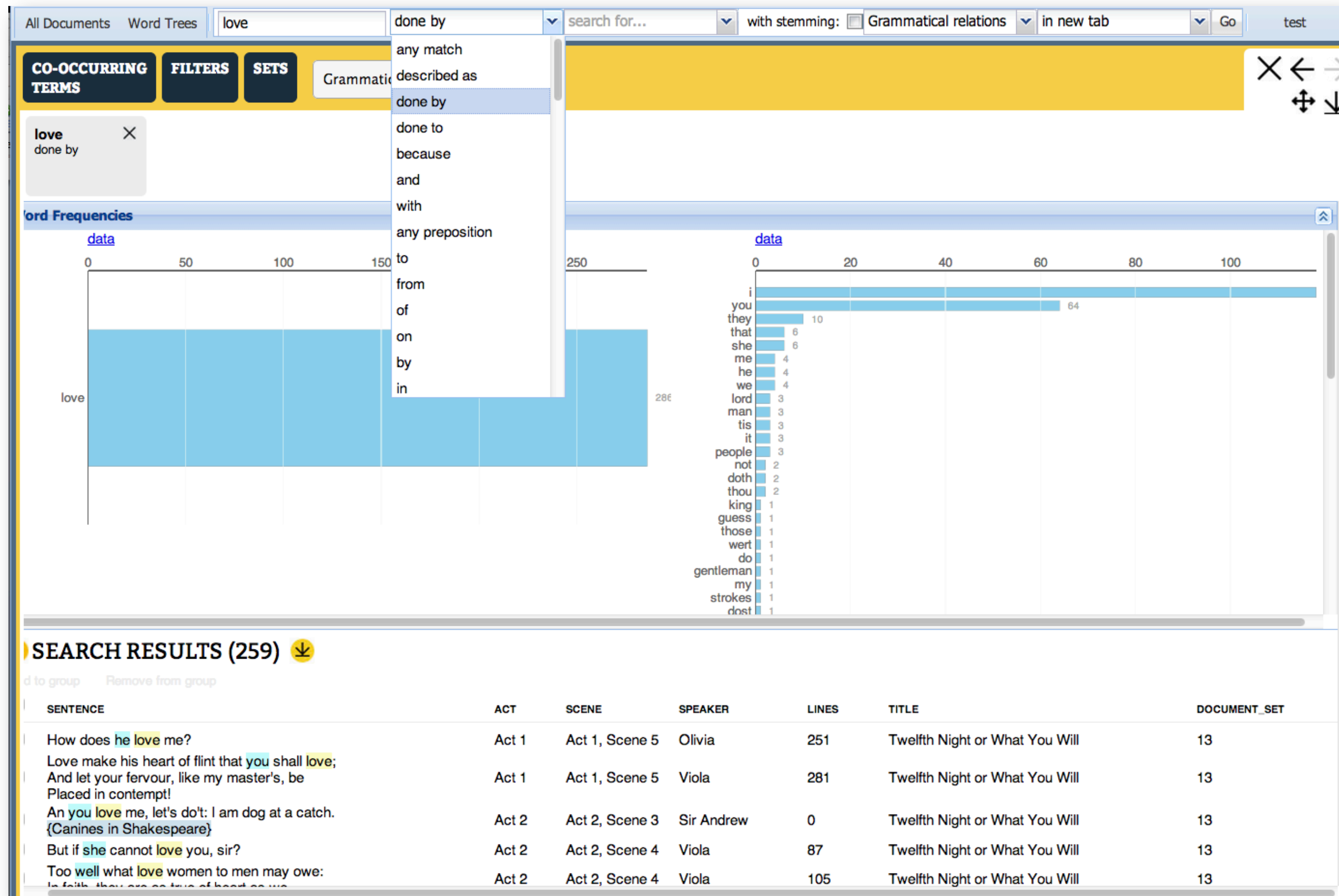


# Making Syntactic Relations Recognizable



## WordSeer Currently

Grammatical Relations Can be Searched & Visualized

But:

- Menu labels for the dependency parses are unclear.
- Difficult for a non-expert to find the desired relation

## Principle: Recognition over Recall

Question: how to show the context of syntactic relations in an understandable manner?

