The role of veridicality and factivity in clause selection

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Slides available at **aswhite.net**

Introduction

Overarching question

Which of a verb's **semantic properties** determine its **syntactic distribution**? Gruber 1965, Fillmore 1970, Zwicky 1971, Jackendoff 1972, Grimshaw 1979, 1990, Pesetsky 1982, 1991, Pinker 1989, Levin 1993

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Semantic Properties

$$\begin{bmatrix} + & \text{TELIC} \\ - & \text{DURATIVE} \\ - & \text{STATIVE} \\ & \dots \end{bmatrix}$$

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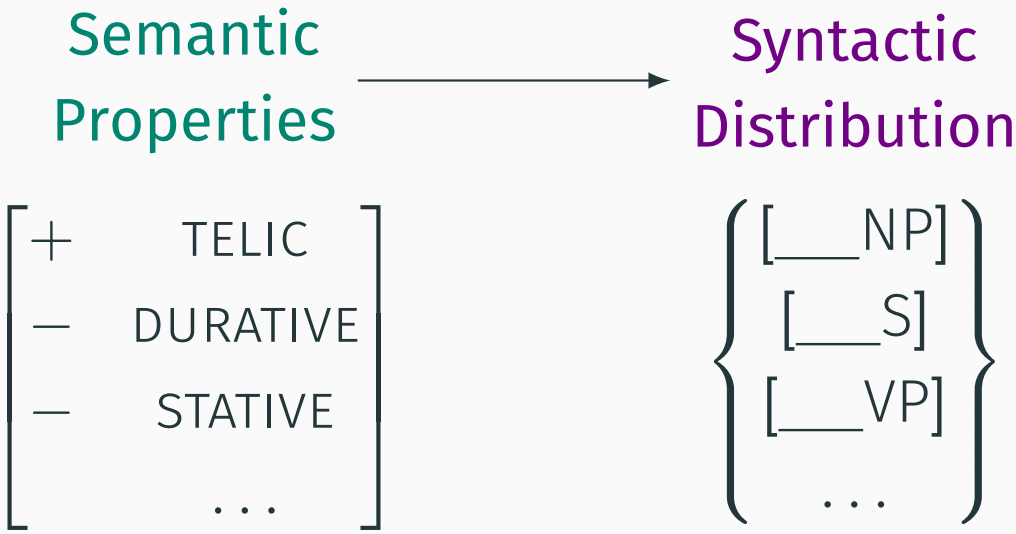

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Distribution of nominals

Sensitive to event structural properties like stativity, telicity, durativity, causativity, transfer, etc. (see Levin & Rappaport Hovav 2005)

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Distribution of clauses

Sensitive to intentional properties like representationality, preferentiality, factivity/veridicality, communicativity, etc. Bolinger 1968, Hintikka 1975, Hooper 1975, Stalnaker 1984, Farkas 1985, Villalta 2000, 2008, Kratzer 2006, Egré 2008, Scheffler 2009, Moulton 2009, Anand & Hacquard 2013, Rawlins 2013, Portner & Rubinstein 2013, Anand & Hacquard 2014, Spector & Egré 2015, Bogal-Allbritten 2016, Theilier et al. 2017 among many others

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The distribution of clauses is determined by the **same** semantic properties as the distribution of nouns (cf. Koenig & Davis 2001)

Not intentional properties (cf. White & Rawlins 2017)

Intuition

Intentional properties require that an eventuality have **informational content**, but not all eventualities have such content, resulting in a piece-wise semantic-to-syntax mapping

Today's talk

Focus

Two intentional properties—factivity and veridicality—that are argued to determine selection of interrogatives & declaratives

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Use experiments that measure (i) syntactic distribution and (ii) factivity/veridicality for all clause-embedding verbs to show that...

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Outline

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Background: veridicality & factivity

Veridicality

A verb V is **veridical** iff NP V S *entails* S Karttunen 1971a, Egré 2008, Karttunen 2012, Spector & Egré 2015 a.o.

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Factivity

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(2) a. Jo didn't **know** that Bo was alive → Bo was alive

Veridicality and factivity

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Factivity

A verb V is **factive** iff NP V S *presupposes* S Kiparsky & Kiparsky 1970, Karttunen 1971b *et seq*

(2) a. Jo didn't **know** that Bo was alive → Bo was alive
b. Jo didn't **prove** that Bo was alive ↛ Bo was alive

Veridicality/factivity and responsivity

Responsivity (Lahiri 2002)

A verb is **responsive** iff it takes interrogatives and declaratives

see also Karttunen 1977a,b, Groenendijk & Stokhof 1984 *et seq*

(3) a. Jo **knew** that Bo was alive.
b. Jo **knew** whether Bo was alive.

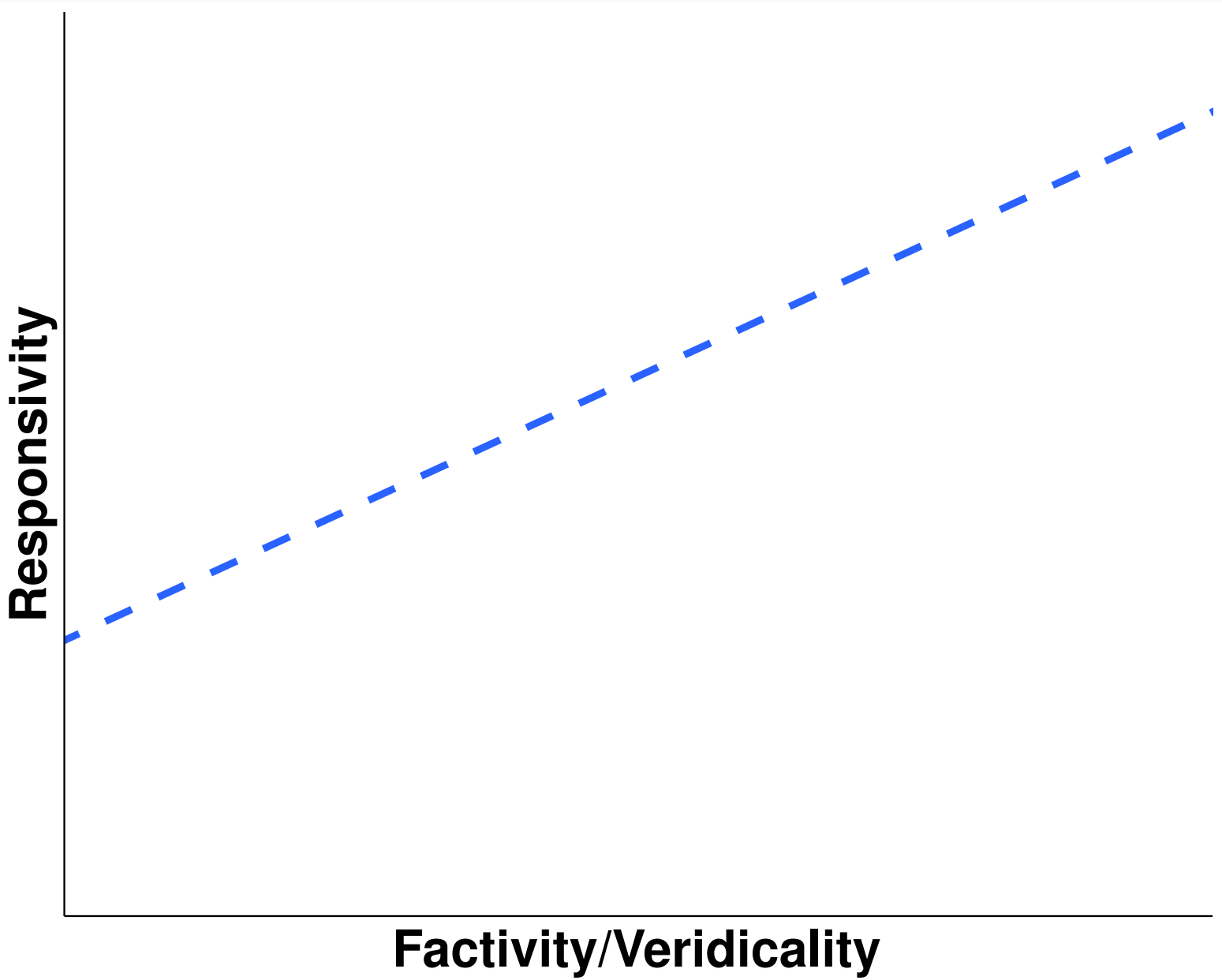
Generalization

A verb is **responsive** iff {**factive** (Hintikka 1975) / **veridical** (Egré 2008)}

see also George 2011, Uegaki 2012, 2015; cf. Beck & Rullmann 1999, Spector & Egré 2015

(4) a. Jo **knew** {that, whether} Bo was alive.
b. Jo **thought** {that, *whether} Bo was alive.

Predicted correlation



Measuring syntactic distribution

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MegaAttitude dataset (White & Rawlins 2016)

Ordinal (1-7 scale) acceptability ratings

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MegaAttitude dataset (White & Rawlins 2016)

Ordinal (1-7 scale) acceptability ratings

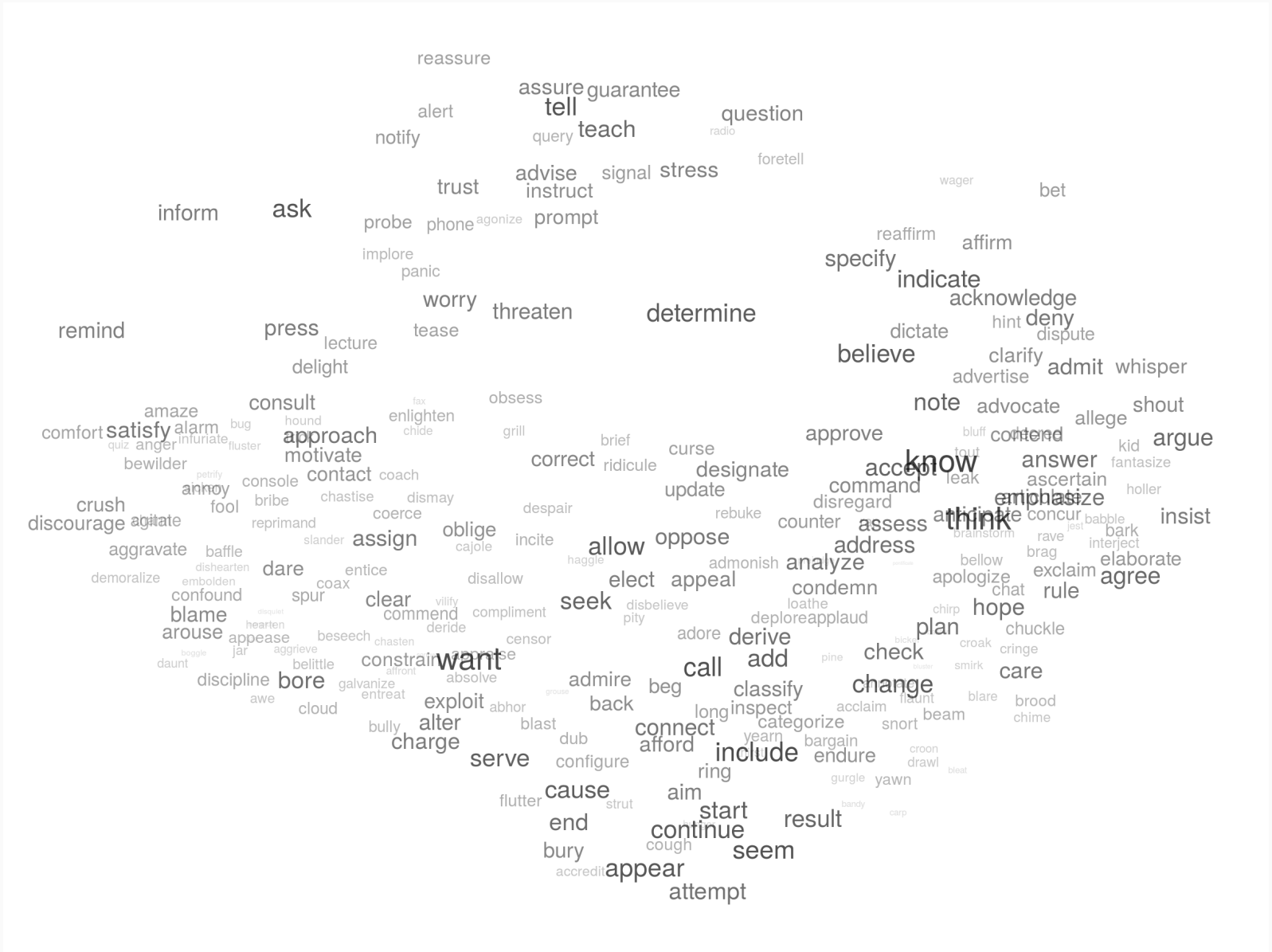
for

1000 clause-embedding verbs

$\times$

50 syntactic frames

MegaAttitude verbs



Sentence construction

Challenge

Automate construction of a very large set of frames in a way that is sufficiently general to many verbs

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Construct semantically bleached frames using indefinites

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(5) a. *know* + **NP _ed {that, whether} S**

Someone knew {that, whether} something happened.

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(5) a. *know* + **NP _ed {that, whether} S**

Someone knew {that, whether} something happened.

b. *tell* + **NP _ed NP {that, whether} S**

Someone was told {that, whether} something happened.

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Someone knew {that, whether} something happened.

b. *tell* + **NP _ed NP {that, whether} S**

Someone was told {that, whether} something happened.

c. *bother* + **NP was _ed {that, which NP} S**

Someone was bothered {that something, which thing} happened.

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Someone was bothered {that something, which thing} happened.

Measuring veridicality and factivity

Task

...you will be given a statement and a question related to that statement. Your task will be to respond *yes*, *maybe or maybe not*, or *no* to the question, assuming that the statement is true.

(cf. Karttunen et al. 2014)

Task

61. **Someone knew that a particular thing happened.**

Did that thing happen?

no	maybe or maybe not	yes
○	○	○

*How acceptable is the **bolded** sentence?*

terrible	2	3	4	5	6	perfect
○	○	○	○	○	○	○

Task

68. **Someone didn't know that a particular thing happened.**

Did that thing happen?

no	maybe or maybe not	yes
○	○	○

*How acceptable is the **bolded** sentence?*

terrible	2	3	4	5	6	perfect
○	○	○	○	○	○	○

Stimuli

517 verbs from the MegaAttitude based on their acceptability in the [NP _ that S] and [NP was _ed that S] frames

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1,088 items randomly partitioned into 16 lists of 68

Stimuli

Active

(6) a. Someone thought that a particular thing happened.
b. Someone didn't think that a particular thing happened.

Stimuli

Active

(6) a. Someone thought that a particular thing happened.
b. Someone didn't think that a particular thing happened.

Passive

(7) a. Someone was told that a particular thing happened.
b. Someone wasn't told that a particular thing happened.

Stimuli

Active

(6) a. Someone thought that a particular thing happened.
b. Someone didn't think that a particular thing happened.

Passive

(7) a. Someone was told that a particular thing happened.
b. Someone wasn't told that a particular thing happened.

(8) a. Someone was bothered that a particular thing happened.
b. Someone wasn't bothered that a particular thing happened.

Participants

160 unique participants through Amazon's Mechanical Turk

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160 unique participants through Amazon's Mechanical Turk

- 10 ratings per item...

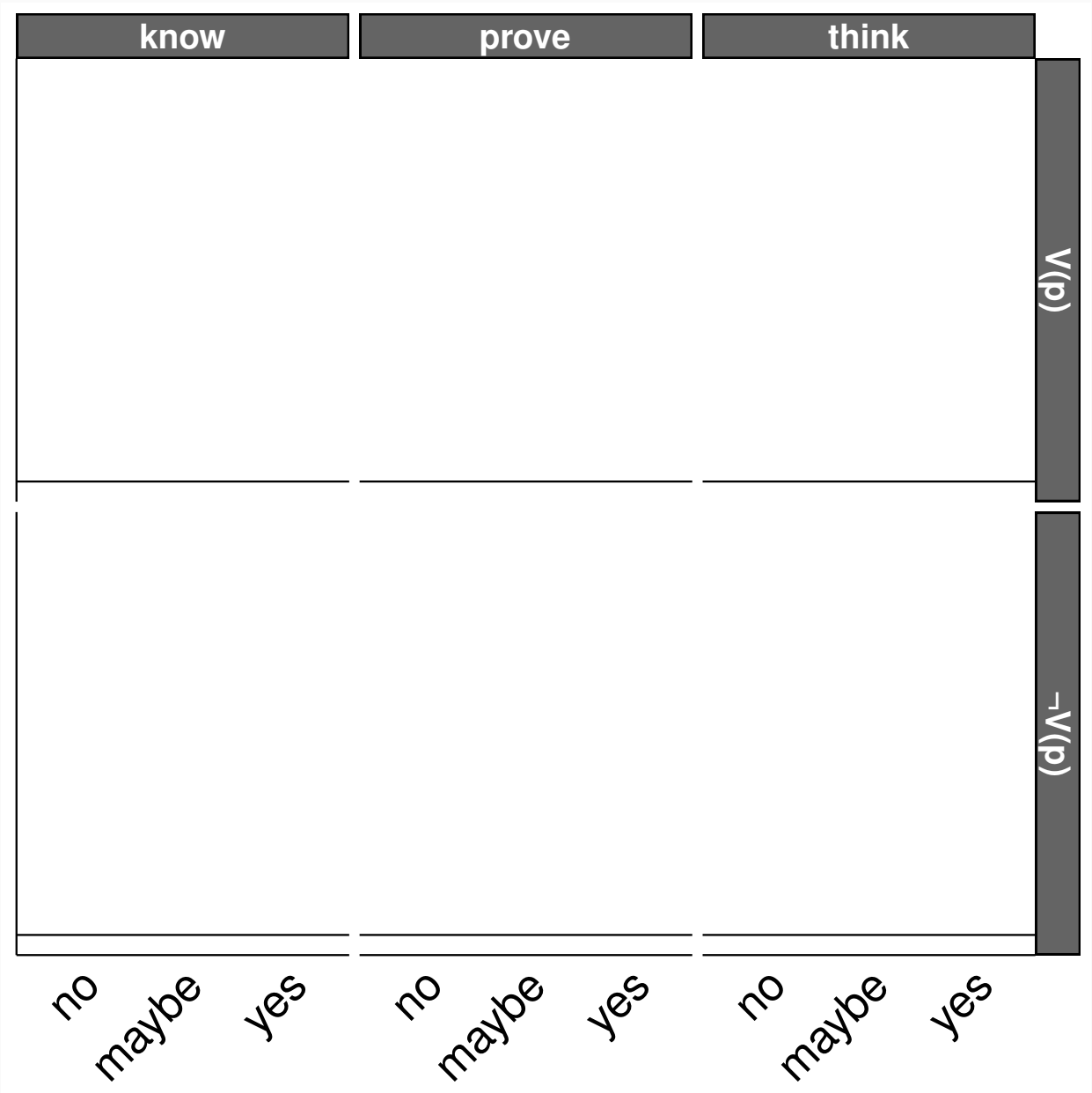
Participants

160 unique participants through Amazon's Mechanical Turk

- 10 ratings per item...
- ...given by 10 different participants

Results and analysis

Raw responses



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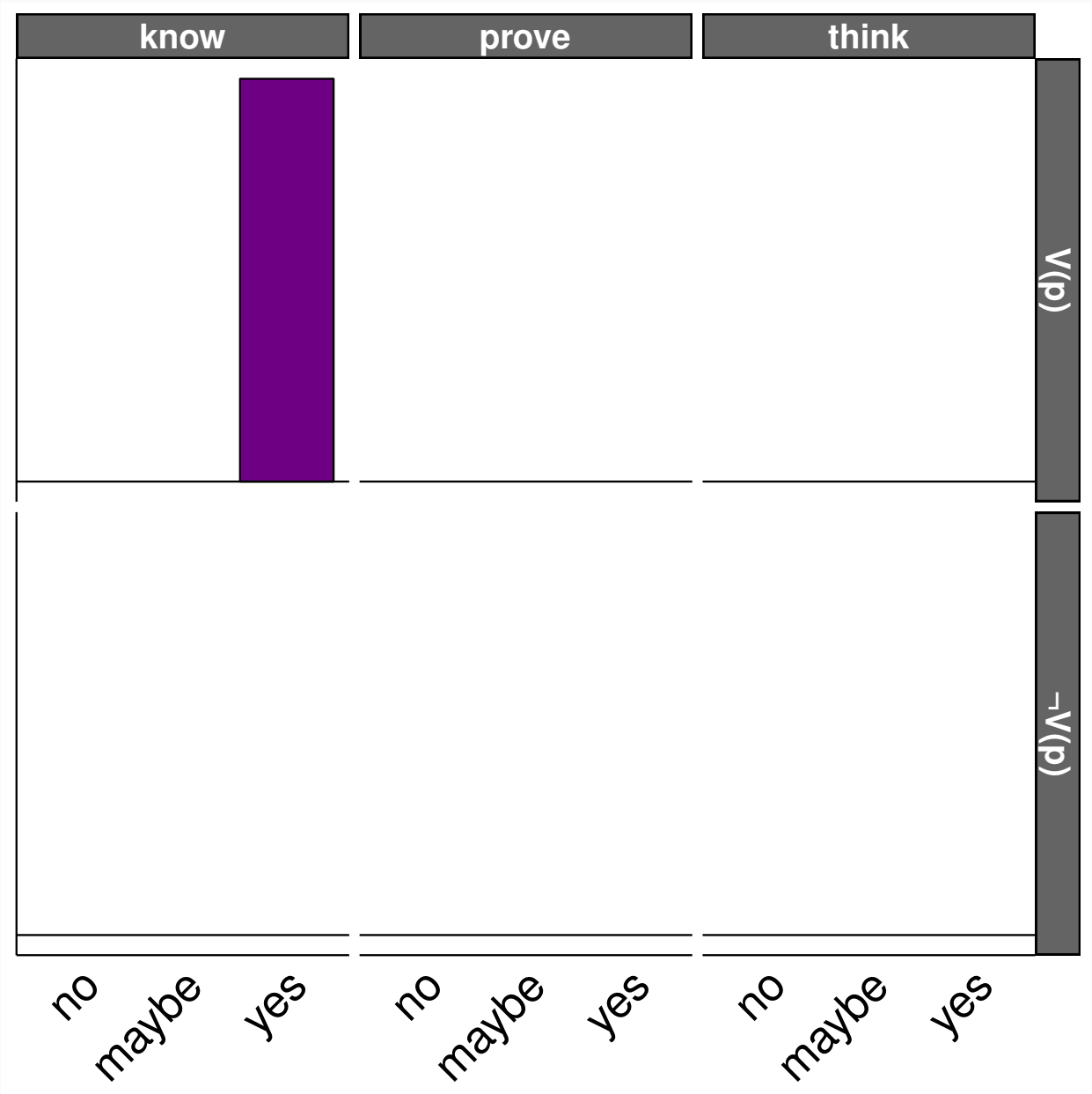

