Generic masculines in German – Why all teachers are masculine

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Masculine generics in German

- in German, role nouns such as *Lehrer* 'teacher' can be used as generic forms

target word paradigm

word	referent gender(s)	grammatical gender	number
Lehrer	male	masculine	singular
Lehrer	male or female	masculine	
Lehrerin	female	feminine	
Lehrer	male	masculine	plural
Lehrer	male and/or female	masculine	
Lehrerinnen	female	feminine	

- generic forms are not different from explicit masculine forms in their orthographic or phonological form
- they are used to describe individuals of all genders in singular and plural contexts
- generic forms are traditionally assumed to "abstract away" notions of gender; to be "gender-neutral" (Doleschal, 2002)

Previous research

- however, previous research has cast doubt on the gender-neutral use of masculine generics
- most (if not all) behavioural studies on the subject find one overall result

  → masculine generics are not gender-neutral but show a clear bias towards the explicit masculine reading (e.g. Demarmels, 2017; Garnham et al., 2012; Gygax et al., 2008; Irmen & Kurovskaja, 2010; Irmen & Linner, 2005; Koch, 2021; Misersky et al., 2019; Stahlberg & Sczesny, 2001)
- even though a masculine generic may be used by a speaker with the intention of considering all genders…
- …this intention is not fully translated by the receiver's comprehension system
- instead, a reading favouring male individuals is received

Issues of previous research

Issue 1: Stereotypicality

Almost no previous research included effects of stereotypicality in their analyses on masculine generics.

Issue 2: Underlying Representations

No previous research investigated the underlying representations of masculine generics in order to account for their masculine bias.

Issues of previous research

Issue 1: Stereotypicality

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→ include stereotypicality ratings in analyses

Issue 2: Underlying Representations

No previous research investigated the underlying representations of masculine generics in order to account for their masculine bias.

→ use linear discriminative learning (e.g. Baayen et al., 2019) to explore semantics

Research questions

Research Question 1

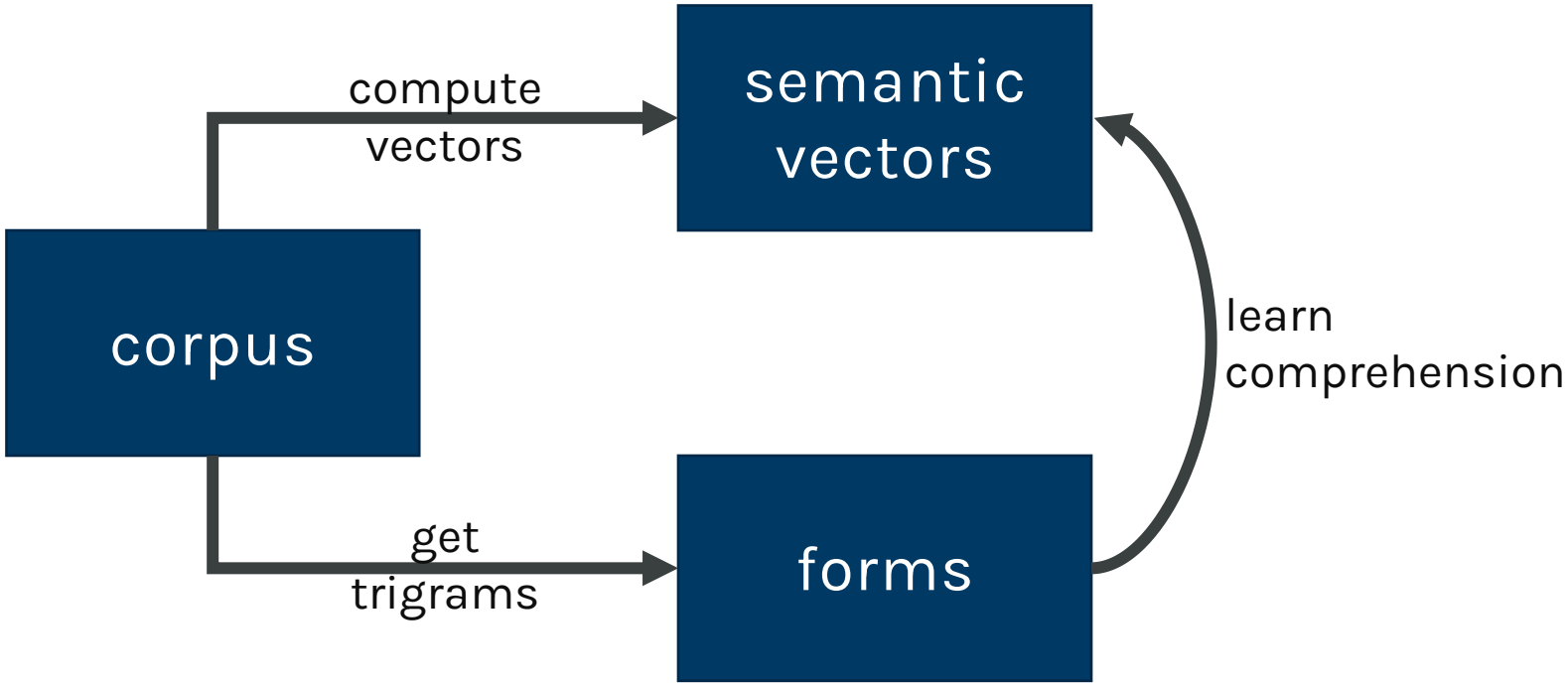
Is the bias of masculine generics affected by stereotypicality?