## A crowdsourced recognizability experiment

We focused on the specific problem of recognizing English syntactic dependency relationships between words. Our question was: how can dependency relationships be represented in order to make them more recognizable?

### 1 Method

Amazon's Mechanical Turk

Non-expert users

Moby Dick by Melville, Stanford Dependency parser

Participants given a series of identification tasks:

- In each task, see a list of sentences containing a syntactic relationship between highlighted words.
- Asked to identify the relationship type from a list of 4 options.
- Options shown in 3 different ways; each participant saw the same presentation for all 12 tasks.

Payment: 50c (U.S.) + 50c bonus if they correctly identified 10 or more of the 12 relationships.

Used the 12 most common grammatical relationships in Tested each of the relations with 4 different focus words Tested 2 focus words in each role.

### 2 Hypothesis

Grammatical relations are identified more accurately when shown with examples of contextualizing words or phrases than without.

Builds on the success of auto-suggest in search interfaces.

### 3 Experiment Materials

Choose the option that best describes the grammatical relationship between the highlighted words in the sentences on the right.

possessive: **life**  
Patterns like:  
• place in my **life**.  
• of Mr. Woodhouse's **life**; and  
• never in her **life** been within  
• part of his **life**, and

determiner: **life**  
Patterns like:  
• wildness of this canal **life** is,  
• , whether that invaluable **life** of his  
• his is an unwritten **life**.  
• There is no **life** in thee

preposition: **life** of **life**  
Patterns like:  
• the fathom-deep **life** of the whale.  
• the probationary **life** of the Grand Canal furnishes the  
• for the **life** of them, can  
• in the **life** of patient Job.

adjective modifier: **life**  
Patterns like:  
• because in common **life** we esteem  
• sort of seagoing **life**, in  
• in this tropic whaling **life**, a  
• corrupt and often lawless **life**.

And as the sea surpasses the land in this matter, so the whale fishery surpasses every other sort of maritime **life**, in the wonderfulness and fearfulness of the rumors which sometimes circulate there.

So Tamerlane's soldiers often argued with tears in their eyes, whether that **invaluable life** of his ought to be carried into the thickest of the fight.

"Now, the Captain D'Wolf here alluded to as commanding the ship in question, is a New Englander, who, after a **long life** of unusual adventures as a sea-captain, this day resides in the village of Dorchester near Boston.

And what with the standing spectacle of the black terrific Ahab, and the periodical tumultuous visitations of these three savages, Dough-Boy's **whole life** was one continual lip-quiver.

Men, ye seem the years; so **brimming life** is gulped and gone.

No one having previously heard his history, could for the first time behold Father Mapple without the utmost interest, because there were certain engrafted clerical peculiarities about him, imputable to that **adventurous maritime life** he had led.

It seemed as though, by some nameless, interior volition, he would fain have shocked into them the same fiery emotion accumulated within the Leyden Jar of his own **magnetic life**.

He would say the most terrific things to his crew, in a tone so strangely compounded of fun and fury, and the fury seemed so calculated merely as a spice to the fun, that no seaman could hear such queer invocations without pulling for **dear life**, and yet pulling for the mere joke of the thing.

Figure 1: A sample recognition task. Target word in yellow ("life"). 8 example sentences containing the relation were shown, with the words that entered into the relationship highlighted. Participants had to identify the relationship and correctly select it from a list of four options on the left.

The presentation styles:

Baseline.

possessive: **life**

Baseline + 4 example words.

possessive: **life**  
Examples: **my**, **Woodhouse's**, **her**, **his** etc.

Baseline + 4 example phrases.

possessive: **life**  
Patterns like:  
• place in **my life**.  
• of Mr. Woodhouse's **life**; and  
• never in her **life** been within  
• part of **his life**, and

### 4 Results: examples improve recognizability

400 participants completed the study distributed randomly over the 3 presentations.

The results confirm our hypothesis.

Participants in conditions that showed examples (phrases and words) were significantly more accurate at identifying the relations than participants in the baseline condition.

The average success rate in the baseline condition was 41%, which is significantly less accurate than words: 52%, ( $p=0.00019$ ,  $W=6136$ ), and phrases: 55%, ( $p=0.00014$ ,  $W=5546.5$ ).