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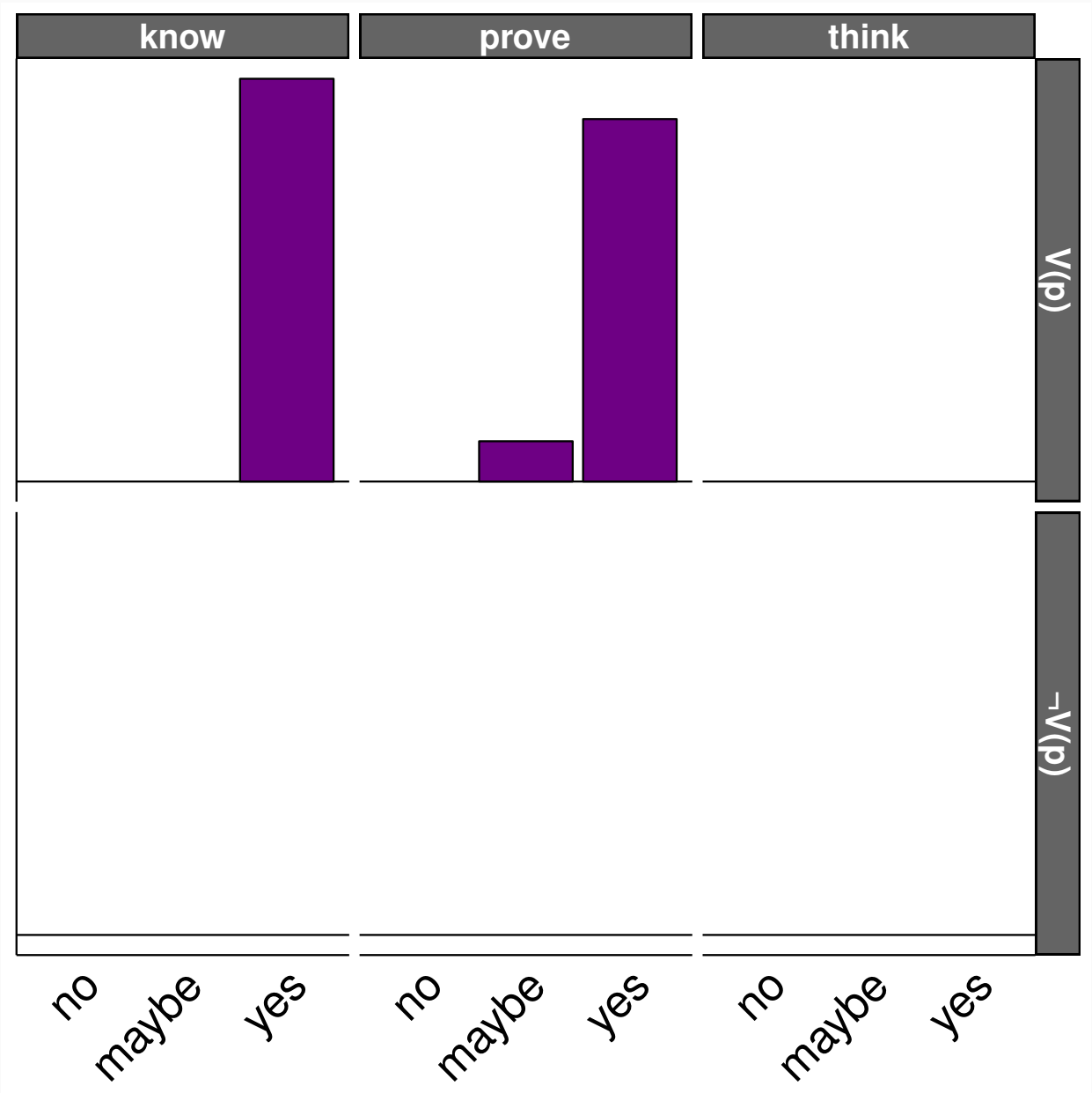

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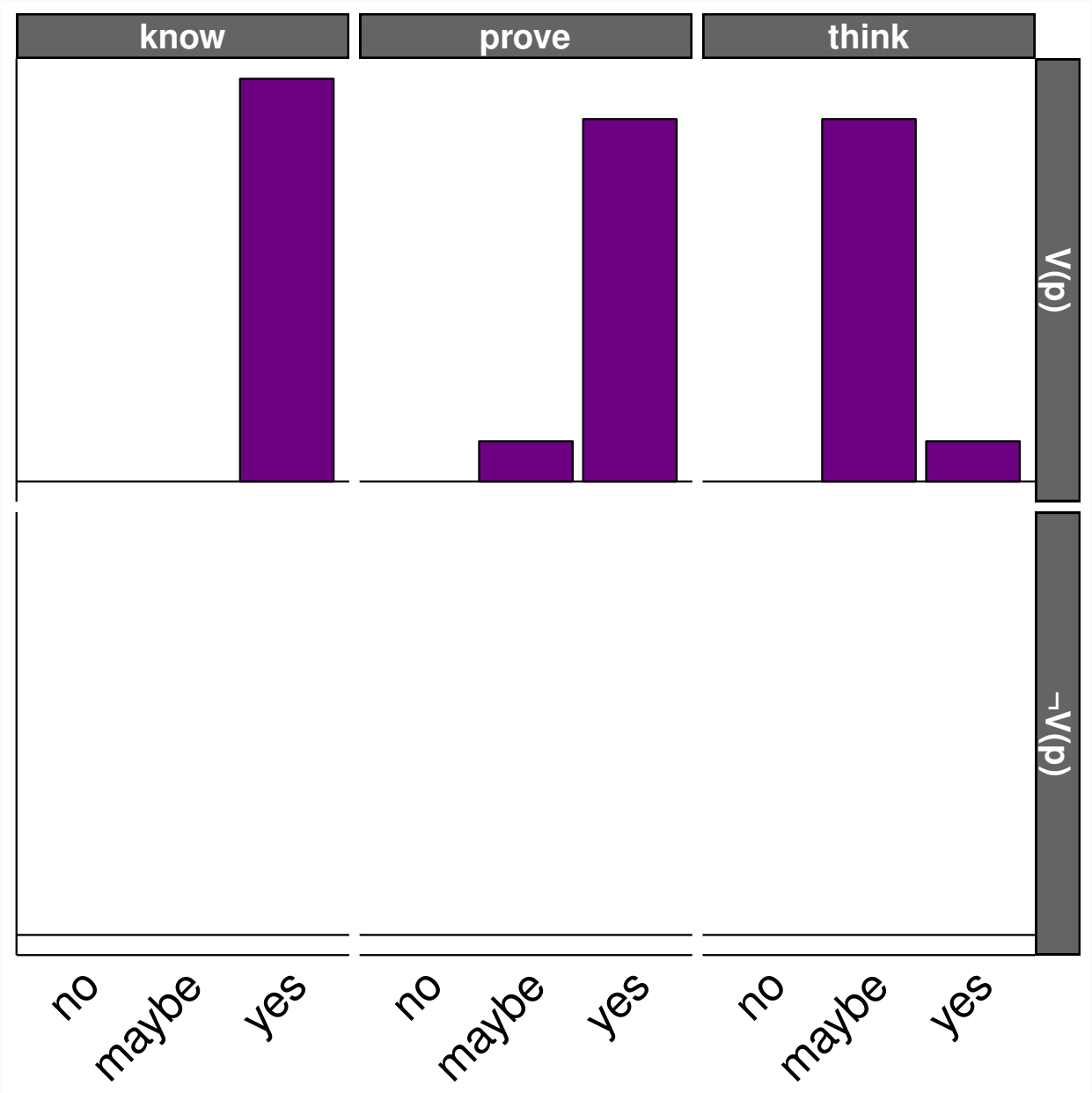

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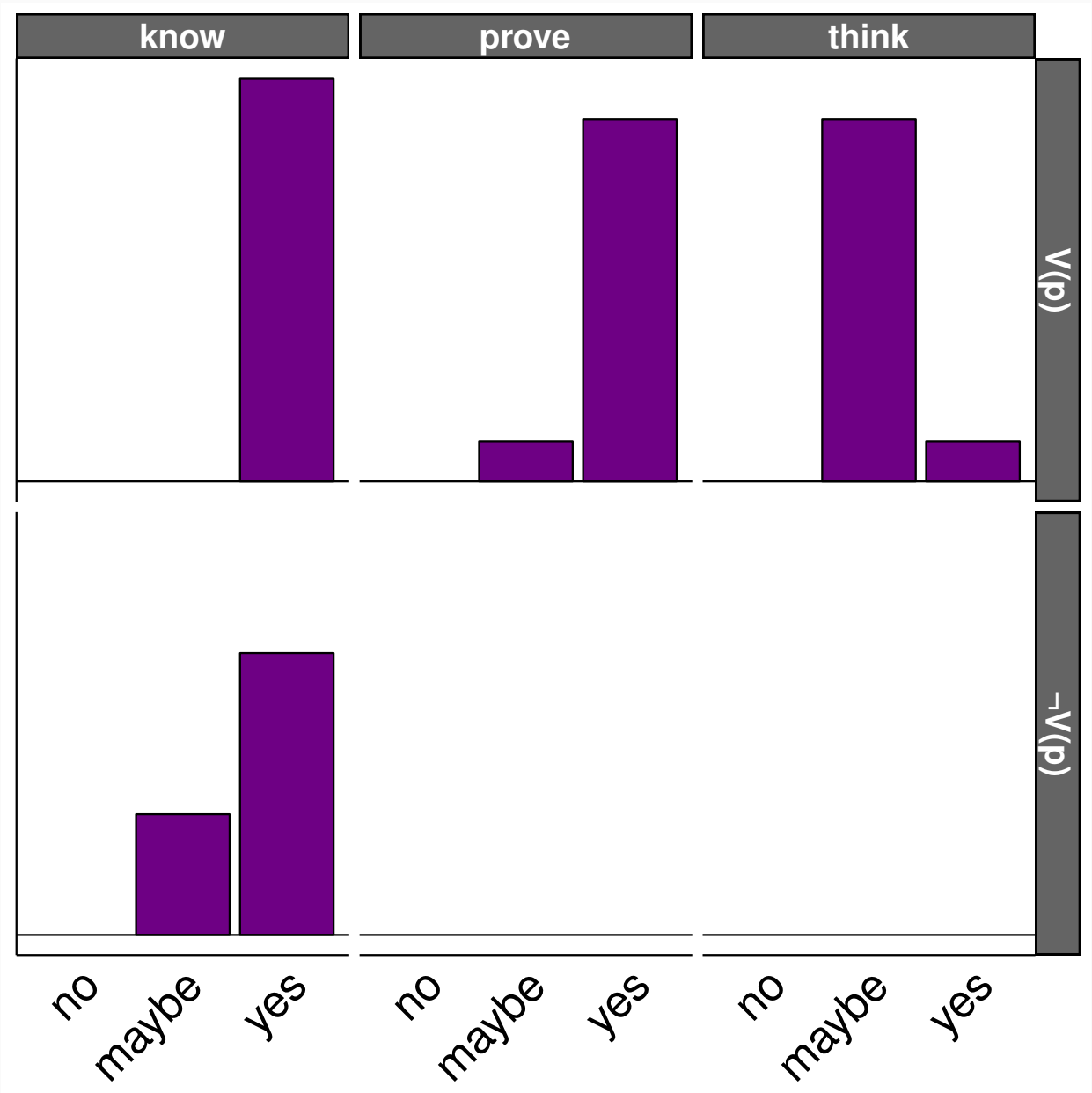

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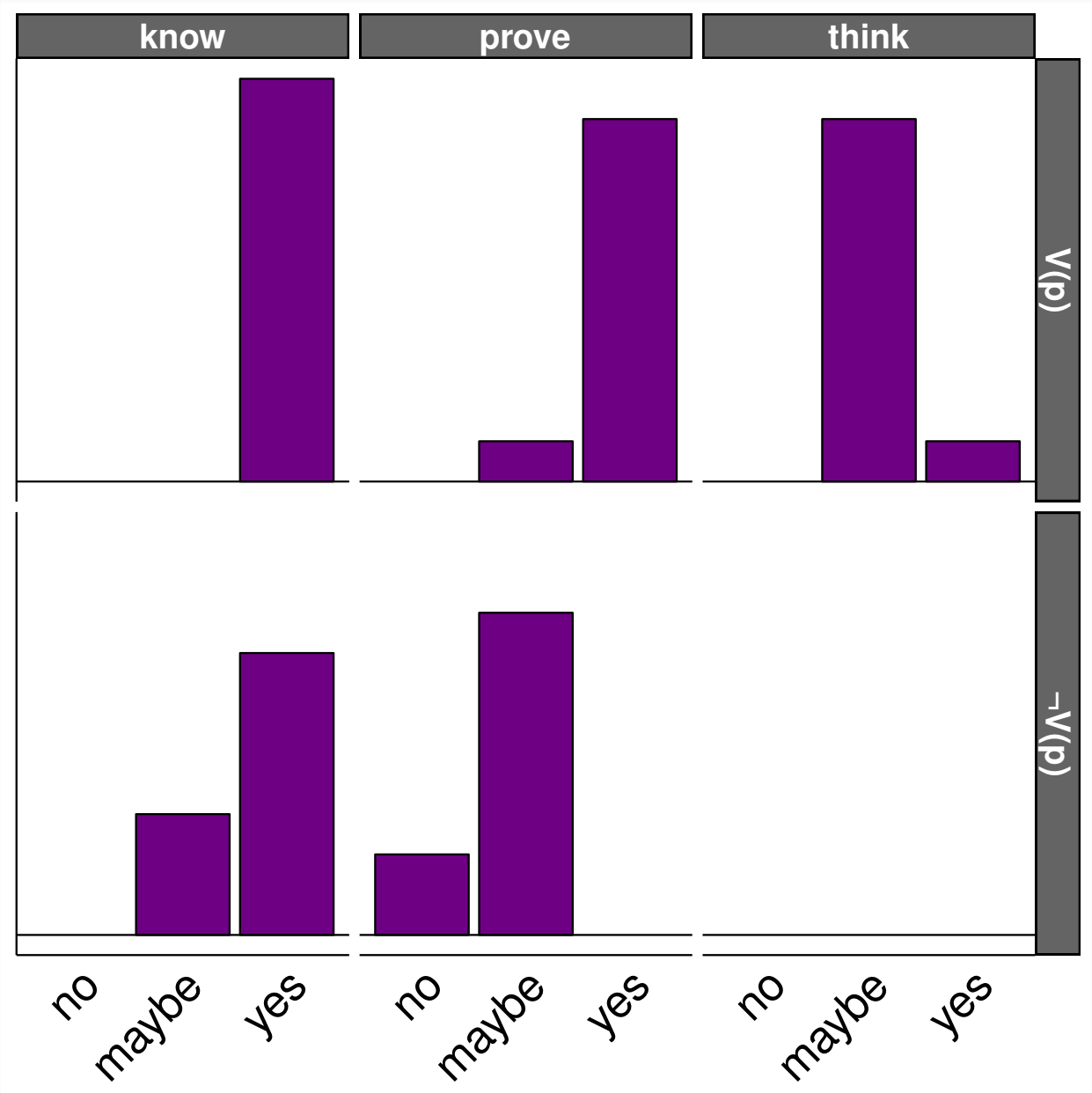

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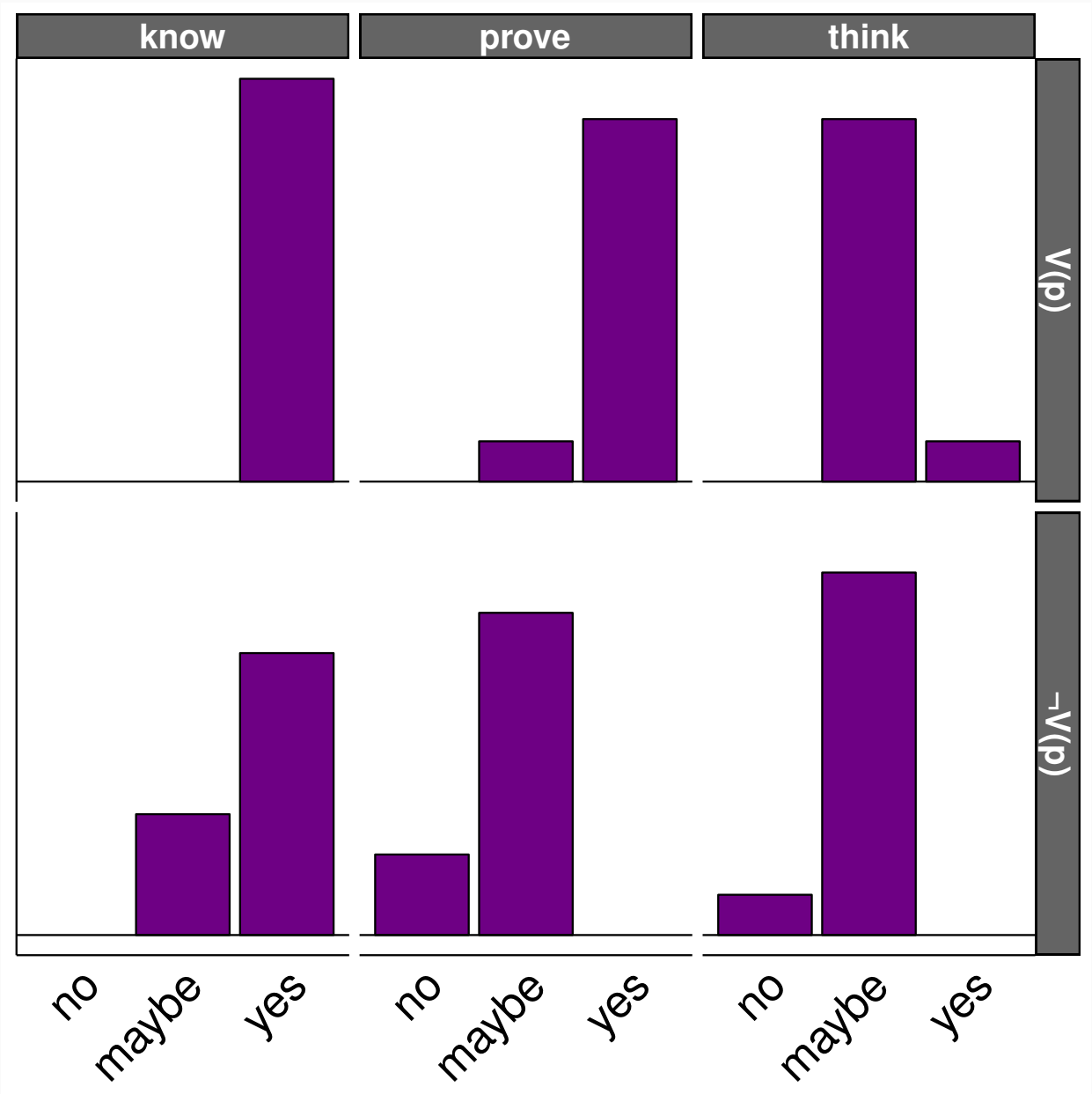