Research Question 2

Does linear discriminative learning offer an insight into the underlying nature of the masculine generic's bias?

Method

- we simulate an individual's mental lexicon by implementing a linear discriminative learning network (e.g. Baayen et al., 2019)
- for this, semantics and word forms are required as starting points



Method

Corpus

- corpus created based on Leipzig Corpora Collection's (Goldhahn et al., 2012) subcorpus "News"
  - 49,044,960 word form tokens
  - 30,000 sentences with target word paradigm members
  - 800,000 sentences with further word forms
- target words adopted from a study on stereotypicality of role nouns (Gabriel et al., 2008)
- 113 target word paradigms in total

Method

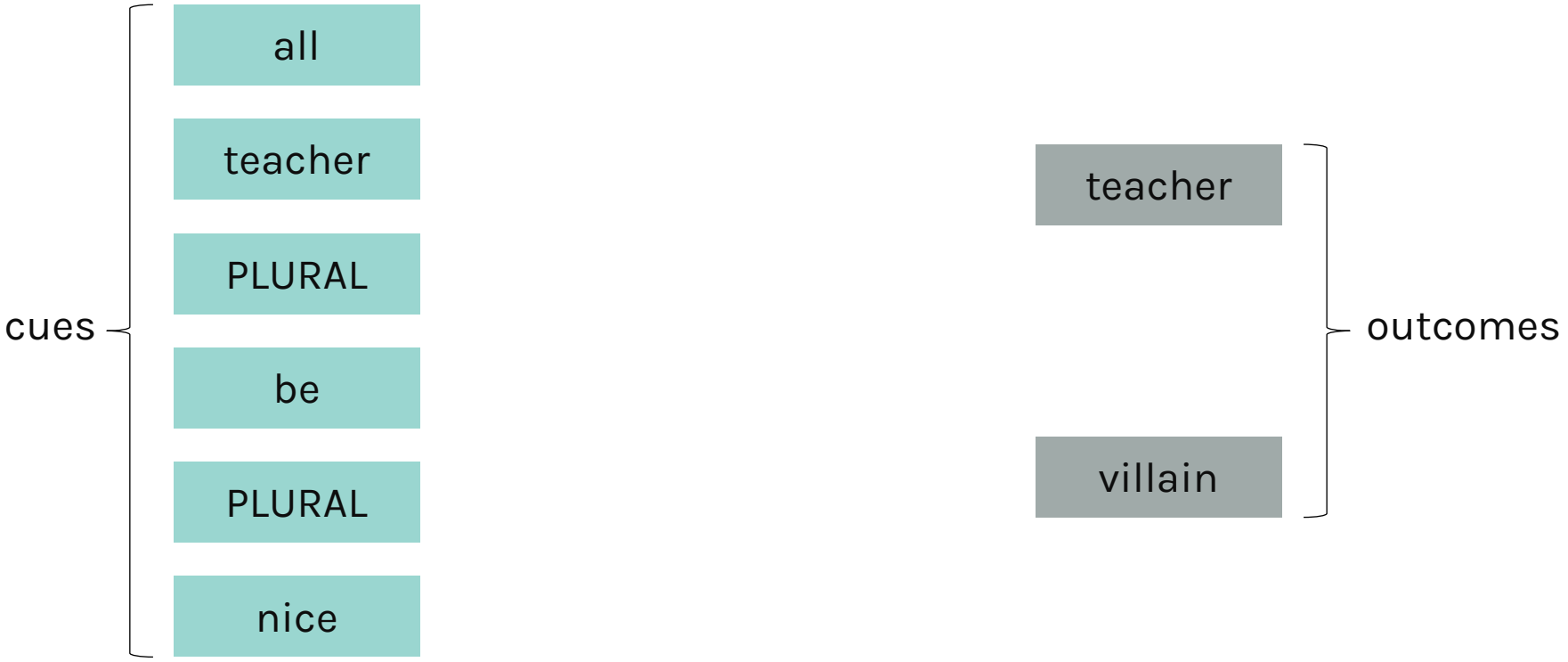
Semantic vectors

- semantic vectors computed based on the 830,000 sentence corpus for words and inflectional functions with Naive Discriminative Learning (NDL; e.g. Baayen & Ramscar, 2015)

  → semantic vectors for bases, function words, and inflection

- NDL follows the Rescorla-Wagner rules (Rescorla & Wagner, 1972)
- most importantly, these rules state that
  - outcomes (word forms) are predicted by cues (words/inflection)
  - the associative strength between an outcome and a cue is represented by a single number
- we used each sentence to predict each individual word within the sentence by the other words in that sentence

