

# Typicality Effects and the Logic of Reciprocity

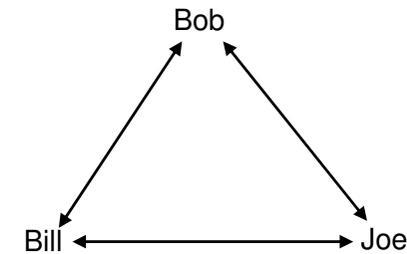
Nir Kerem – Technion and Google  
Naama Friedmann – Tel Aviv U.  
Yoad Winter – Technion and Utrecht U.

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## Background: The Reciprocal Question

Bob, Joe, and Bill *see* one another.

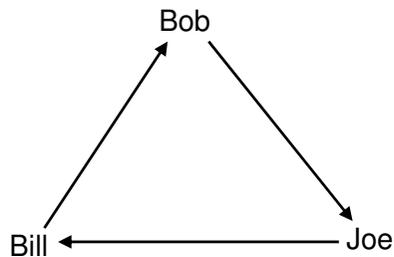
→ **Each one** sees **each** of the others.



## Background: The Reciprocal Question

Bob, Joe, and Bill *are staring at* one another.

→ **Each one** is staring **at one of** the others.



## Background: The Reciprocal Question

Bob, Joe, and Bill *are following* one another.

→ **Each one** is following **or is being** followed.



## Previous Accounts of Reciprocals

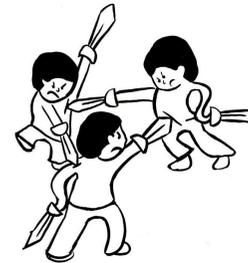
- ❑ **Weak reading (+ strengthening):** Langendoen (1978), Roberts (1988), and others.
- ❑ **Strongest Meaning Hypothesis:**
  - Dalrymple et al (1998): strongest interpretation *in the context*.
  - Sabato & Winter (2005): strongest interpretation *consistent with meaning of predicate*.

## SMH is too strong

Bob, Joe and Bill *are stabbing* one another.

OK

But stronger interpretation is possible!

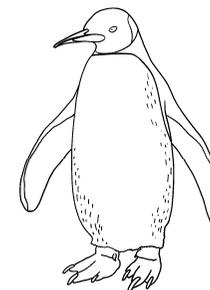


For such predicates, ~**35%** of subjects would prefer the **weaker** interpretation.

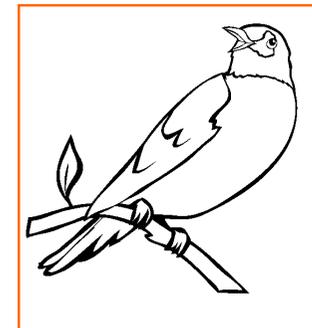
## Where is the problem?

- ❑ According to all accounts, reciprocal interpretation is influenced by context.
- ❑ Specifically, by the meaning of the predicate in the scope of the reciprocal: *see, stare at, follow*, but also *stab*.
- ❑ Thus, *lexical semantics* of predicates is inseparable from analyzing reciprocals.
- ❑ Not all cardinality distinctions in the lexicon are sharp; some come in shades of grey

## Typicality Effects



More typical



**Bird**

$$C_{\text{BIRD}}(\text{Penguin}) < C_{\text{BIRD}}(\text{Robin})$$

## Typicality Effects

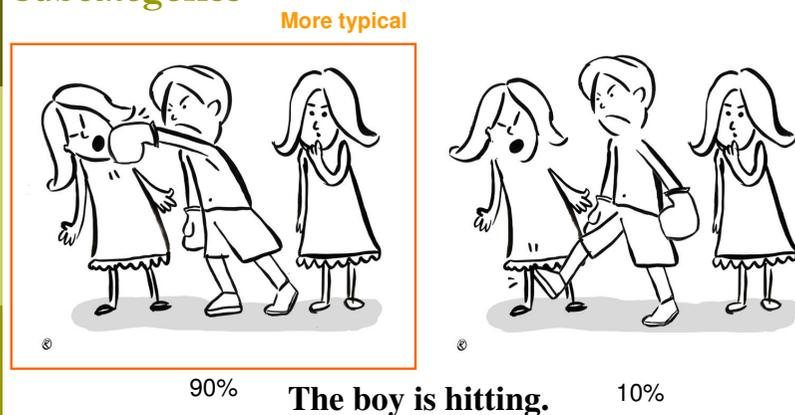
- Different members of a category are empirically graded as better or worse examples of the concept.
  - Categorization time
  - Conscious grading
- Found with many different concepts ('RED', 'EVEN NUMBER', 'HELPFUL'...)
- **Typicality function** of a concept CON is a function  $c_{con}$  from the relevant category to  $[0,1)$ .