Normalization

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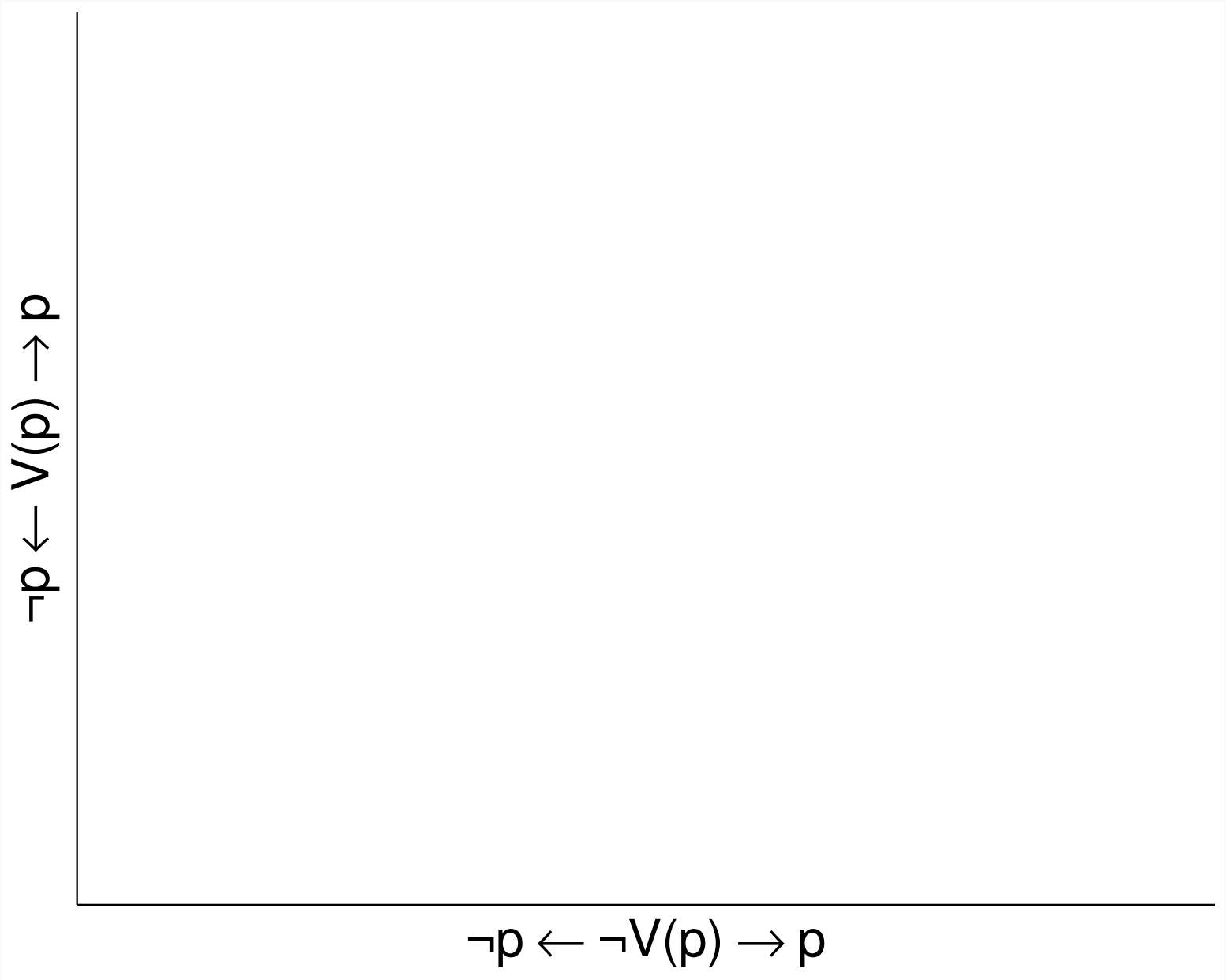
Transformation (roughly)

Map each verb to single two-dimensional point by assigning -1 to *no*, 0 to *maybe*, and 1 to *yes*, then take the mean.

Normalized responses



Normalization

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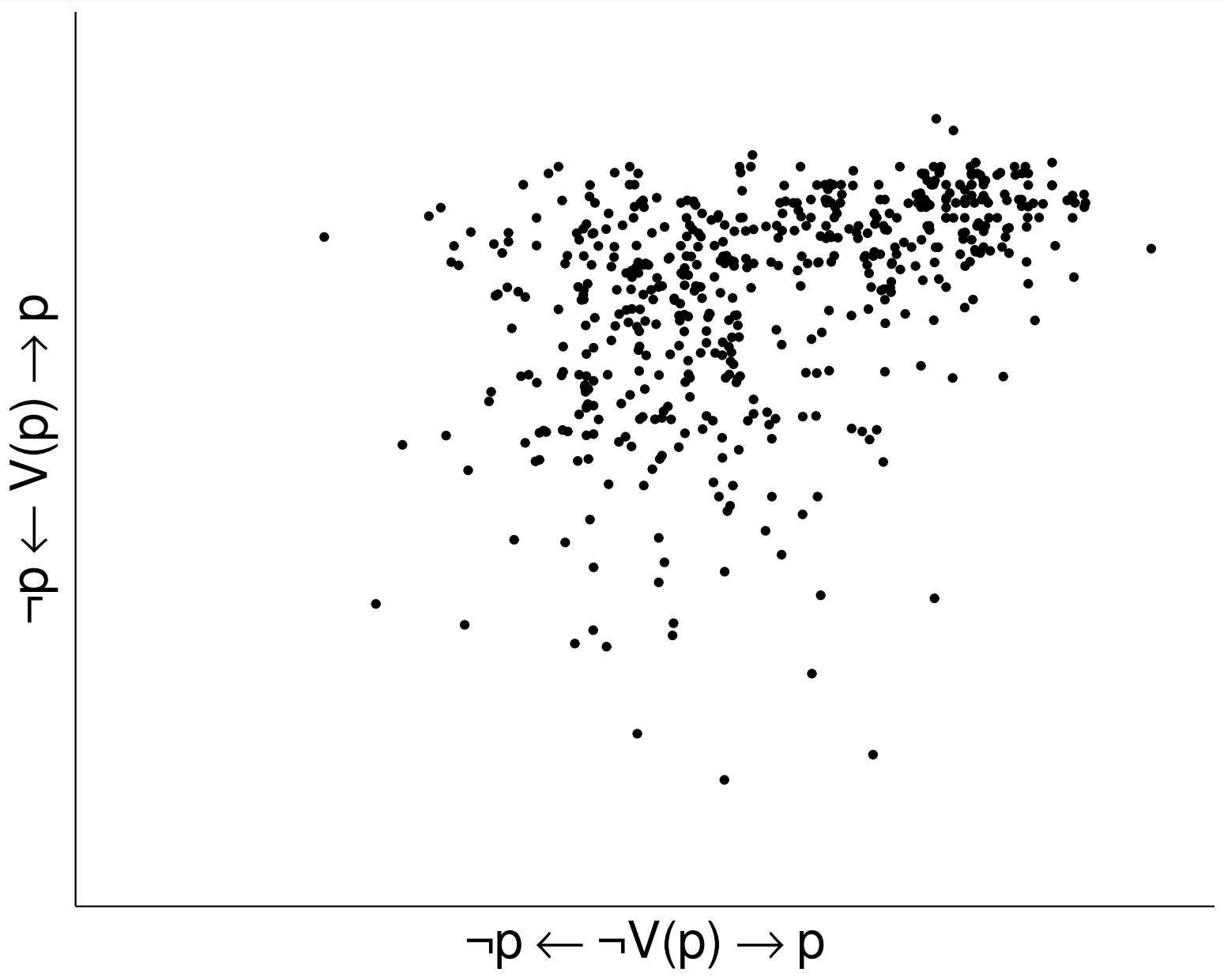
Normalize

Use ridit scoring to normalize for how often a particular participant gives a particular response.

Normalized responses



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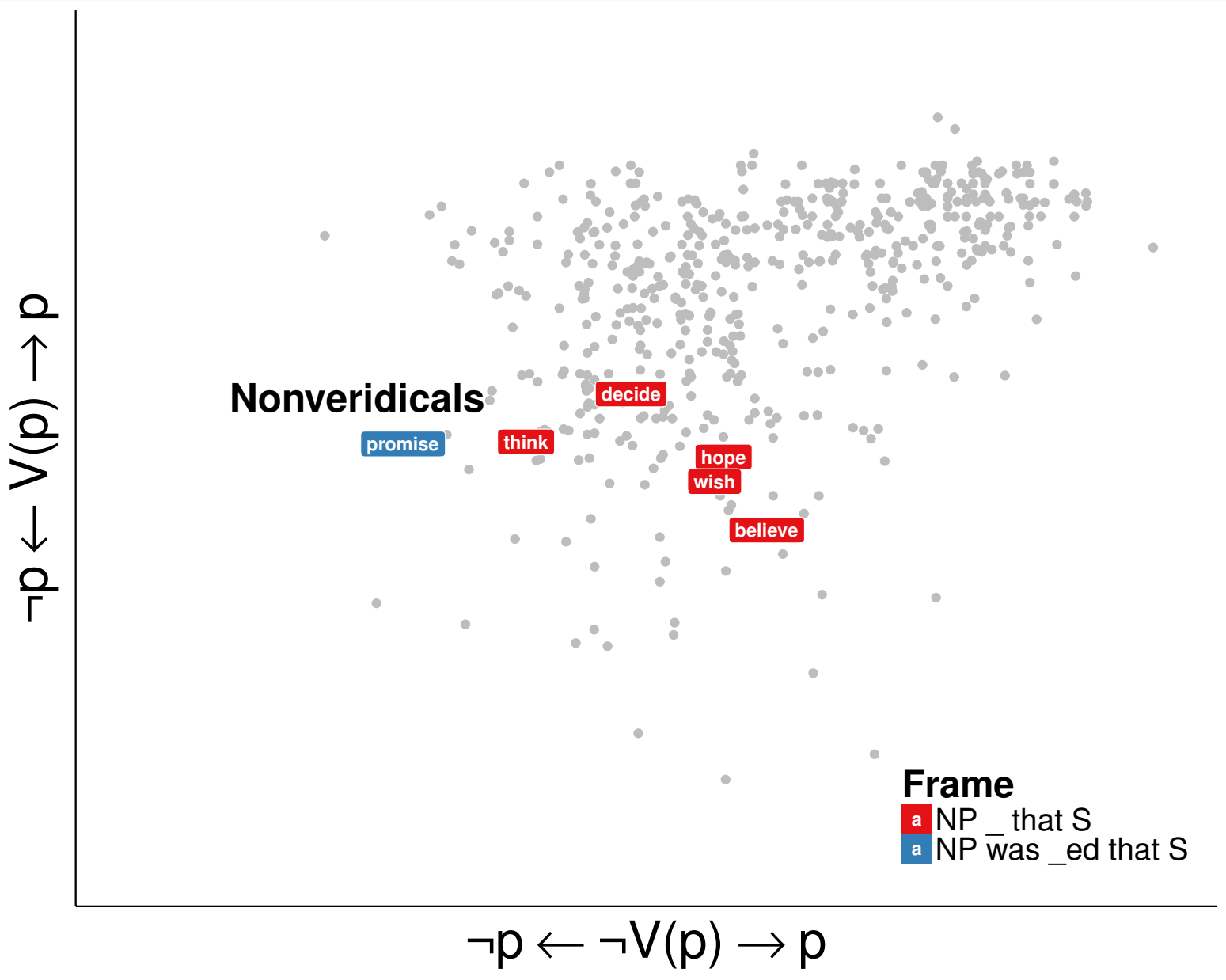

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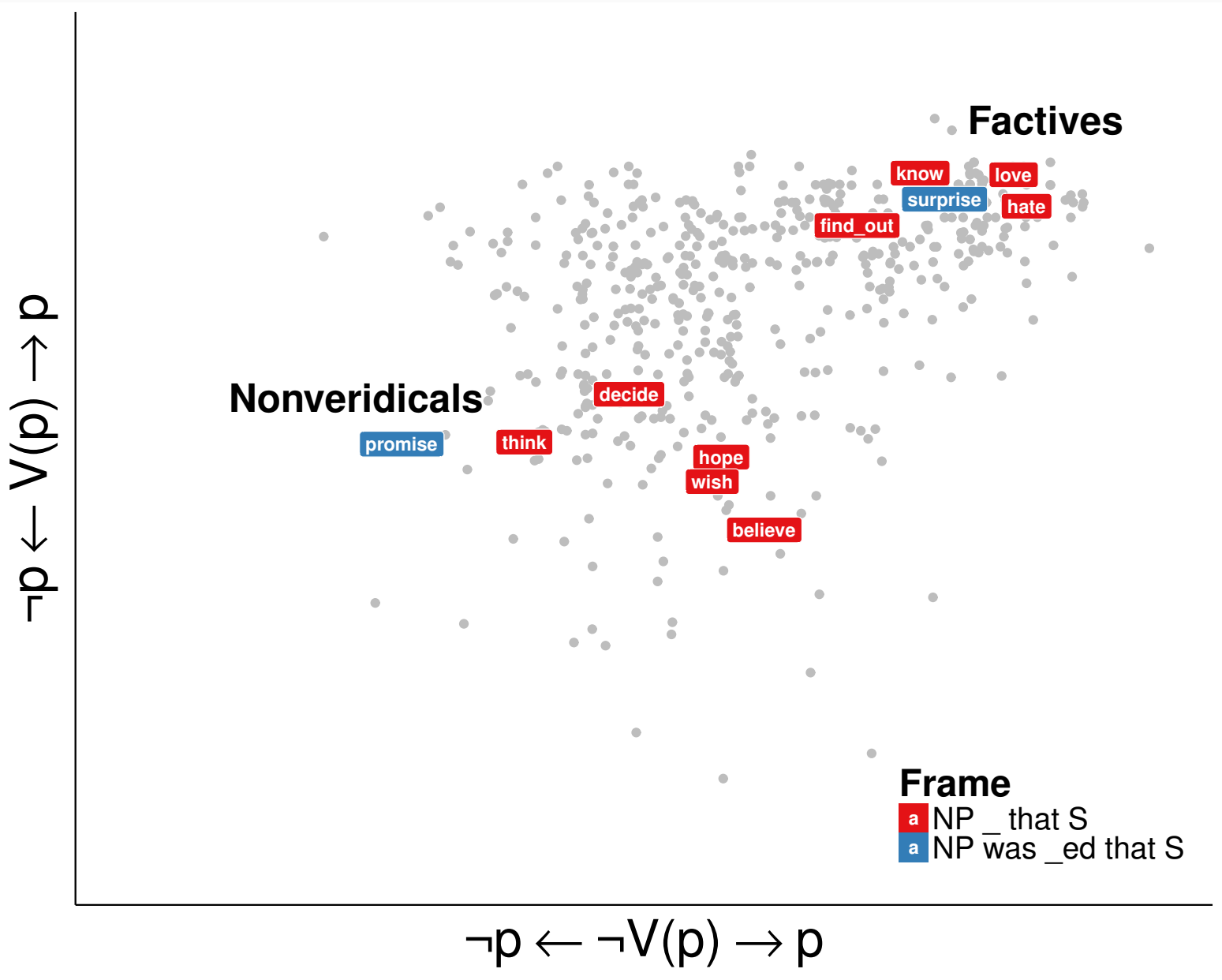

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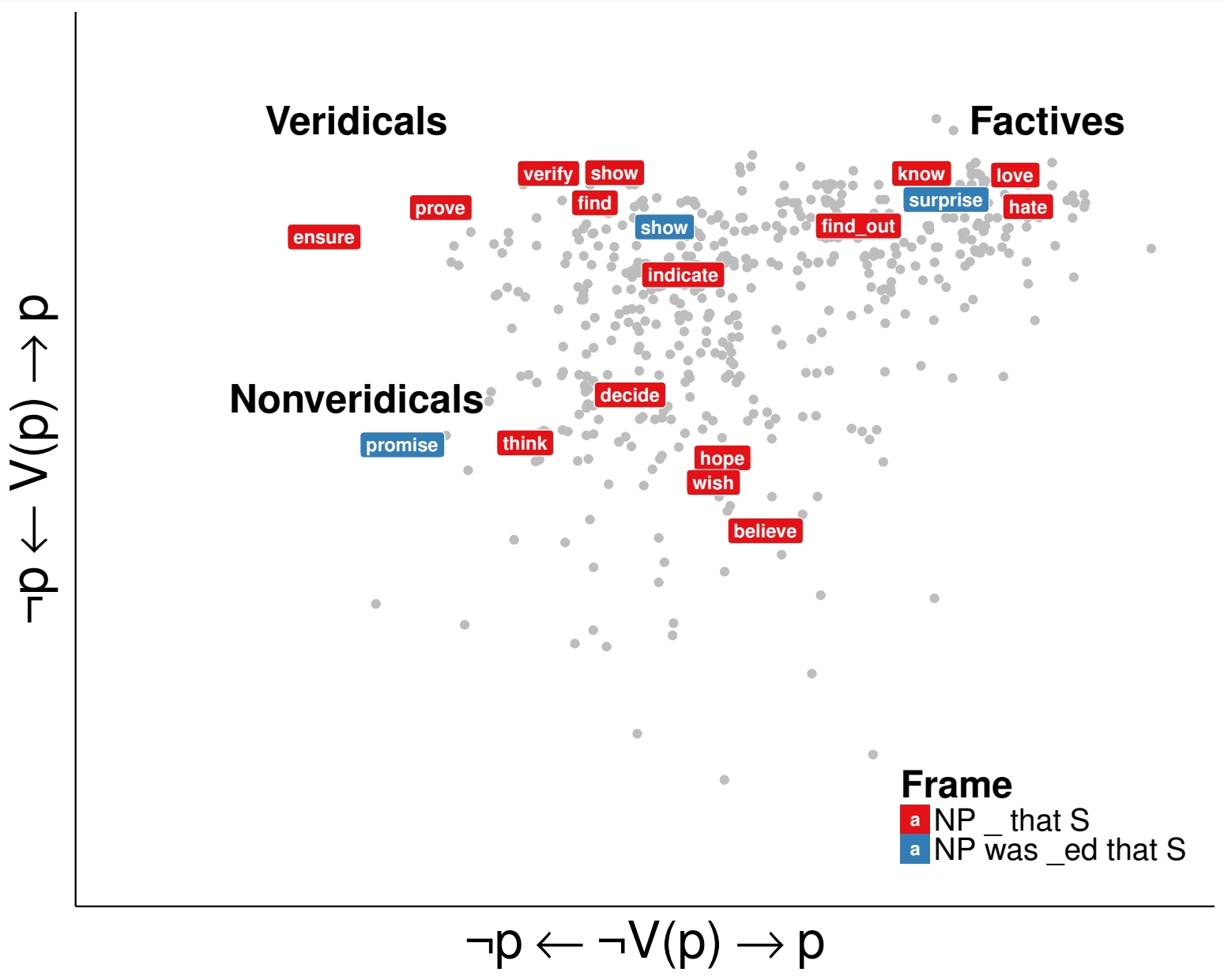

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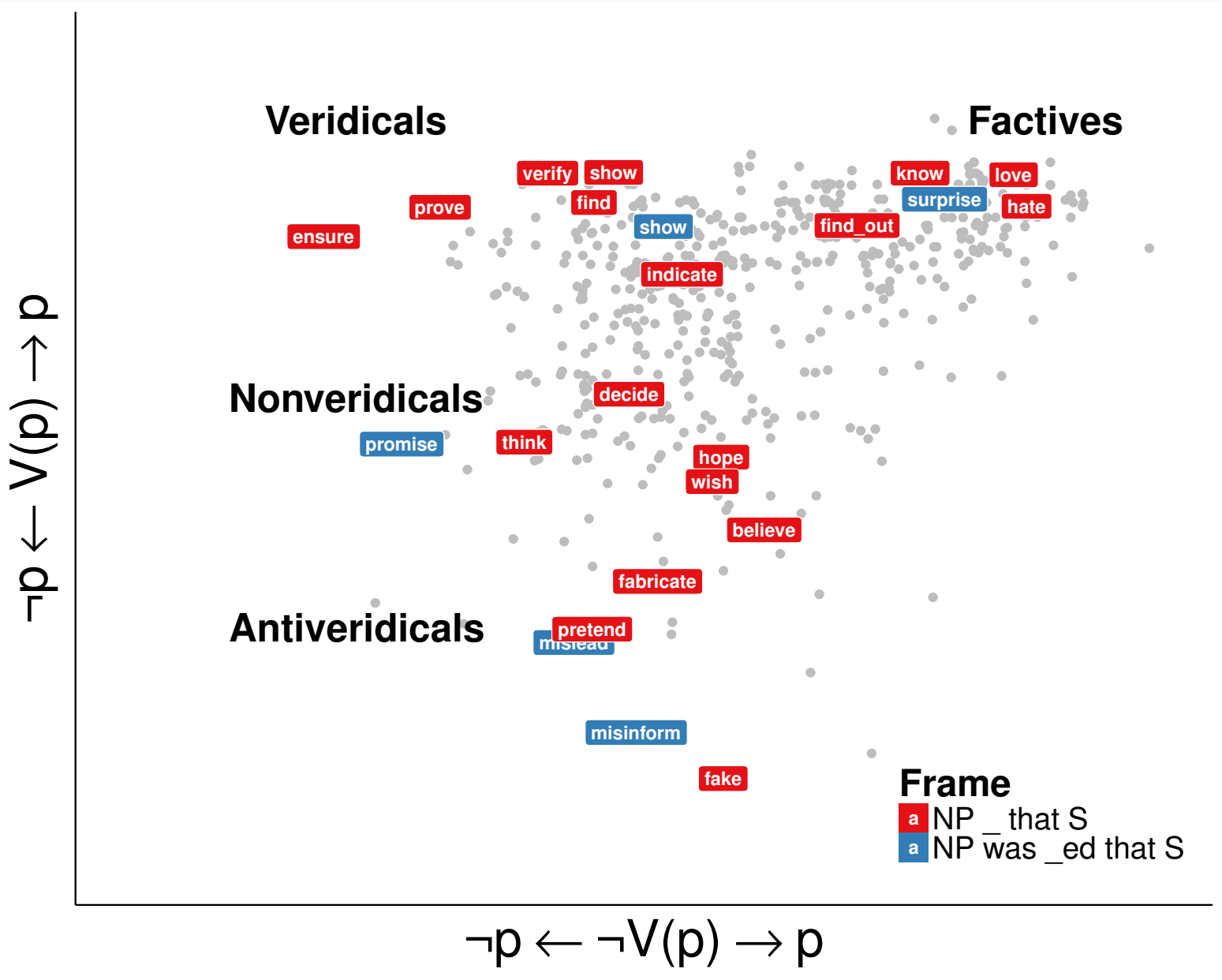