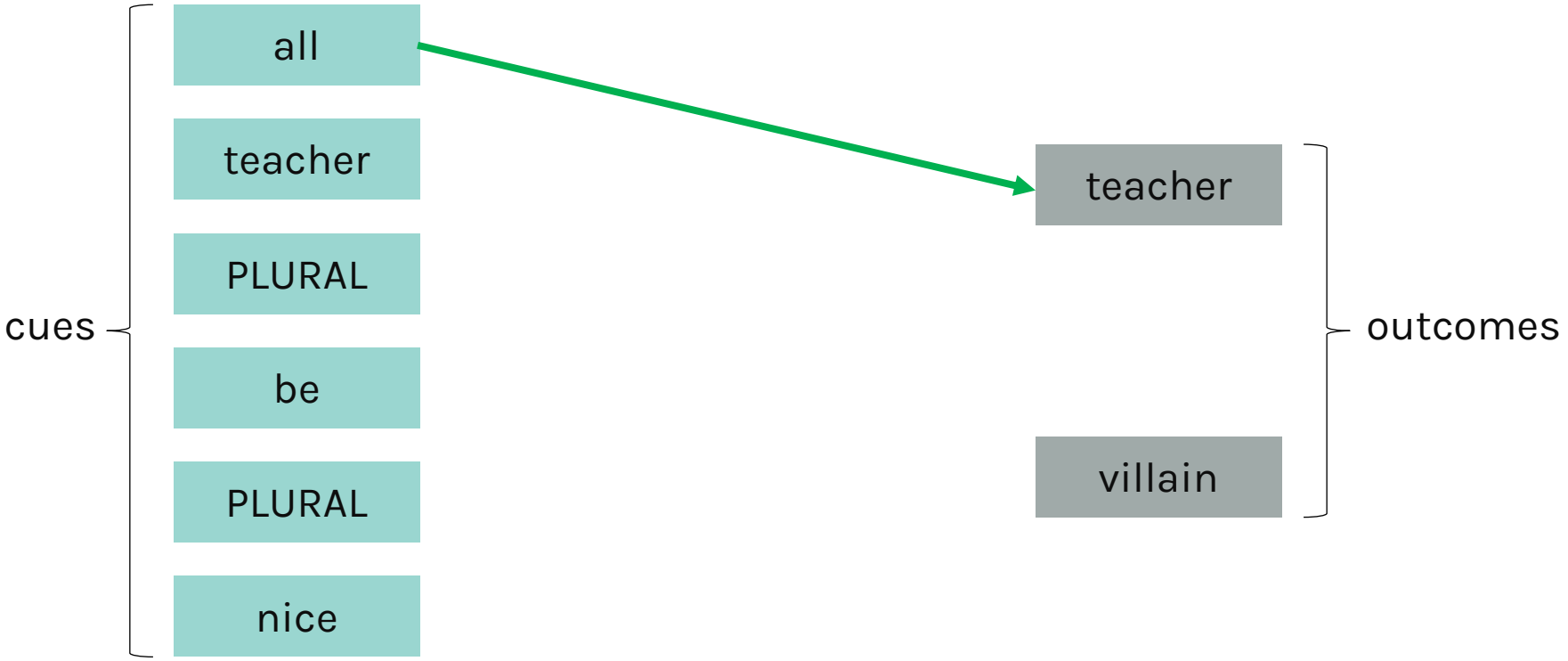
Method



Example: *All teachers are nice.*

	all	teacher	PLURAL	be	nice	villain	evil