## Relational Concepts

- Predicates are mentally represented by *relational concepts*.
- Given the ubiquity of typicality, we expect relational concepts to exhibit typicality effects as well.

## Typicality Effects in Relational Concepts

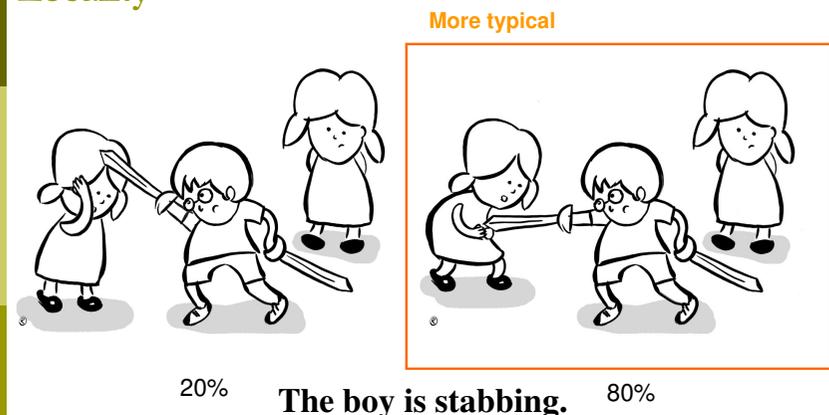
### Subcategories



$$C_{HIT}(\text{Punch}) > C_{HIT}(\text{Kick})$$

## Typicality Effects in Relational Concepts

### Locality



$$C_{STAB}(\text{In-head}) < C_{STAB}(\text{In-stomach})$$

# Typicality Effects in Relational Concepts

## Cardinality

More typical

88%    **The boy is stabbing.**    12%

$C_{STAB}(Single) > C_{STAB}(Multiple)$

# Maximal Typicality Hypothesis

A reciprocal is consistent with models in which no tuple can be added to the reciprocated  $n$ -ary relation **without reducing its typicality relative to the relational concept.**

Bob, Joe, and Bill *are stabbing* one another.

Typical
Typical
Nontypical  
Not reciprocal
Reciprocal
Reciprocal

# Maximal Typicality Hypothesis

A reciprocal is consistent with models in which no tuple can be added to the reciprocated  $n$ -ary relation **without reducing its typicality relative to the relational concept.**

Bob, Joe, and Bill *see* one another.

Typical
Typical
Typical  
Not reciprocal
Not reciprocal
Reciprocal

# Maximal Typicality Hypothesis

A reciprocal is consistent with models in which no tuple can be added to the reciprocated  $n$ -ary relation **without reducing its typicality relative to the relational concept.**

Bob, Joe, and Bill *are following* one another.

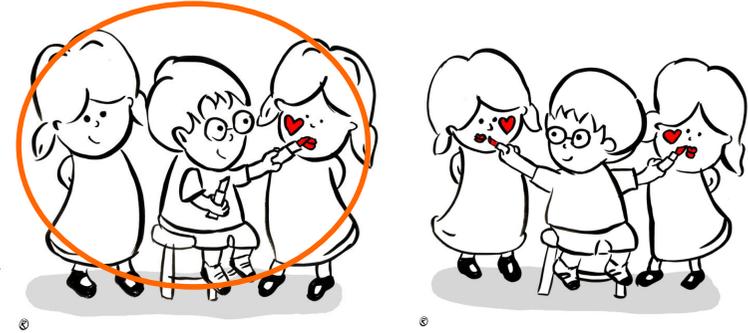
Typical
Nontypical  
Reciprocal
Reciprocal

## Experimental Support for MTH

- Each set tested verbs for typicality and for reciprocal meaning.
- We then examined the correlation between typicality and reciprocal meaning in each set.
- Each experiment was conducted on 50 university students that are native Hebrew speakers.

## Experiment 1<sup>T</sup>: Forced Choice

Subjects were asked to draw a circle around the picture that best depicts the accompanying sentence.



Ha-Yeled Me'aper  
(The boy is applying make-up)

## Experiment 1<sup>R-i</sup>: Forced Choice



The girls are applying make-up to each other.