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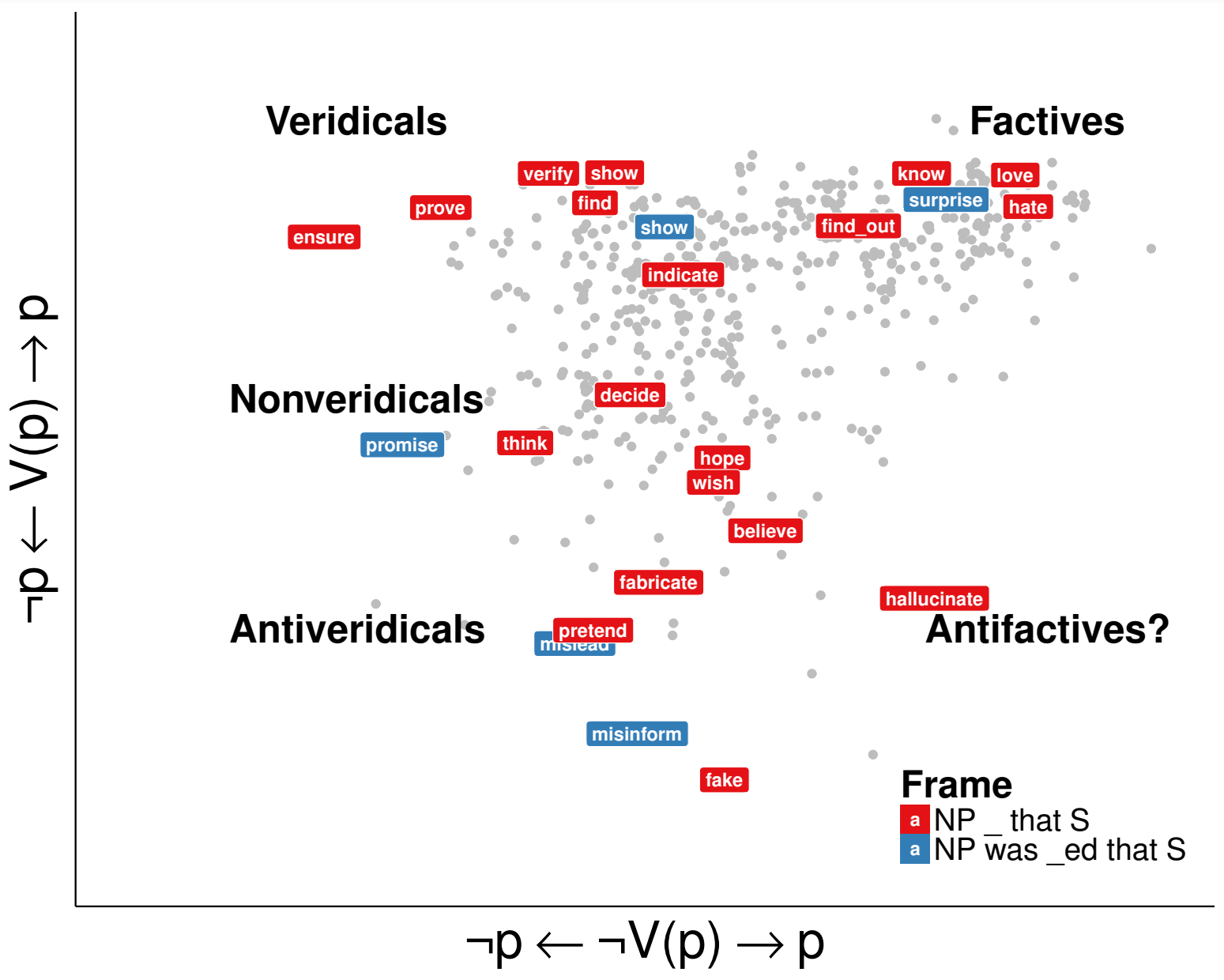

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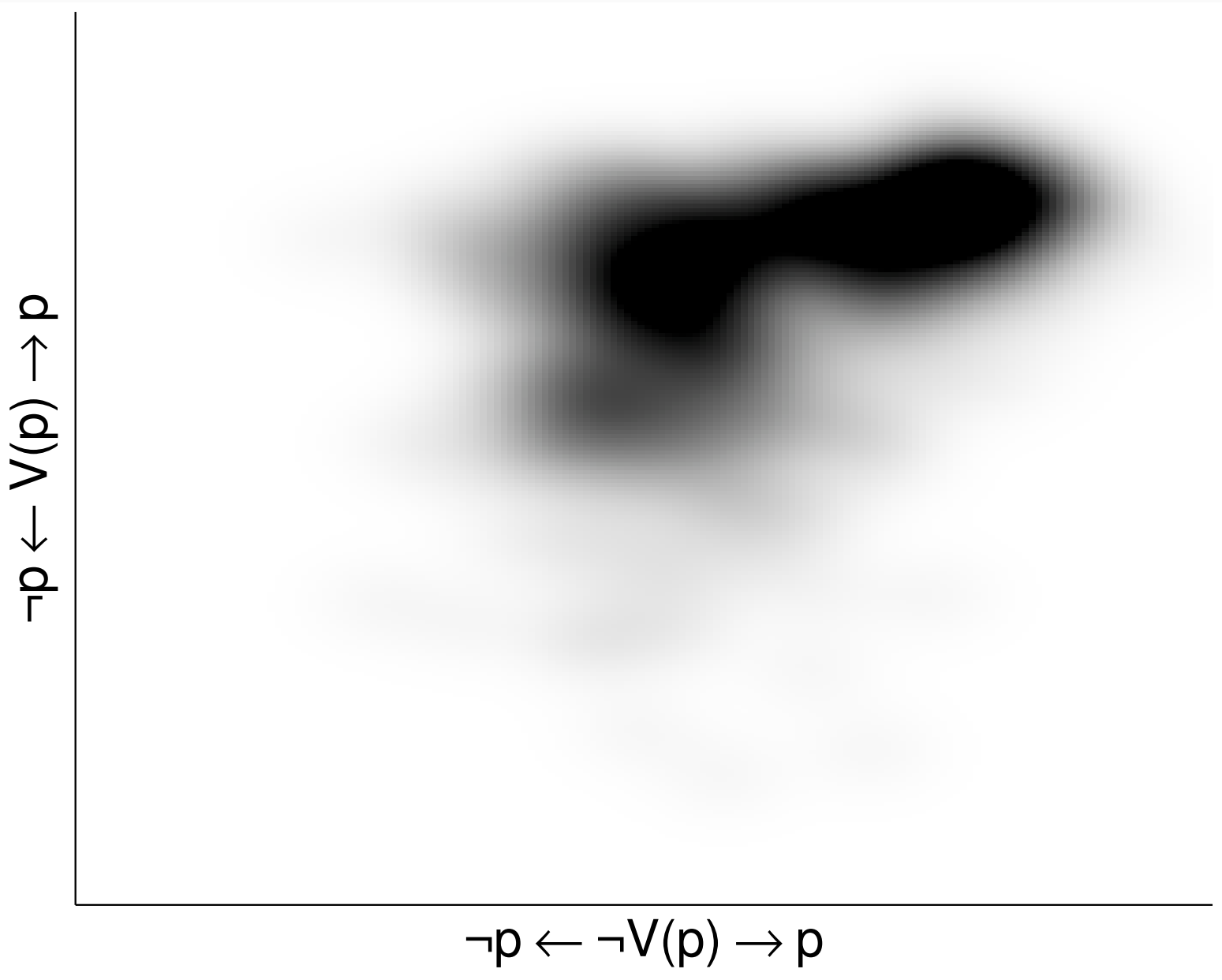

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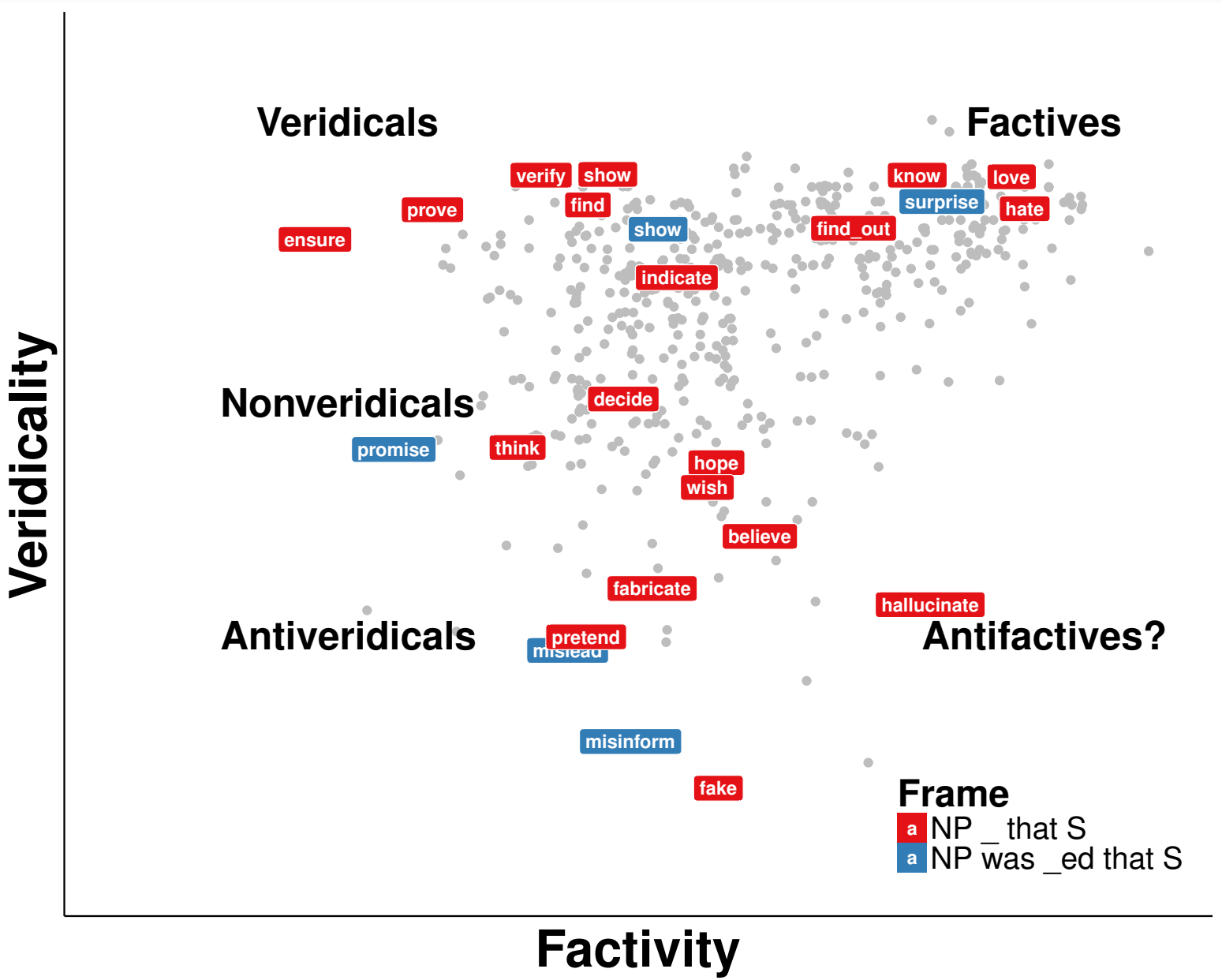
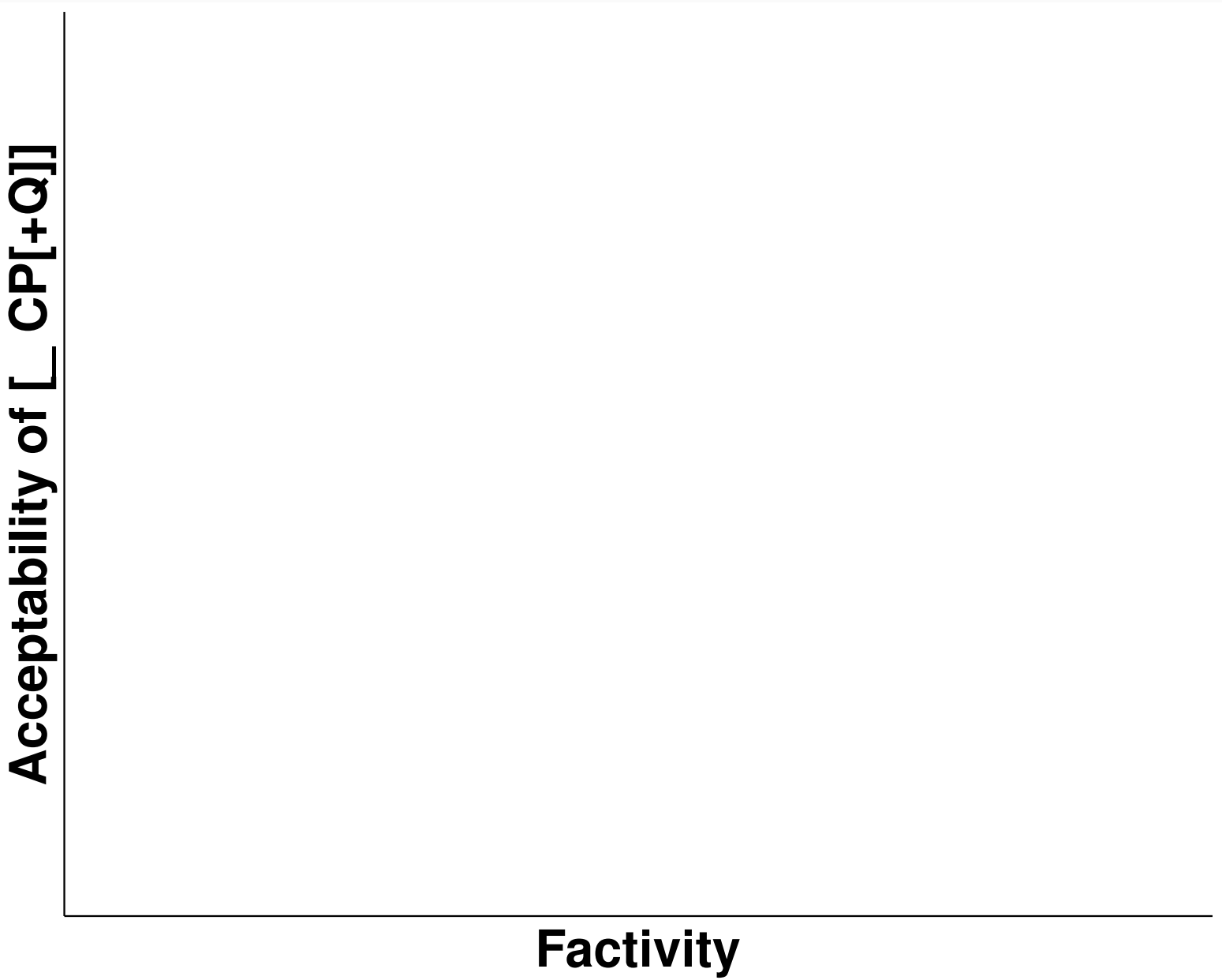


Relating factivity, veridicality, and question-taking

Question

Do factivity/veridicality positively correlate with question-taking?

Correlation: factivity and question-taking



Measure of question selection

Acceptability of [___CP[+Q]]

For a particular verb, maximum acceptability over all frames that contain an interrogative complement.

Measure of question selection

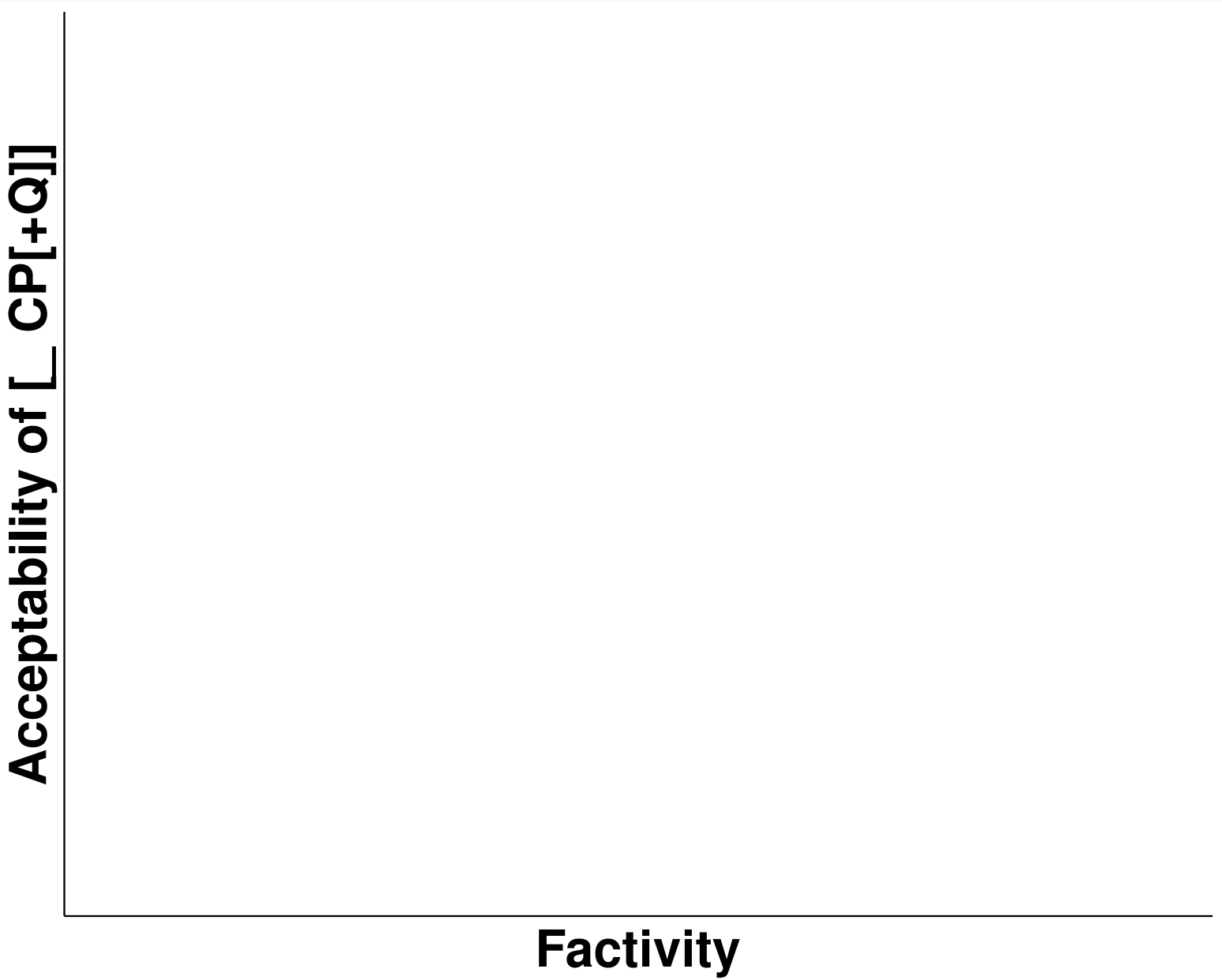
Acceptability of [___CP[+Q]]

For a particular verb, maximum acceptability over all frames that contain an interrogative complement.