teacher							
villain							

Method



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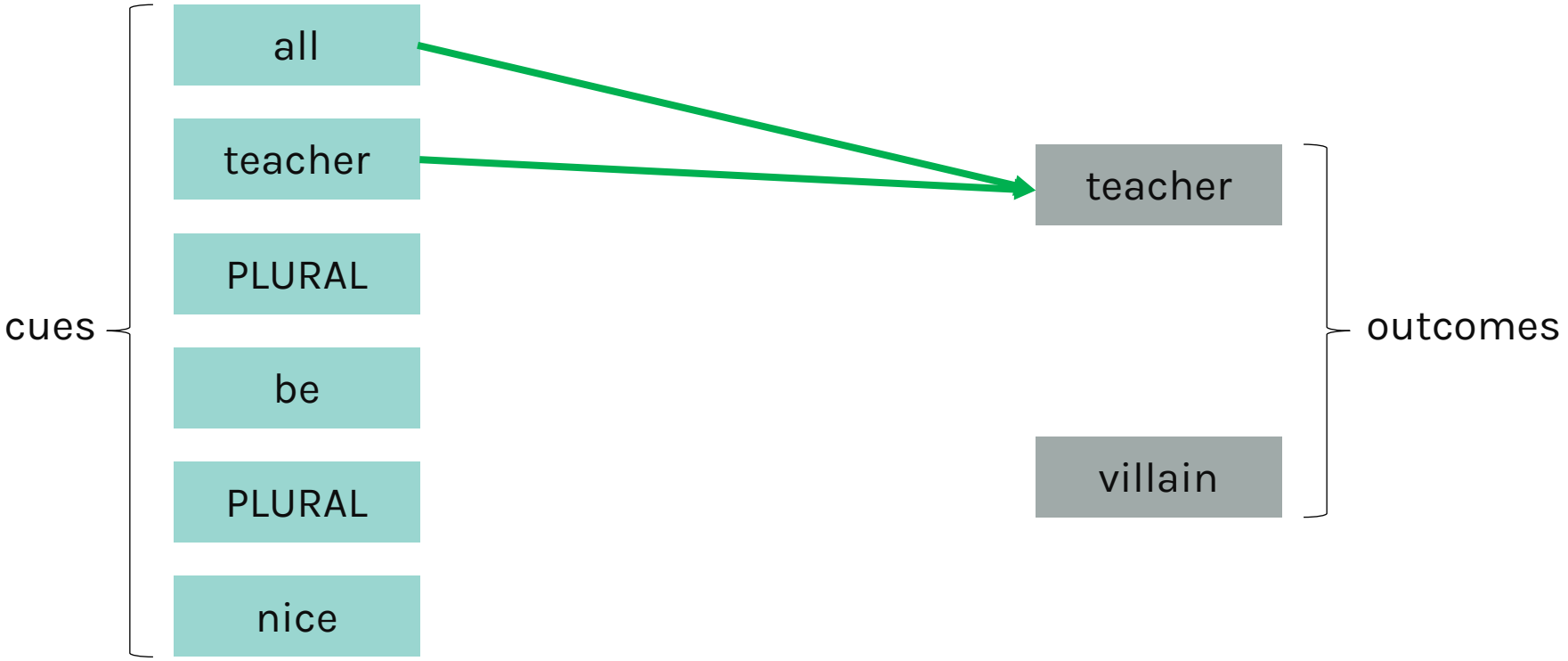