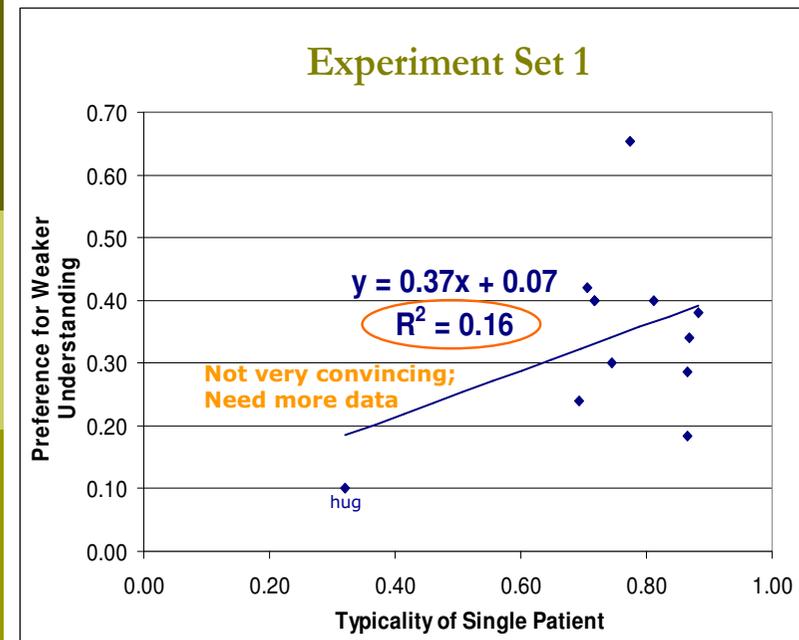
## Experiment 1<sup>R-ii</sup>: Forced Choice



The girls are applying make-up to each other.

## Experiment Set 1: Results

- Most predicates tested typically prefer single patients (**70%-90%**);  
*stab, wipe, pinch, paint, scrape, shake ...*
- Same predicates show nearly equal preference for circle and full reciprocal interpretation (~**35|65**)
- One predicate, *hug*, does not typically prefer single patient interpretation (only **32%**).
- hug* also shows **90%** preference for full reciprocal interpretation.
- For all predicates: 95-100% preference for circle over path reciprocal interpretation.



## Experiment 2<sup>T</sup>: Sentence Completion

Subjects were presented with an incomplete sentence and asked to choose the completion that sounds best to them:

Mary pointed at ... the boy / the boys.

## Experiment 2<sup>R</sup>: Textual Entailment

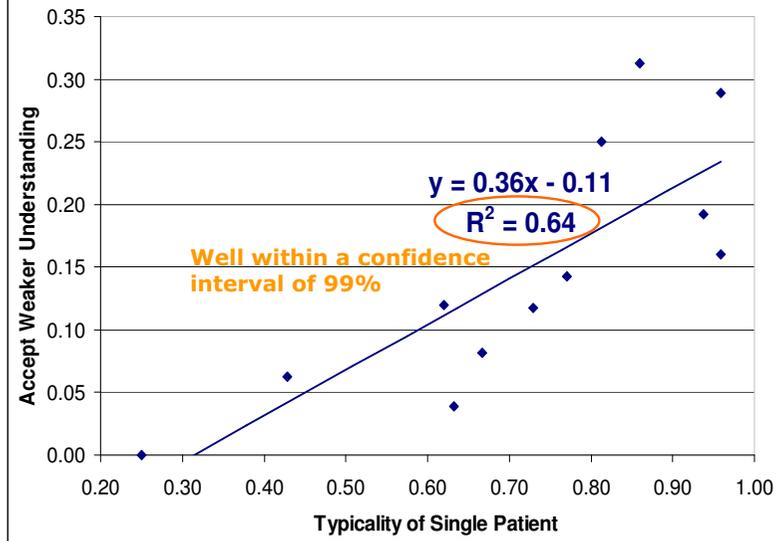
Subjects were presented with a reciprocal sentence and asked if a second sentence is entailed by it:

Mary, Jane, and Sue are pointing at each other.

Can you infer that Mary is pointing at Sue?

Yes / No

## Eventive Verbs in Experiment Set 2



## Summary

- ❑ Experiment set 1, diagram-based task, results were not evenly distributed, only 'hug' does not typically prefer single patient.
- ❑ Experiment set 2, textual tasks, allow for more selection in predicates; wide variance in typicality preferences.
- ❑ Despite different tasks, both show similar typicality-reciprocity correlation; **0.36**

## Conclusions

- ❑ *Rejection* of weaker interpretations correlates with *typicality retain* in stronger interpretations.
- ❑ *Acceptance* of weaker interpretations correlates with typicality reduction in stronger ones.
- ❑ Supports for MTH: A reciprocal is consistent with models in which no tuple can be added to the  $n$ -ary relation without reducing its typicality relative to the relational concept.