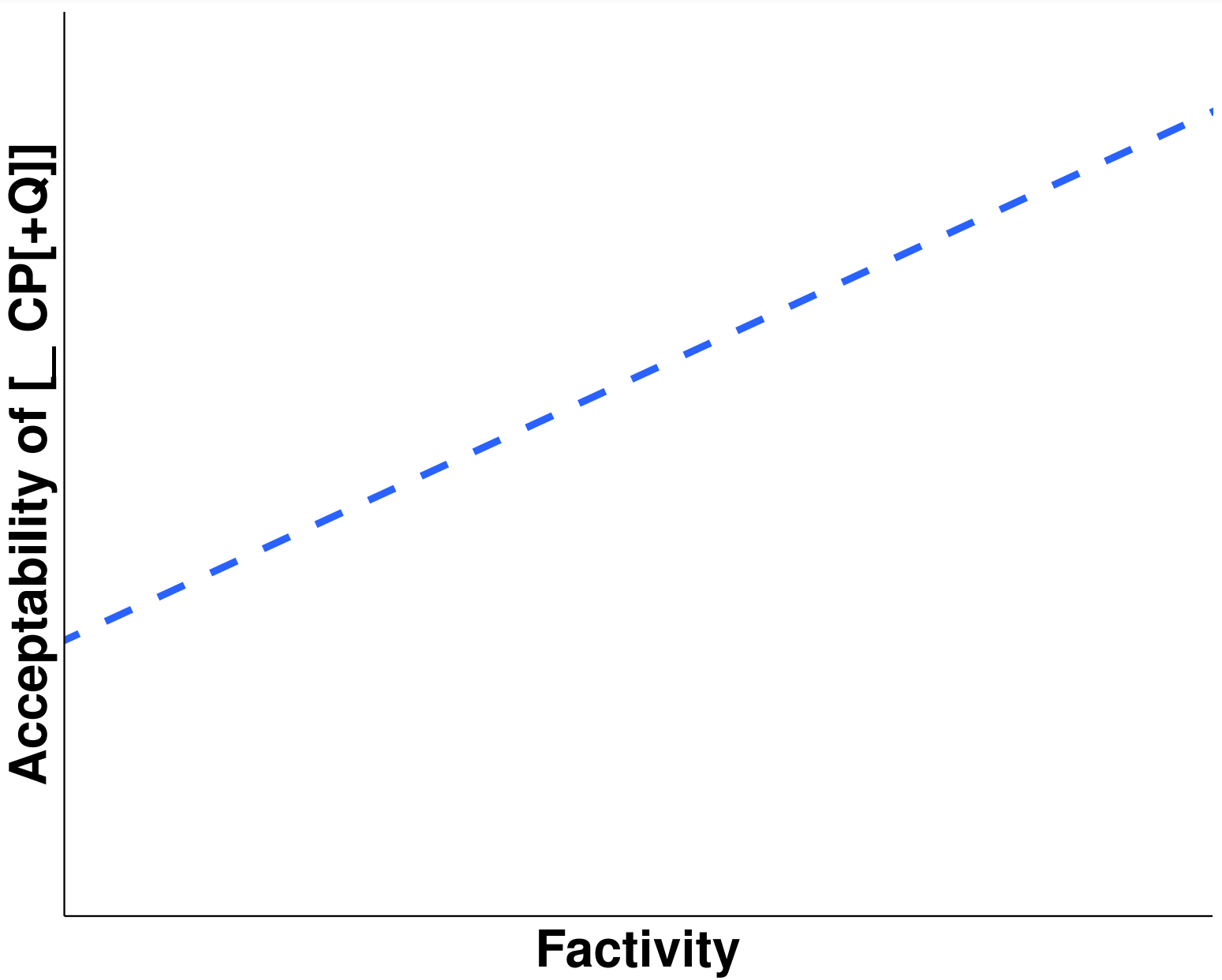
Intuition

If a verb is acceptable in some frame that contains an interrogative complement, it is acceptable with interrogatives.

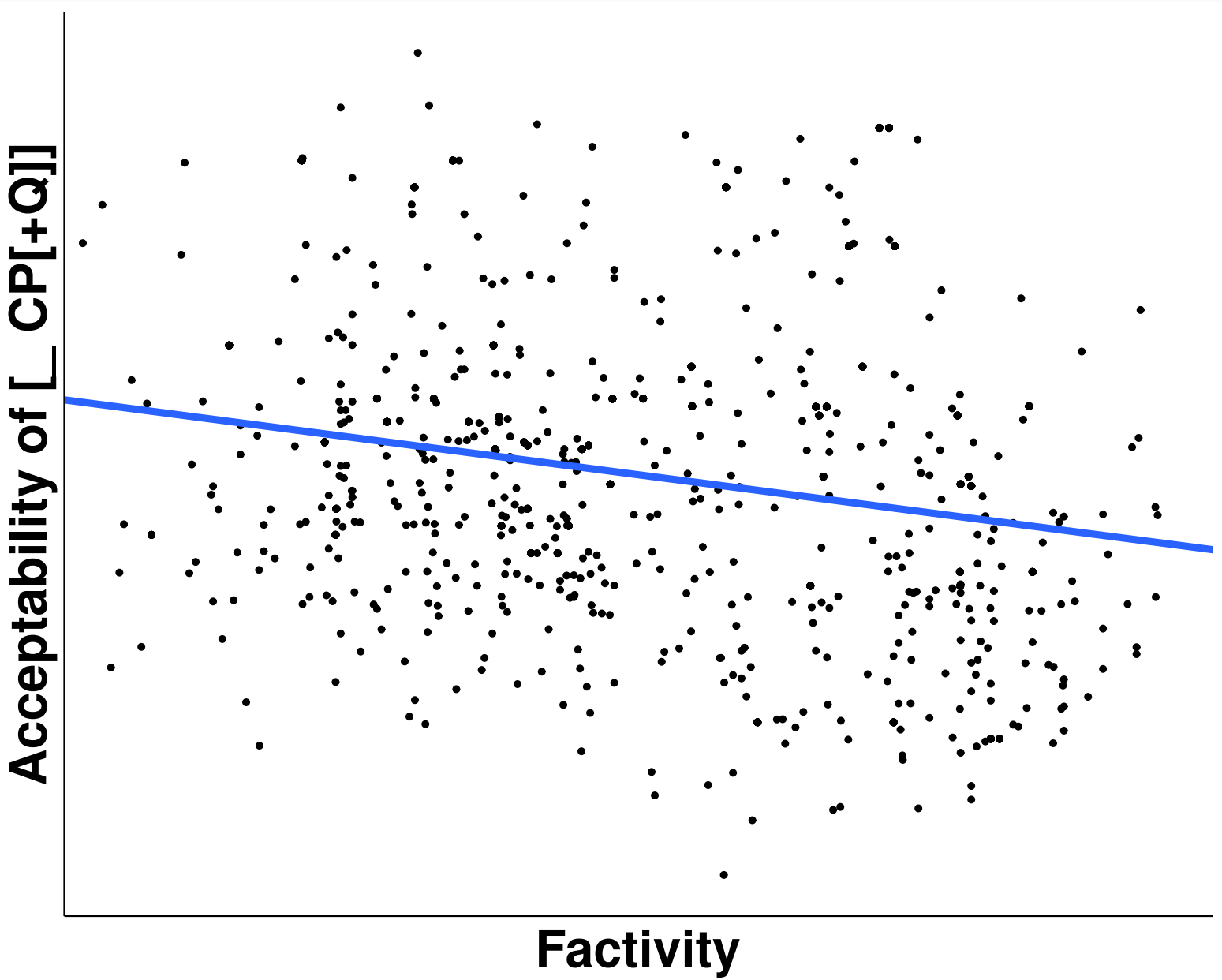
Correlation: factivity and question-taking



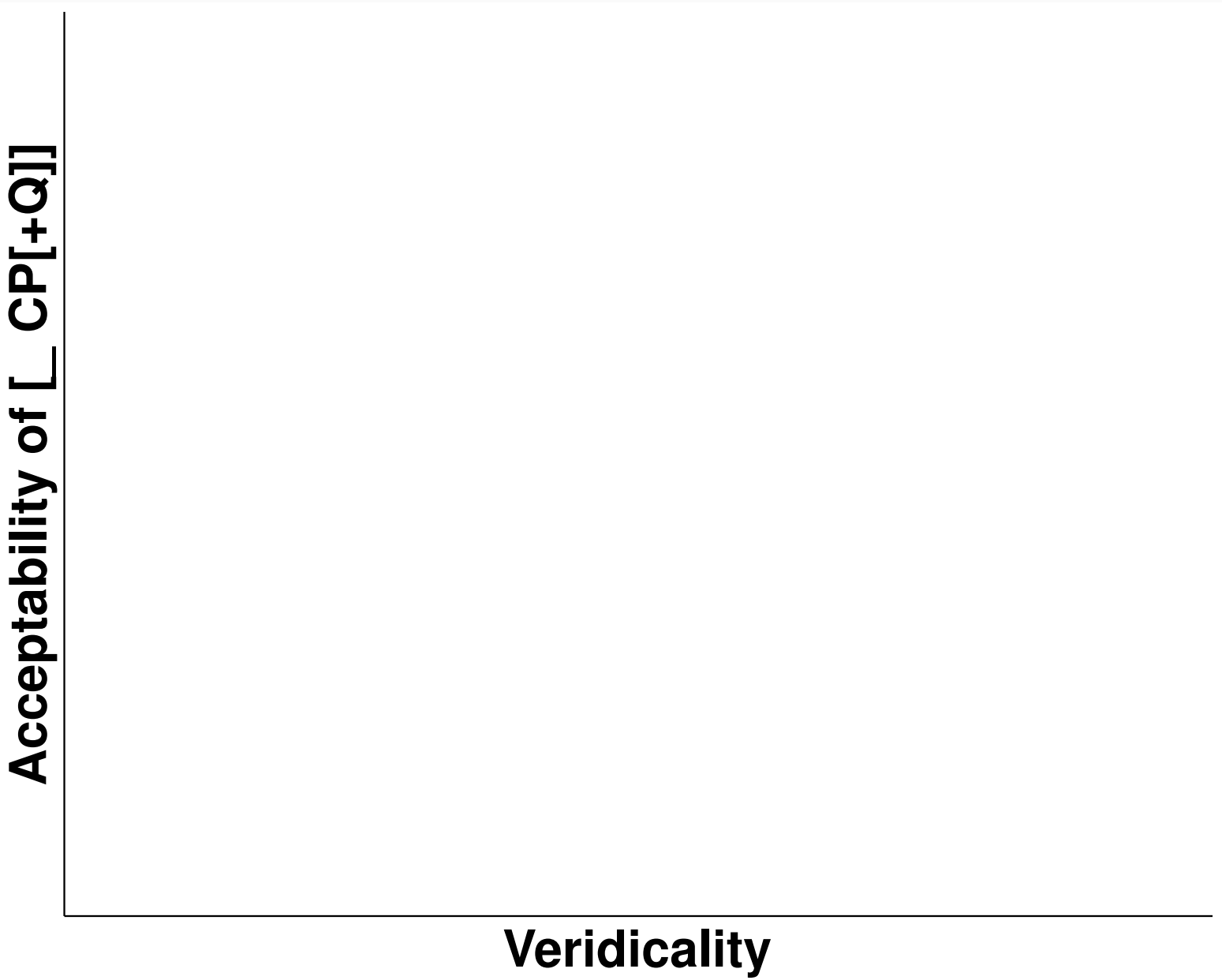
Correlation: factivity and question-taking



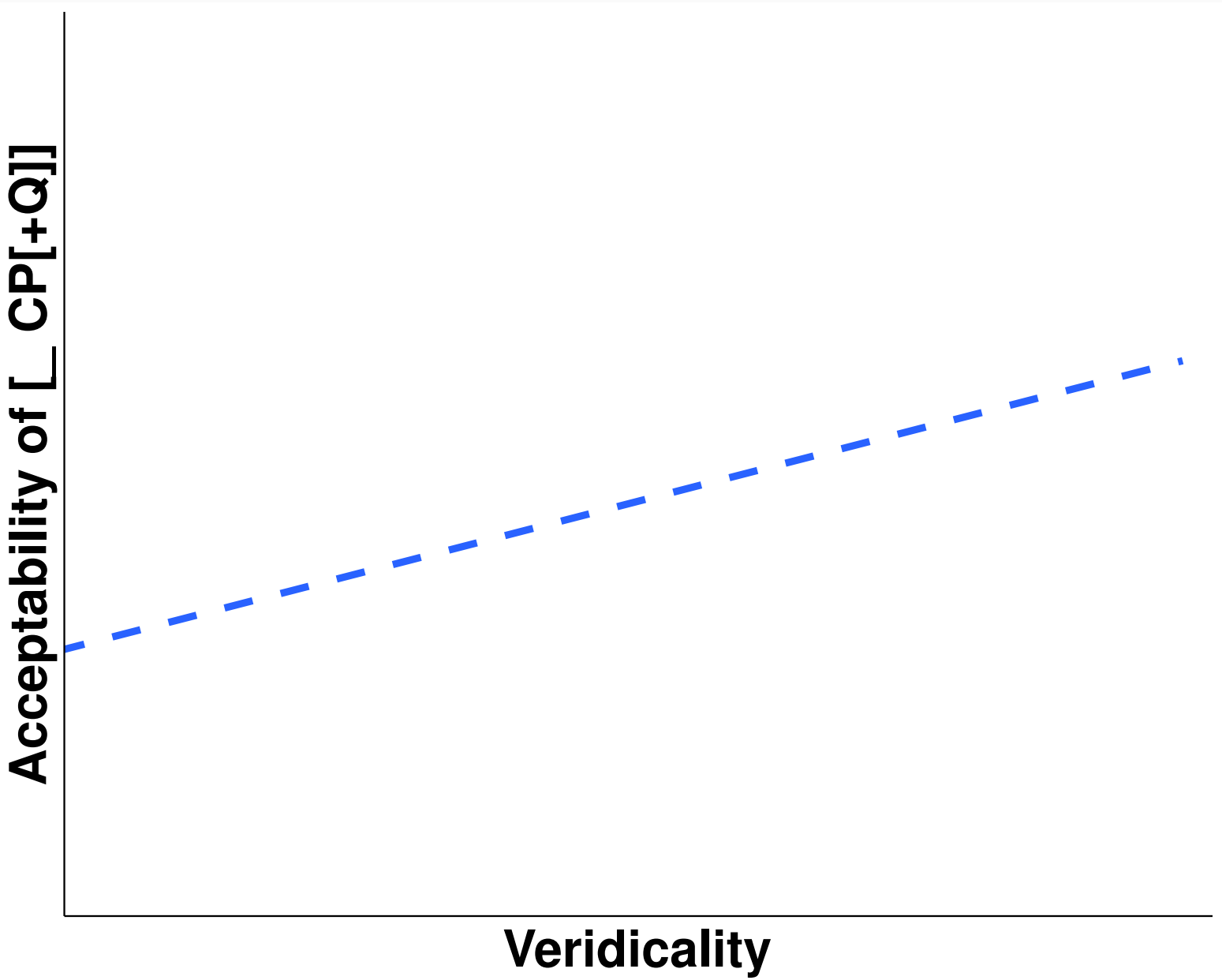
Correlation: factivity and question-taking



Correlation: veridicality and question-taking



Correlation: veridicality and question-taking



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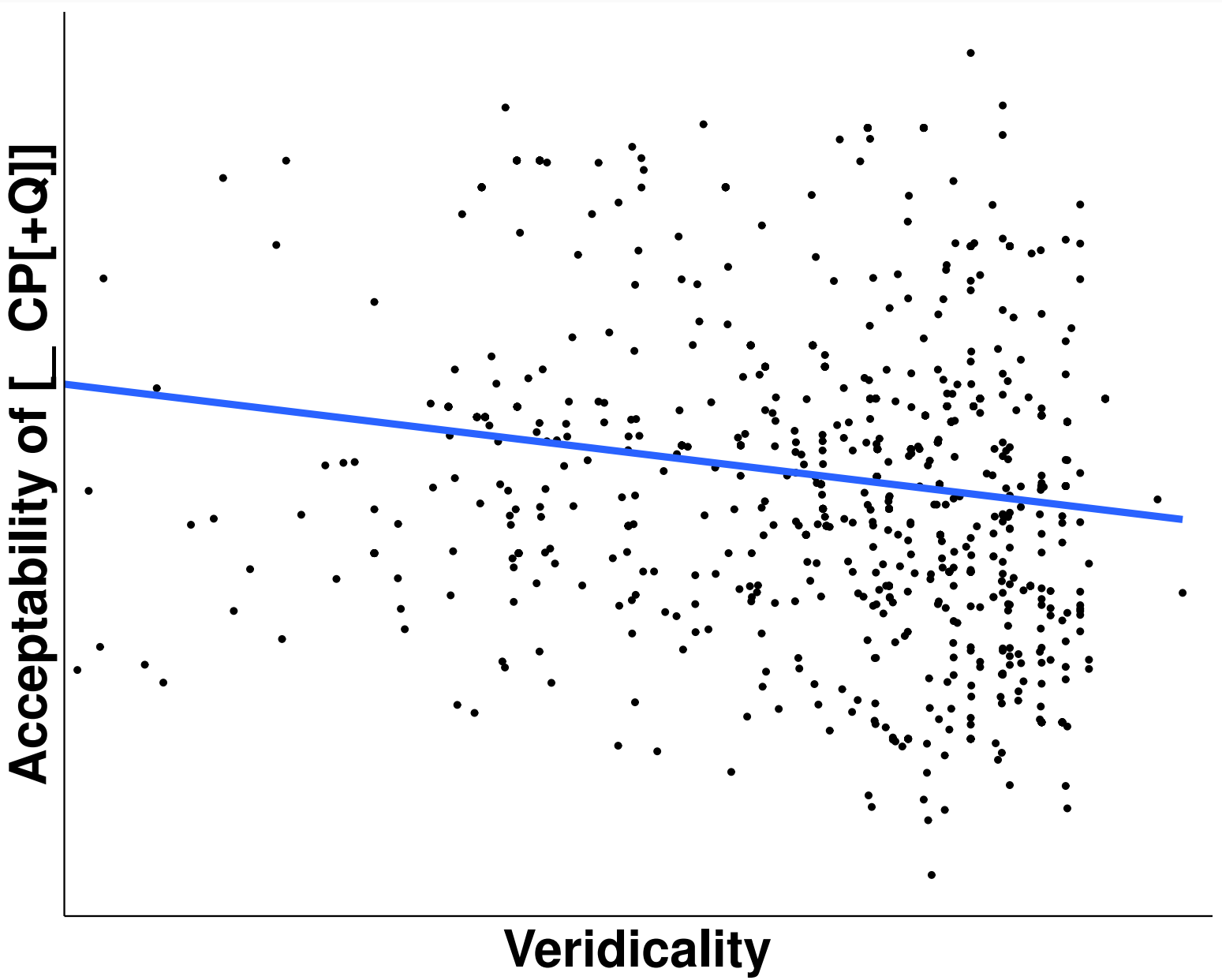


What’s going on?

Question

How could we have gotten the direction of correlation so wrong?

What's going on?

Question

How could we have gotten the direction of correlation so wrong?