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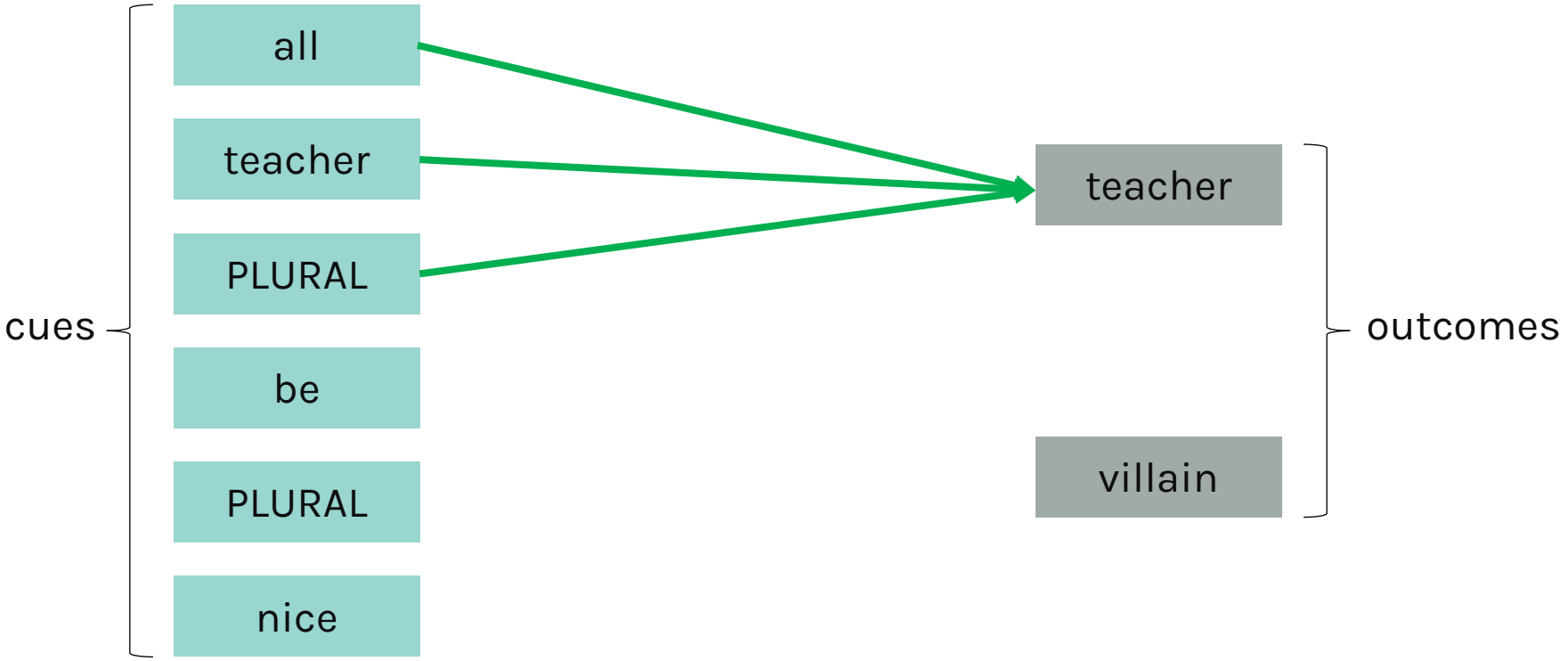