For the non-clausal relations, there was no significant difference between phrases and words, although they were both overall significantly better than the baseline

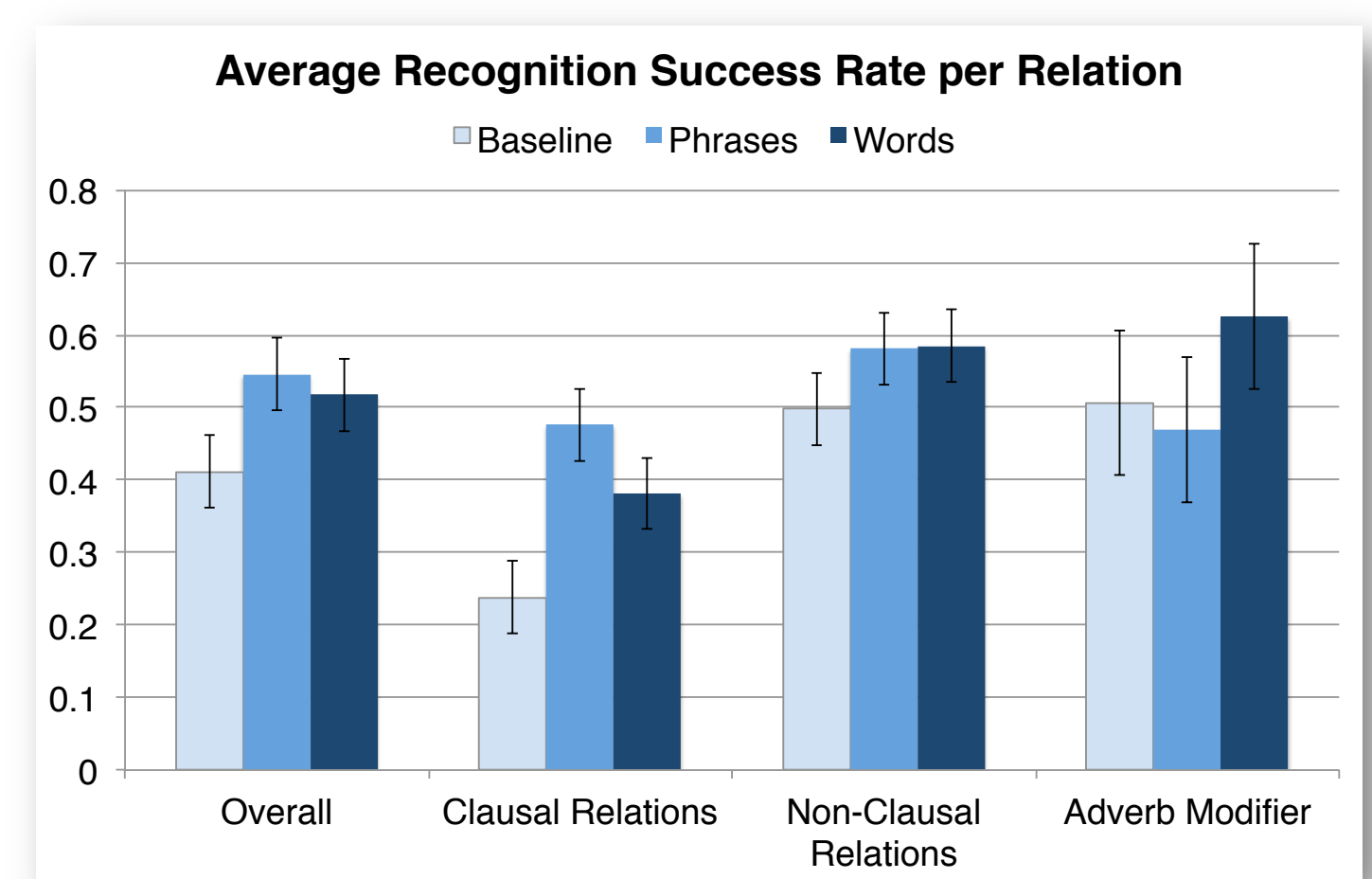


Figure 2: Results – recognition success rate for different types of relations under the three presentations.

## Implications

- A list of phrases is the most recognizable presentation (34% better than the baseline). However, there is room for improvement. Even the best strategy had a success rate of only 55%.
- Auto-suggest interfaces for syntactic search should show candidate relationships augmented with a list of phrases in which they occur.