Two hypotheses

1. Previous analyses were biased by verb frequency.

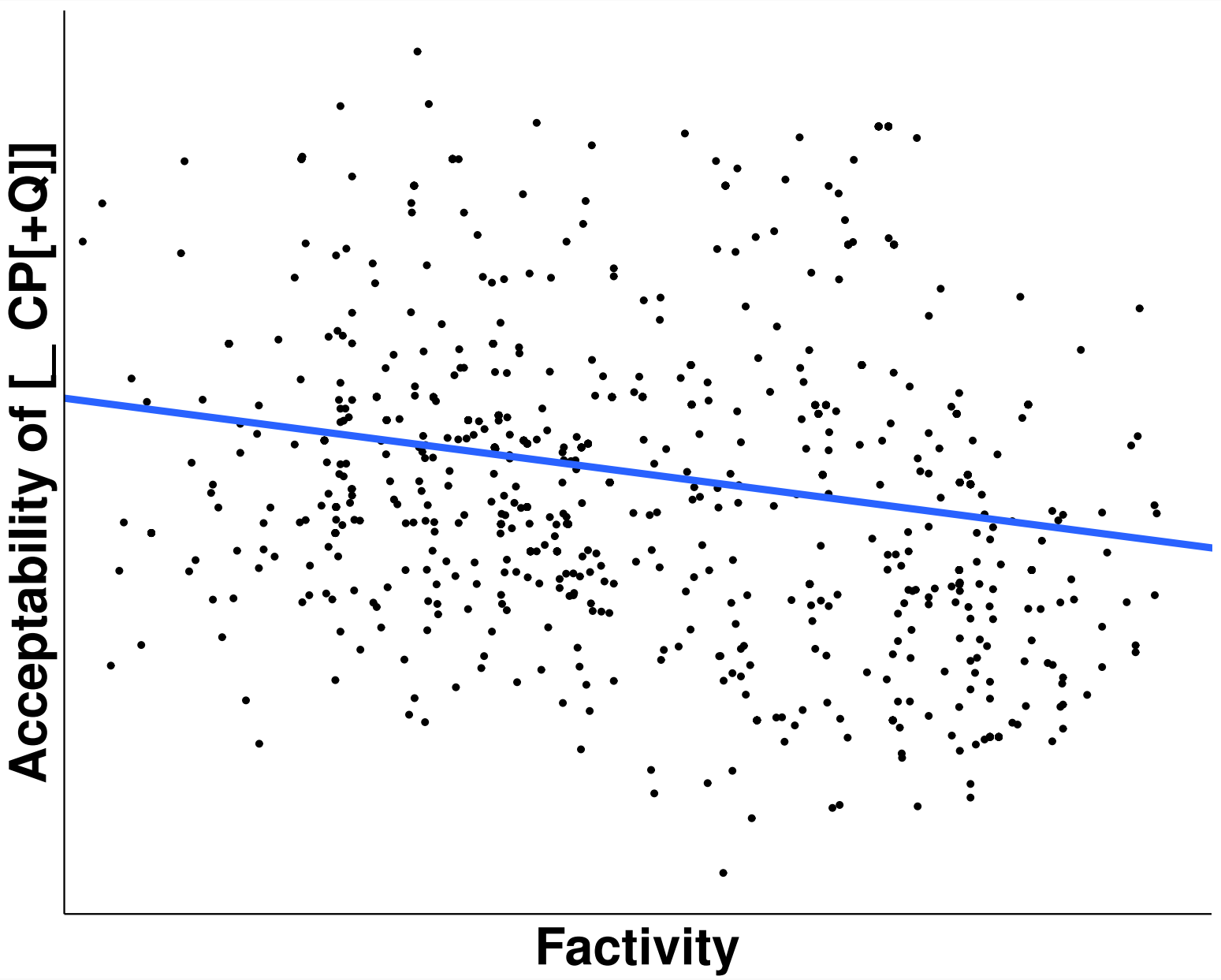
Two findings

Two findings

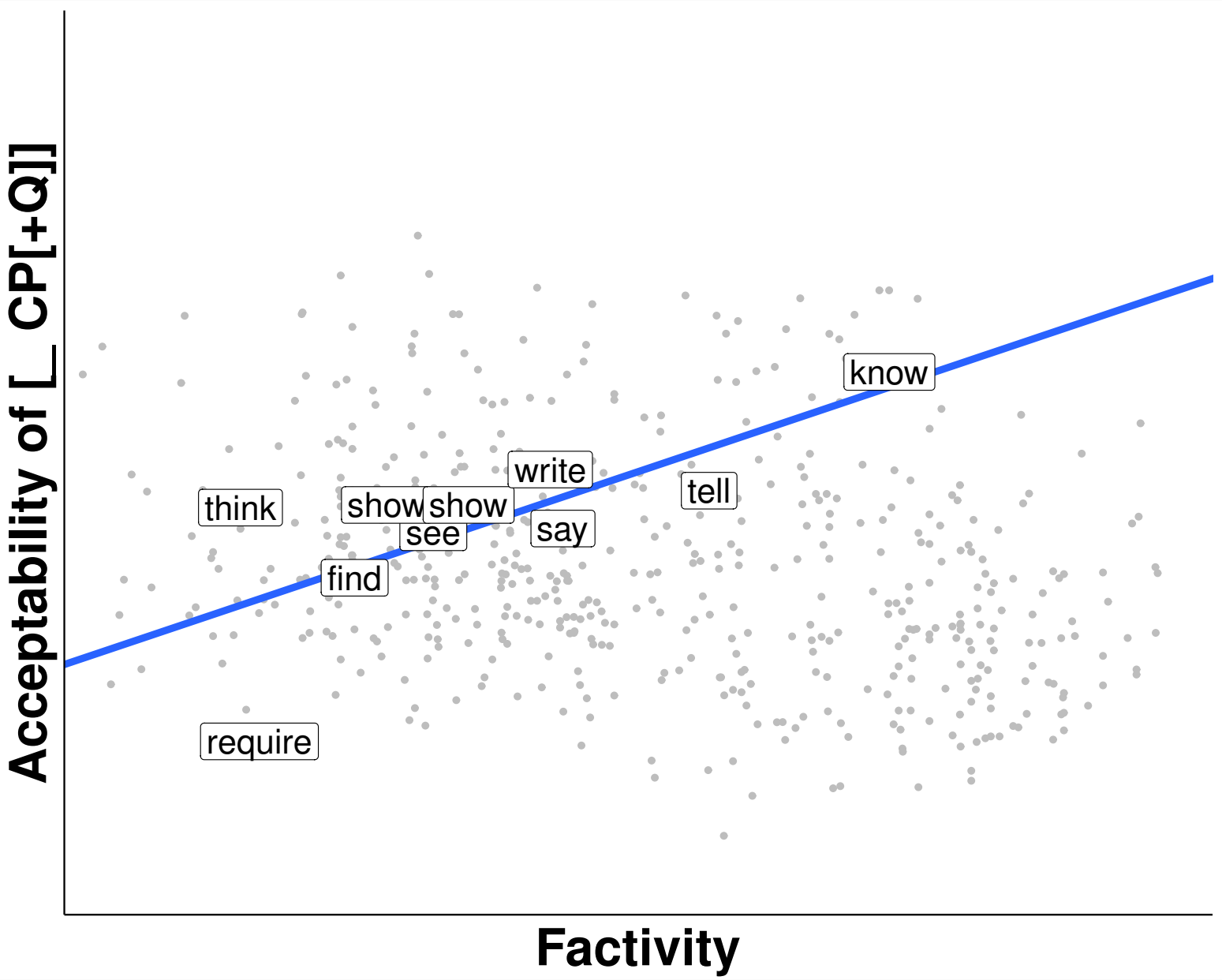
Finding #1

If we look at only the most frequent verbs, the correlations flip.

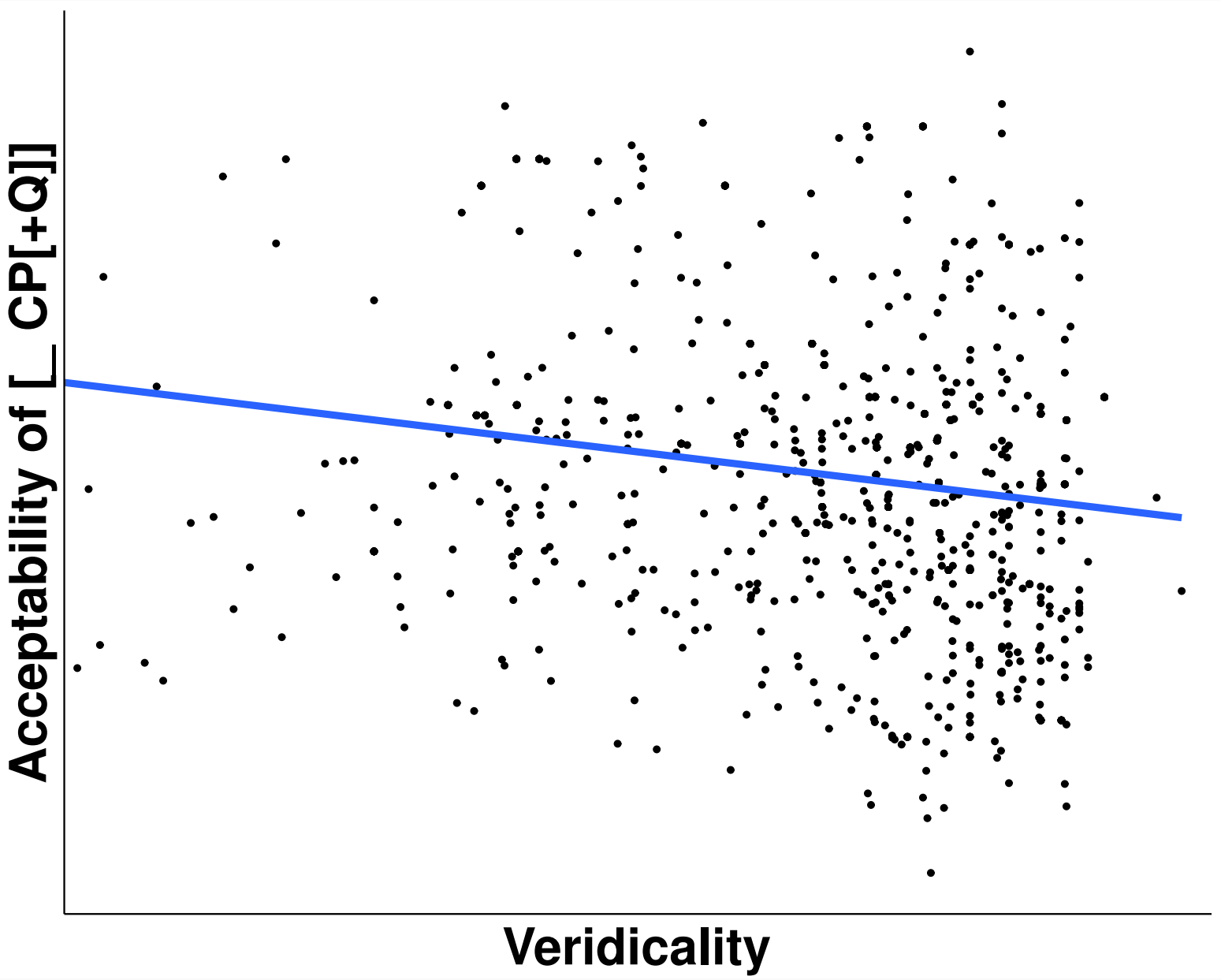
Correlation: factivity with all verbs



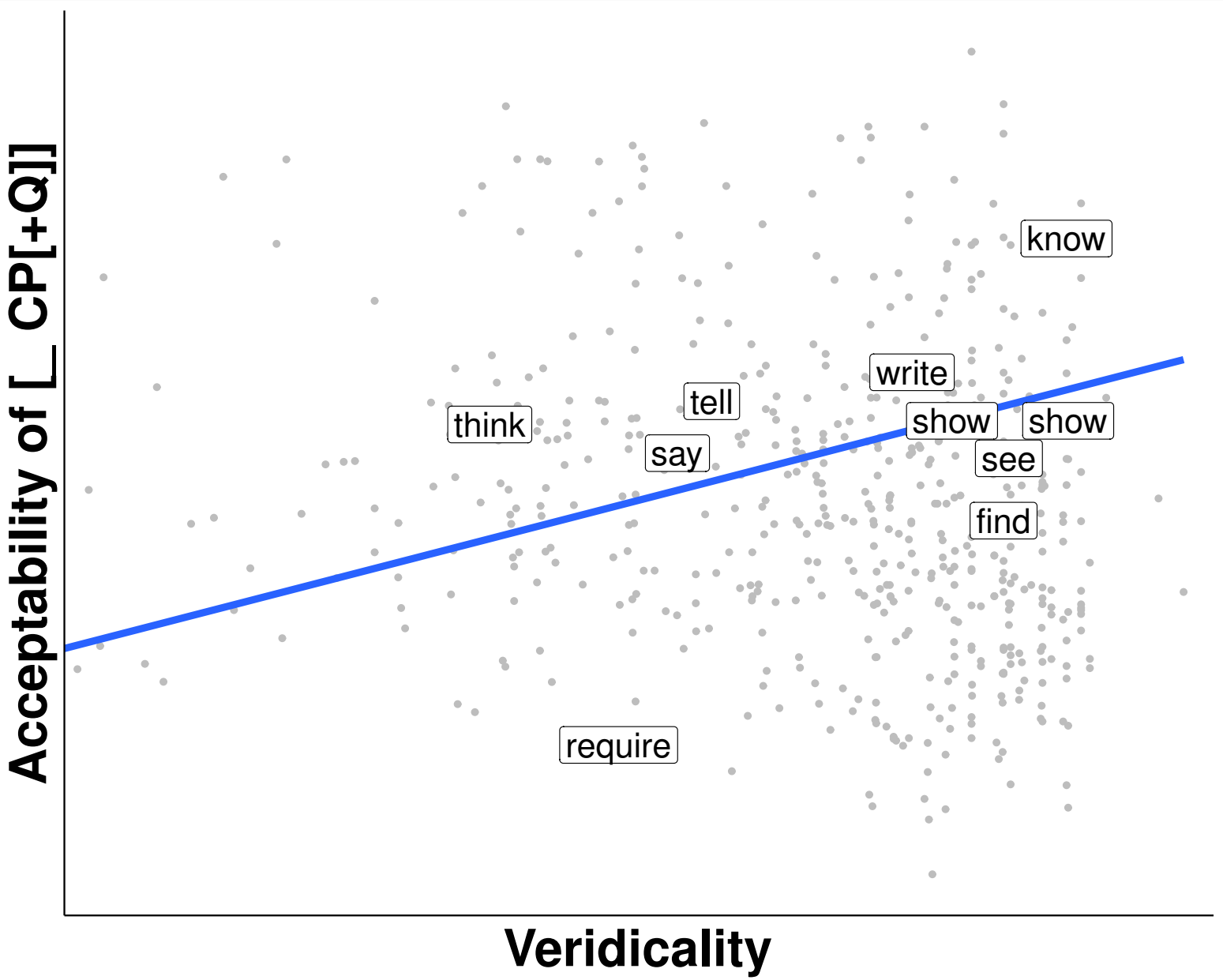
Correlation: factivity with high-frequency verbs



Correlation: veridicality with all verbs



Correlation: veridicality with high-frequency verbs



What's going on?

Question

How could we have gotten the direction of correlation so wrong?

Two hypotheses

1. Previous analyses were biased by verb frequency.
2. Our analysis missed subregularities due to verb class.

Two findings

Finding #1

If we look at only the most frequent verbs, the correlations flip.

Two findings

Finding #1

If we look at only the most frequent verbs, the correlations flip.

Finding #2

There are subregularities, but they don’t validate the purported correlation.

Finding subregularities

Aim

Find overlapping clusters of verbs that best explain both...

Finding subregularities

Aim

Find overlapping clusters of verbs that best explain both...

1. veridicality/factivity

Finding subregularities

Aim

Find overlapping clusters of verbs that best explain both...

1. veridicality/factivity
2. full syntactic distribution (not just question-taking)

Finding subregularities

Aim

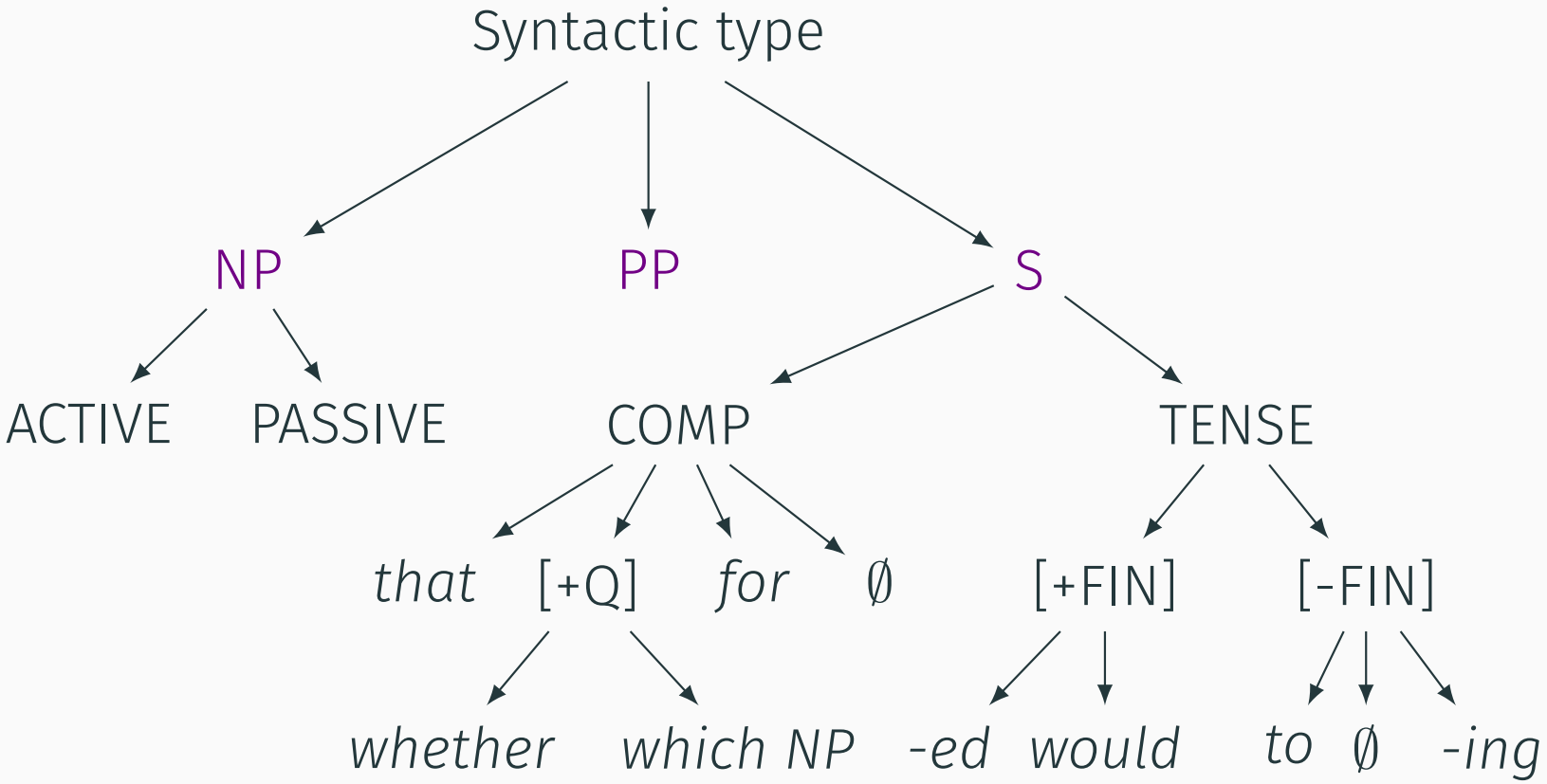
Find overlapping clusters of verbs that best explain both...

1. veridicality/factivity
2. full syntactic distribution (not just question-taking)

Possibility

The question-taking correlation holds in some clusters.

MegaAttitude frames



Canonical Correlation Analysis (CCA)

Intuition

Find best way of simultaneously mapping...

Canonical Correlation Analysis (CCA)

Intuition

Find best way of simultaneously mapping...

1. veridicality/factivity to syntactic distribution

Canonical Correlation Analysis (CCA)

Intuition

Find best way of simultaneously mapping...

1. veridicality/factivity to syntactic distribution
2. syntactic distribution to veridicality/factivity

Canonical Correlation Analysis (CCA)

Intuition

Find best way of simultaneously mapping...

1. veridicality/factivity to syntactic distribution
2. syntactic distribution to veridicality/factivity

Veridicality judgments

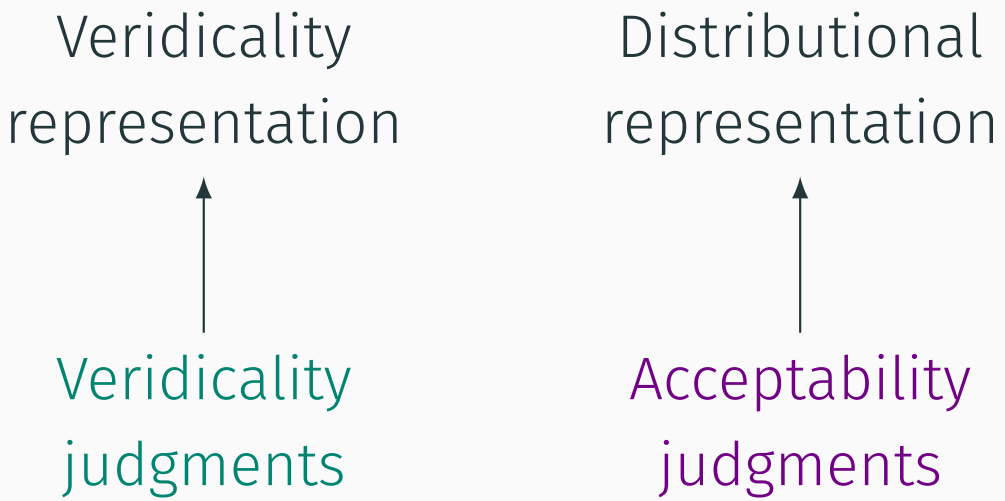
Acceptability judgments

Canonical Correlation Analysis (CCA)

Intuition

Find best way of simultaneously mapping...

1. veridicality/factivity to syntactic distribution
2. syntactic distribution to veridicality/factivity

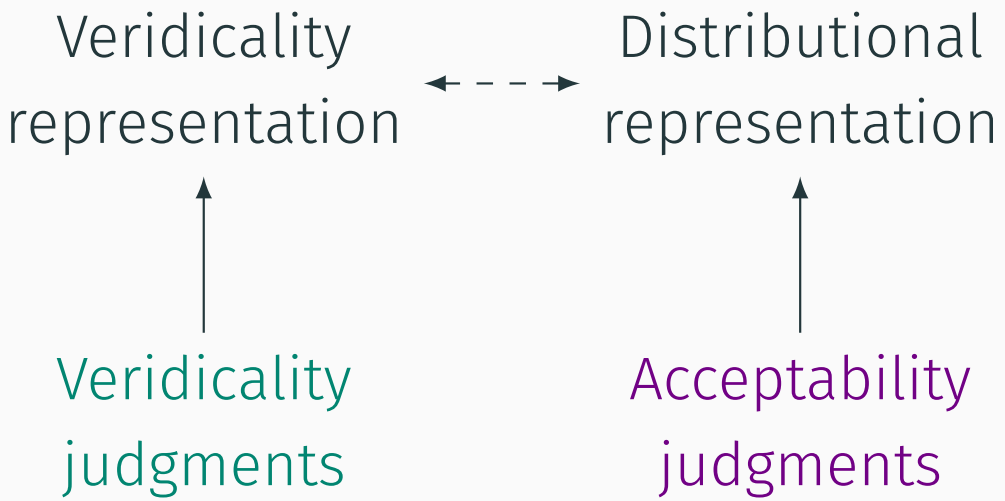


Canonical Correlation Analysis (CCA)

Intuition

Find best way of simultaneously mapping...

1. veridicality/factivity to syntactic distribution
2. syntactic distribution to veridicality/factivity

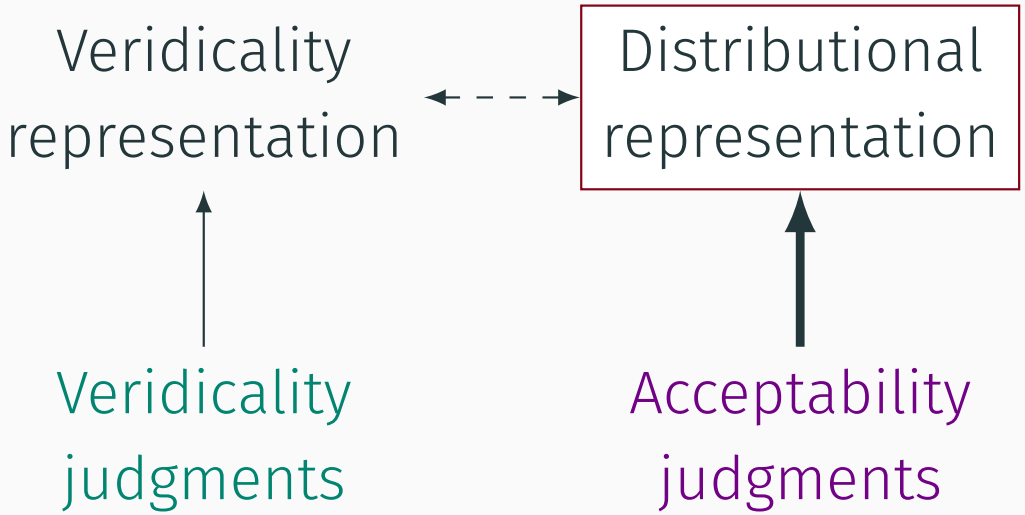


Canonical Correlation Analysis (CCA)

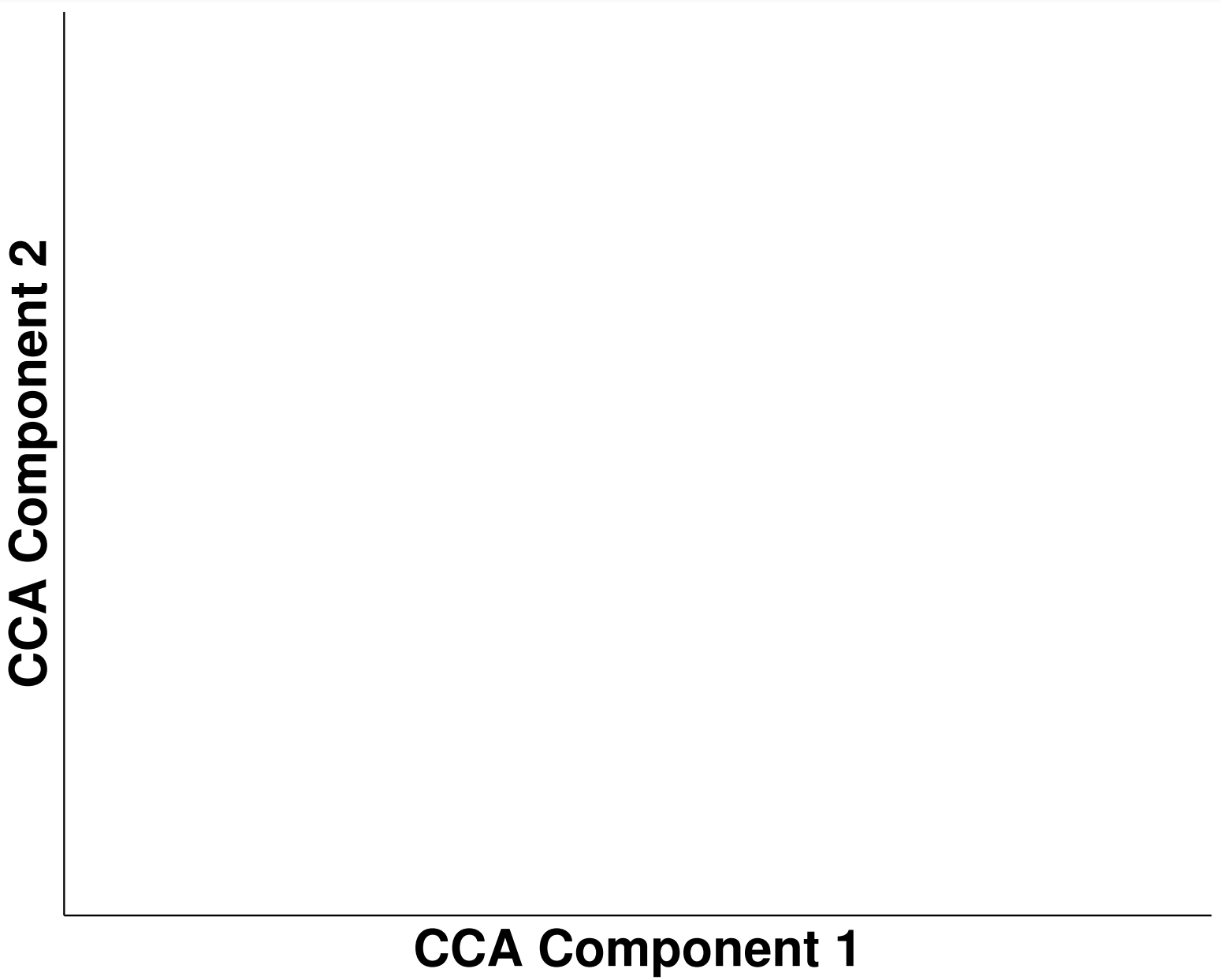
Intuition

Find best way of simultaneously mapping...

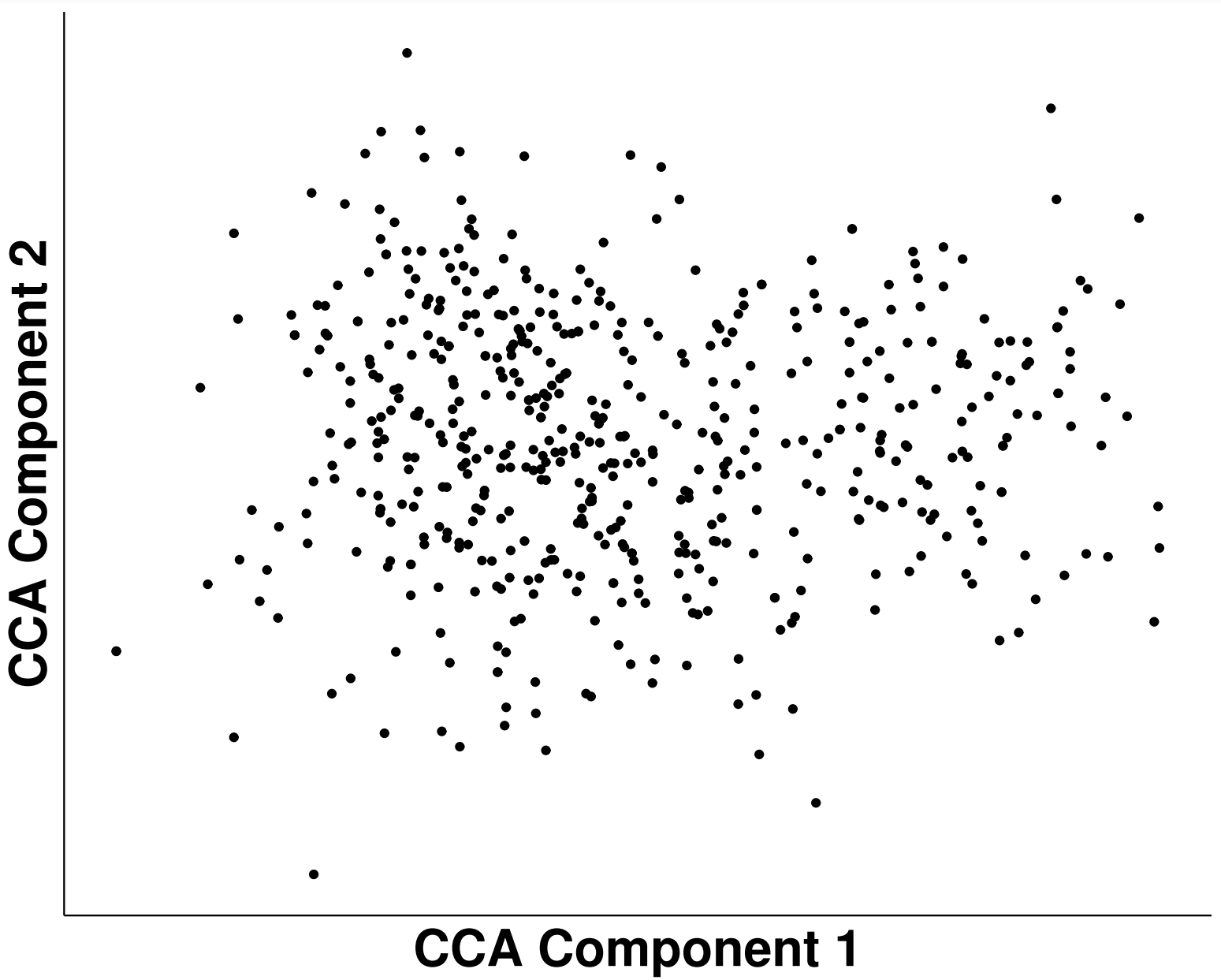
1. veridicality/factivity to syntactic distribution
2. syntactic distribution to veridicality/factivity



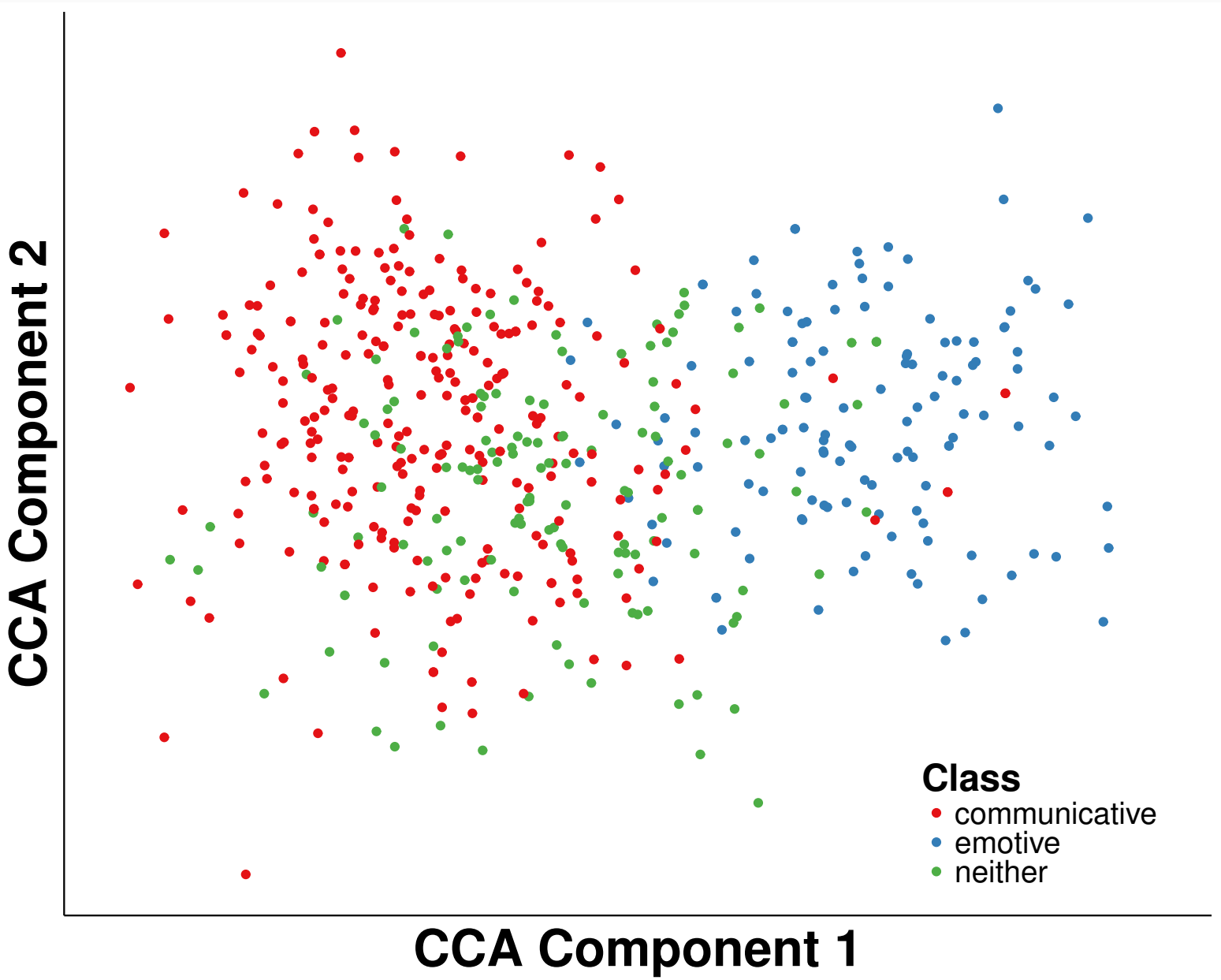
CCA verb scores



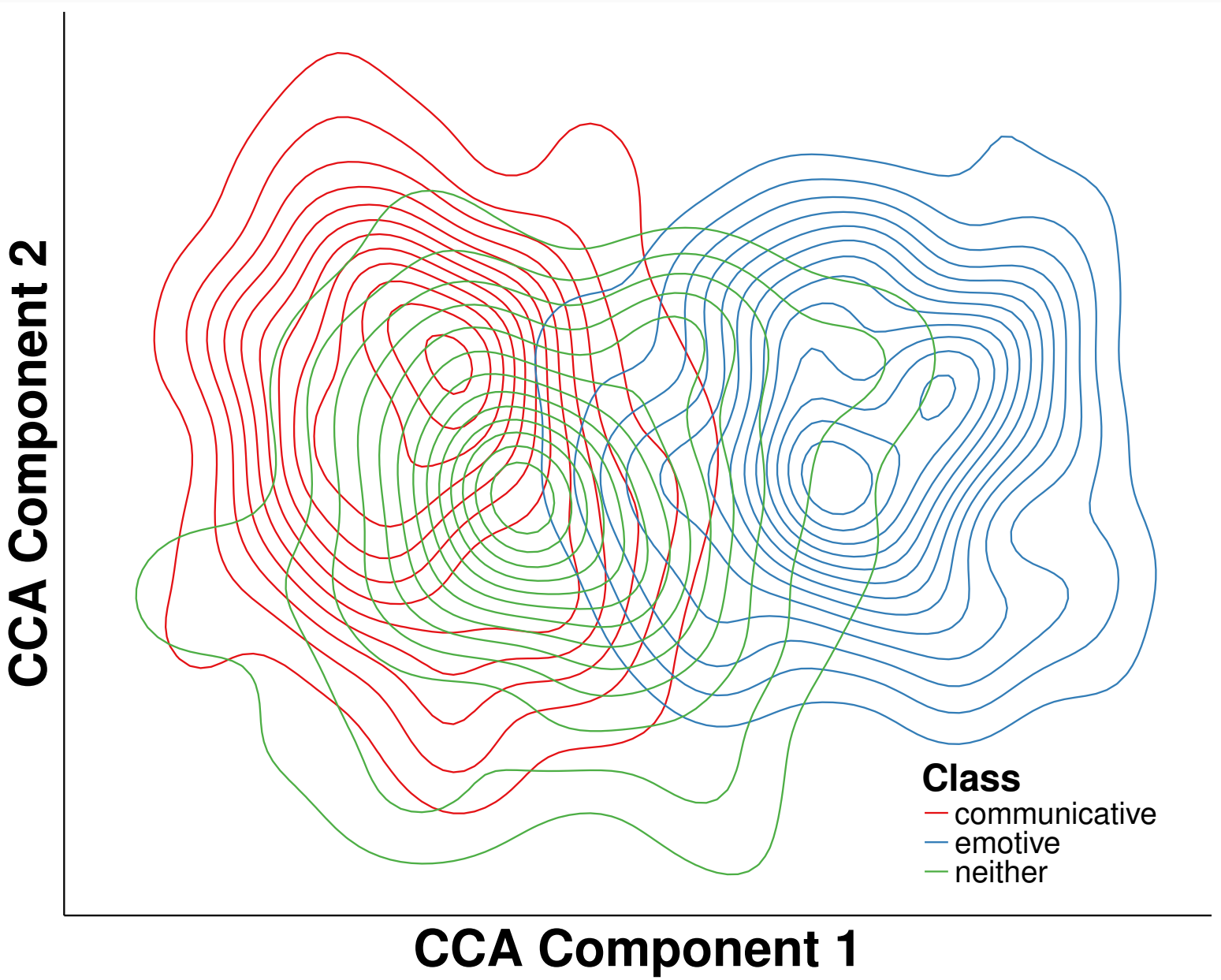
CCA verb scores



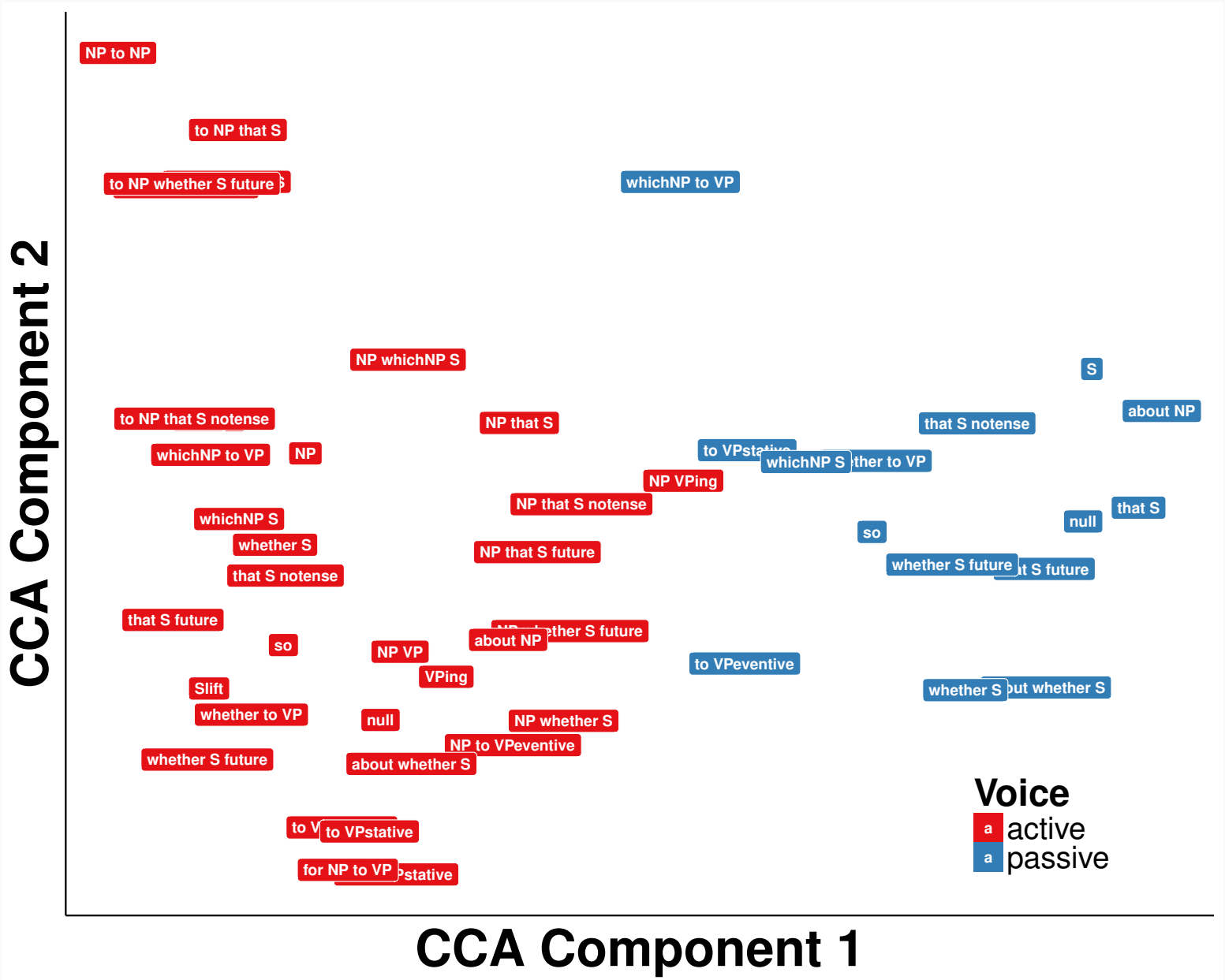
CCA verb scores



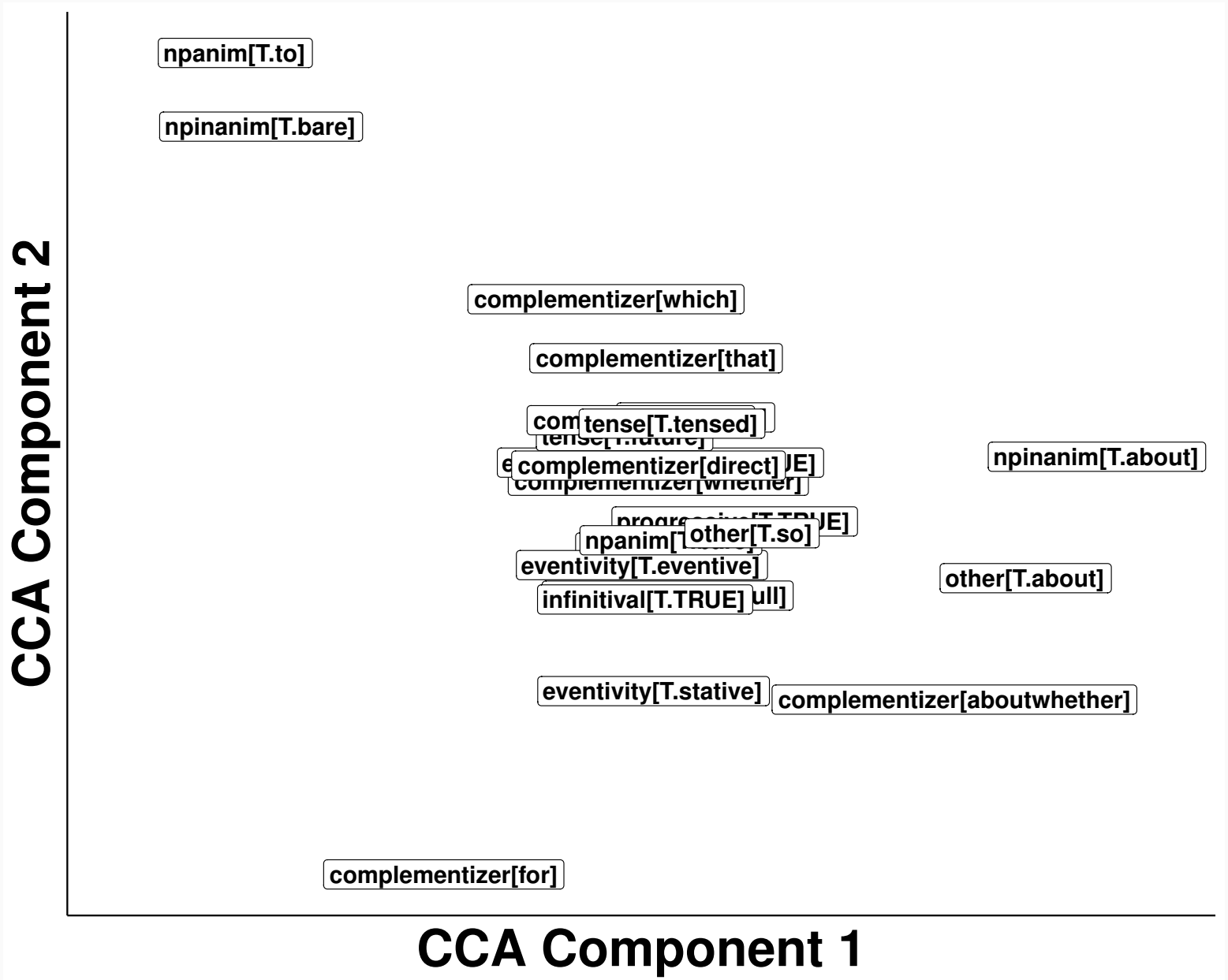
CCA verb scores



CCA frame loadings



CCA feature loadings



Discussion

Negative finding

Veridicality/factivity does not correlate with question-taking

Discussion

Negative finding

Veridicality/factivity does not correlate with question-taking

Positive finding

Veridicality/factivity correlates with NP- and PP-taking (Goal / Experiencer arguments)

Discussion

Possibility #1

Veridicality/factivity can be reduced to semantic properties that control NP- and PP-taking.

Discussion

Possibility #1

Veridicality/factivity can be reduced to semantic properties that control NP- and PP-taking.

Possibility #2

Question selection can be reduced to semantic properties that control NP- and PP-taking

Conclusion

Conclusion

Distribution of nominals

Sensitive to event structural properties like stativity, telicity, durativity, causativity, transfer, etc.

Conclusion

Distribution of nominals

Sensitive to event structural properties like stativity, telicity, durativity, causativity, transfer, etc.

Distribution of clauses

Sensitive to intentional properties like representationality, preferentiality, factivity/veridicality, communicativity, etc.

Conclusion

Hypothesis

The distribution of clauses is determined by the same semantic properties as the distribution of nouns

Conclusion

Hypothesis

The distribution of clauses is determined by the same semantic properties as the distribution of nouns

Not intentional properties

Conclusion

Hypothesis

The distribution of clauses is determined by the **same** semantic properties as the distribution of nouns

Not intentional properties

Intuition

Intentional properties require that an eventuality have **informational content**, but not all eventualities have such content

Conclusion

Focus

Two intentional properties—factivity and veridicality—that are argued to determine selection of interrogatives & declaratives

Conclusion

Focus

Two intentional properties—factivity and veridicality—that are argued to determine selection of interrogatives & declaratives

Findings

1. Veridicality and factivity do not correlate with question-taking

Conclusion

Focus

Two intentional properties—factivity and veridicality—that are argued to determine selection of interrogatives & declaratives

Findings

1. Veridicality and factivity do not correlate with question-taking
2. Veridicality and factivity correlate with NP- and PP-taking

Future directions

Limitation

We didn’t distinguish between factivity and semifactivity.

Future directions

Limitation

We didn't distinguish between factivity and semifactivity.

Approach

Attempt to explicitly measure semifactivity.

Future directions

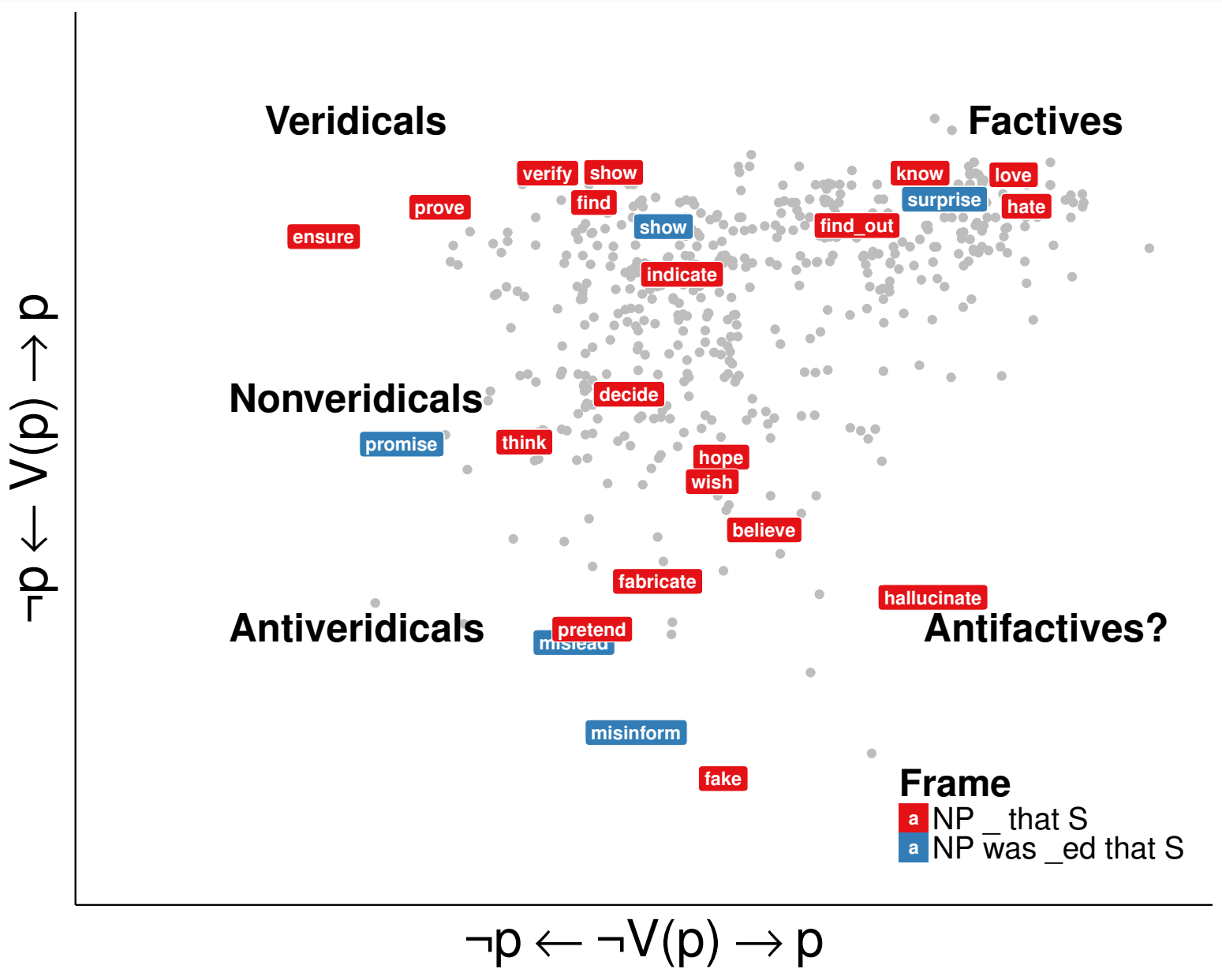
Old prompt

Someone _ed that a particular thing happened.
Did that thing happen?

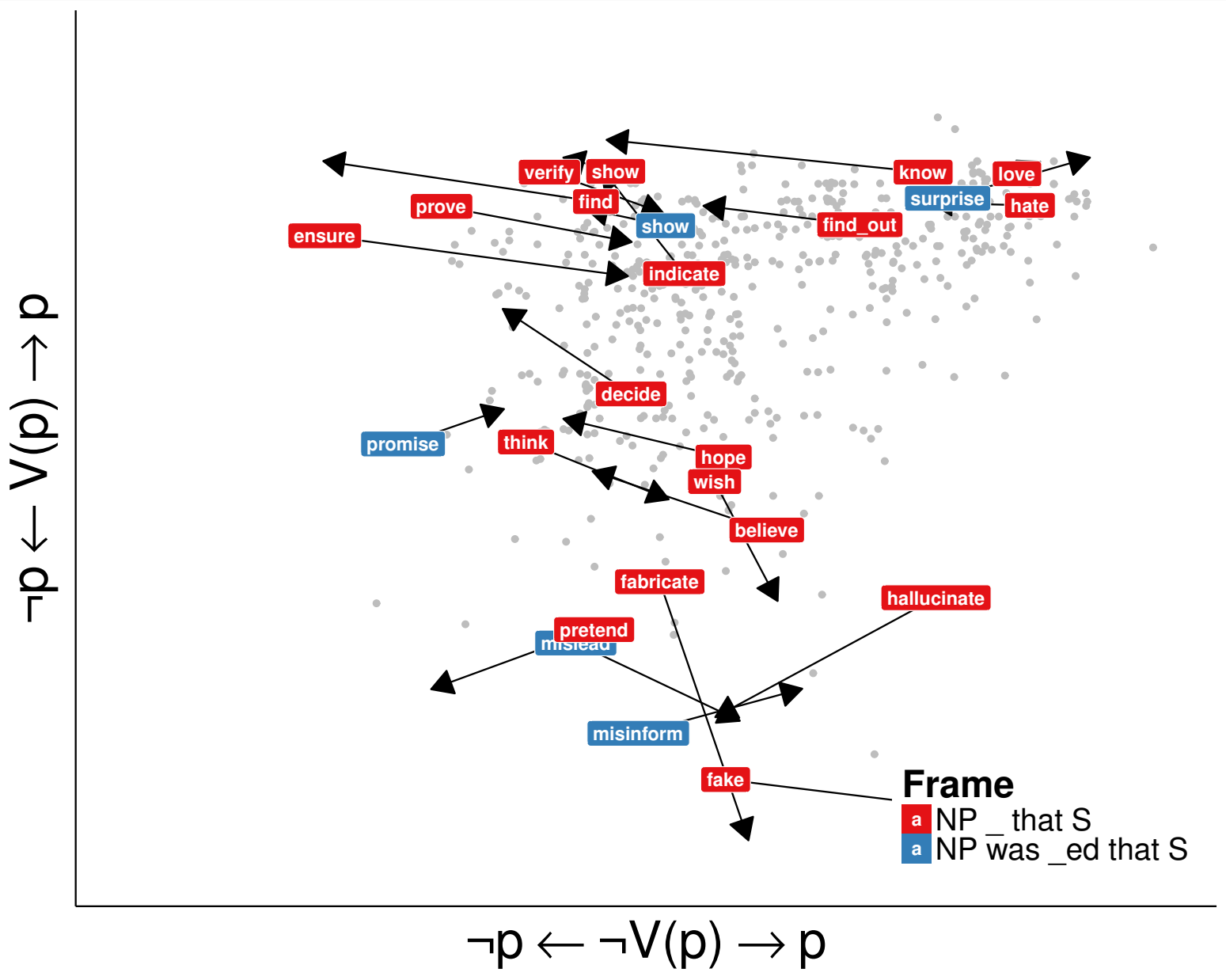
New prompt

If someone _ed that a particular thing happened, *did that thing happen?*

Measuring semifactivity



Measuring semifactivity



Thanks

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Bibliography I

Anand, Pranav & Valentine Hacquard. 2013. Epistemics and attitudes. *Semantics and Pragmatics* 6(8). 1–59.

Anand, Pranav & Valentine Hacquard. 2014. Factivity, belief and discourse. In Luka Crnič & Uli Sauerland (eds.), *The Art and Craft of Semantics: A Festschrift for Irene Heim*, vol. 1, 69–90. Cambridge, MA: MIT Working Papers in Linguistics.

Beck, Sigrid & Hotze Rullmann. 1999. A flexible approach to exhaustivity in questions. *Natural Language Semantics* 7(3). 249–298.

Bogal-Allbritten, Elizabeth A. 2016. *Building Meaning in Navajo*: University of Massachusetts, Amherst dissertation.

Bibliography II

Bolinger, Dwight. 1968. Postposed main phrases: an English rule for the Romance subjunctive. *Canadian Journal of Linguistics* 14(1). 3–30.

Egré, Paul. 2008. Question-embedding and factivity. *Grazer Philosophische Studien* 77(1). 85–125.

Farkas, Donka. 1985. *Intensional Descriptions and the Romance Subjunctive Mood*. New York: Garland Publishing.

Fillmore, Charles John. 1970. The grammar of hitting and breaking. In R.A. Jacobs & P.S. Rosenbaum (eds.), *Readings in English Transformational Grammar*, 120–133. Waltham, MA: Ginn.

George, Benjamin Ross. 2011. *Question Embedding and the Semantics of Answers*: University of California Los Angeles dissertation.

Grimshaw, Jane. 1979. Complement selection and the lexicon. *Linguistic Inquiry* 10(2). 279–326.

Bibliography III

Grimshaw, Jane. 1990. *Argument structure*. Cambridge, MA: MIT Press.

Groenendijk, Jeroen & Martin Stokhof. 1984. *Studies on the Semantics of Questions and the Pragmatics of Answers*: University of Amsterdam dissertation.

Gruber, Jeffrey Steven. 1965. *Studies in Lexical Relations*: Massachusetts Institute of Technology dissertation.

Hintikka, Jaakko. 1975. Different Constructions in Terms of the Basic Epistemological Verbs: A Survey of Some Problems and Proposals. In *The Intentions of Intentionality and Other New Models for Modalities*, 1–25. Dordrecht: D. Reidel.

Hooper, Joan B. 1975. On assertive predicates. In John P. Kimball (ed.), *Syntax and Semantics*, vol. 4, 91–124. New York: Academy Press.

Jackendoff, Ray. 1972. *Semantic Interpretation in Generative Grammar*. Cambridge, MA: MIT Press.

Bibliography IV

Karttunen, Lauri. 1971a. Implicative verbs. *Language* 340–358.

Karttunen, Lauri. 1971b. Some observations on factivity. *Papers in Linguistics* 4(1). 55–69.

Karttunen, Lauri. 1977a. Syntax and semantics of questions. *Linguistics and Philosophy* 1(1). 3–44.

Karttunen, Lauri. 1977b. To doubt whether. In *The CLS Book of Squibs*, Chicago Linguistic Society.

Karttunen, Lauri. 2012. Simple and phrasal implicatives. In *Proceedings of the First Joint Conference on Lexical and Computational Semantics*, 124–131. Association for Computational Linguistics.

Bibliography V

Karttunen, Lauri, Stanley Peters, Annie Zaenen & Cleo Condoravdi. 2014. The Chameleon-like Nature of Evaluative Adjectives. In Christopher Piñón (ed.), *Empirical Issues in Syntax and Semantics 10*, 233–250. CSSP-CNRS.

Kiparsky, Paul & Carol Kiparsky. 1970. Fact. In Manfred Bierwisch & Karl Erich Heidolph (eds.), *Progress in Linguistics: A collection of papers*, 143–173. The Hague: Mouton.

Koenig, Jean-Pierre & Anthony R. Davis. 2001. Sublexical Modality and the Structure of Lexical Semantic Representations. *Linguistics and Philosophy* 24(1). 71–124. http://www.jstor.org/stable/25001804.

Kratzer, Angelika. 2006. Decomposing attitude verbs. http://semanticsarchive.net/Archive/DcwY2JkM/attitude-verbs2006.pdf.

Bibliography VI

Lahiri, Utpal. 2002. *Questions and Answers in Embedded Contexts*. Oxford University Press.

Levin, Beth. 1993. *English Verb Classes and Alternations: A preliminary investigation*. Chicago: University of Chicago Press.

Levin, Beth & Malka Rappaport Hovav. 2005. *Argument Realization*. Cambridge: Cambridge University Press.

Moulton, Keir. 2009. *Natural Selection and the Syntax of Clausal Complementation*: University of Massachusetts, Amherst dissertation.

Pesetsky, David. 1982. *Paths and Categories*: Massachusetts Institute of Technology dissertation.

Pesetsky, David. 1991. Zero syntax: vol. 2: Infinitives.

Bibliography VII

Pinker, Steven. 1989. *Learnability and Cognition: The Acquisition of Argument Structure*. Cambridge, MA: MIT Press.

Portner, Paul & Aynat Rubinstein. 2013. Mood and contextual commitment. In *Semantics and Linguistic Theory*, vol. 22, 461–487.

Rawlins, Kyle. 2013. About 'about'. In Todd Snider (ed.), *Semantics and Linguistic Theory*, vol. 23, 336–357.

Scheffler, Tatjana. 2009. Evidentiality and German attitude verbs. *University of Pennsylvania Working Papers in Linguistics* 15(1).

Spector, Benjamin & Paul Egré. 2015. A uniform semantics for embedded interrogatives: An answer, not necessarily the answer. *Synthese* 192(6). 1729–1784.

Stalnaker, Robert. 1984. *Inquiry*. Cambridge University Press.

Bibliography VIII

Theilier, Nadine, Floris Roelofsen & Maria Aloni. 2017. What's wrong with *believing whether*? In *Proceedings of SALT 27*, .

Uegaki, Wataru. 2012. Content nouns and the semantics of question-embedding predicates. *Proceedings of Sinn und Bedeutung 16* 613–626.

Uegaki, Wataru. 2015. Content nouns and the semantics of question-embedding. *Journal of Semantics* .

Villalta, Elisabeth. 2000. Spanish subjunctive clauses require ordered alternatives. In *Semantics and Linguistic Theory*, vol. 10, 239–256.

Villalta, Elisabeth. 2008. Mood and gradability: an investigation of the subjunctive mood in Spanish. *Linguistics and Philosophy* 31(4). 467–522.

Bibliography IX

White, Aaron Steven & Kyle Rawlins. 2016. A computational model of S-selection. In Mary Moroney, Carol-Rose Little, Jacob Collard & Dan Burgdorf (eds.), *Semantics and Linguistic Theory*, vol. 26, 641–663.

White, Aaron Steven & Kyle Rawlins. 2017. Question agnosticism and change of state. In *Proceedings of Sinn und Bedeutung 21*, to appear.

Zwicky, Arnold M. 1971. In a manner of speaking. *Linguistic Inquiry* 2(2). 223–233.