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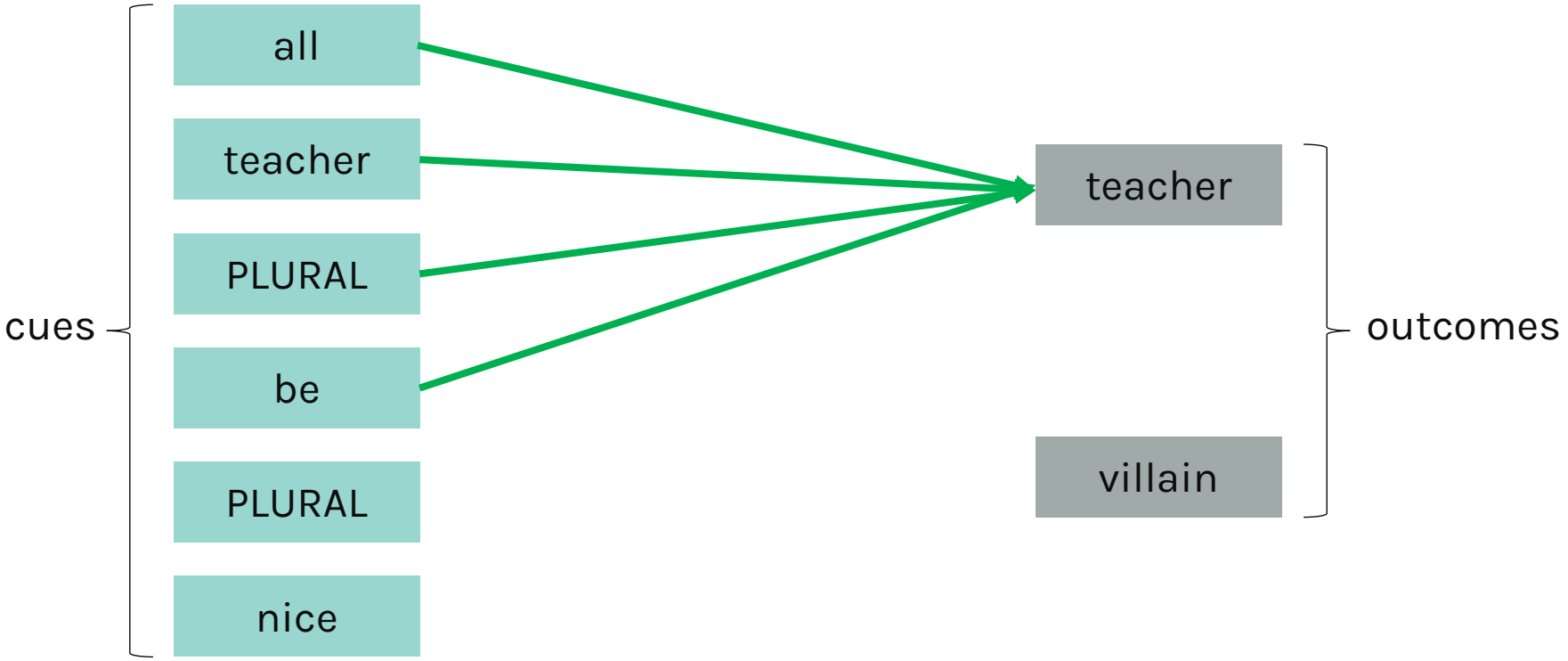

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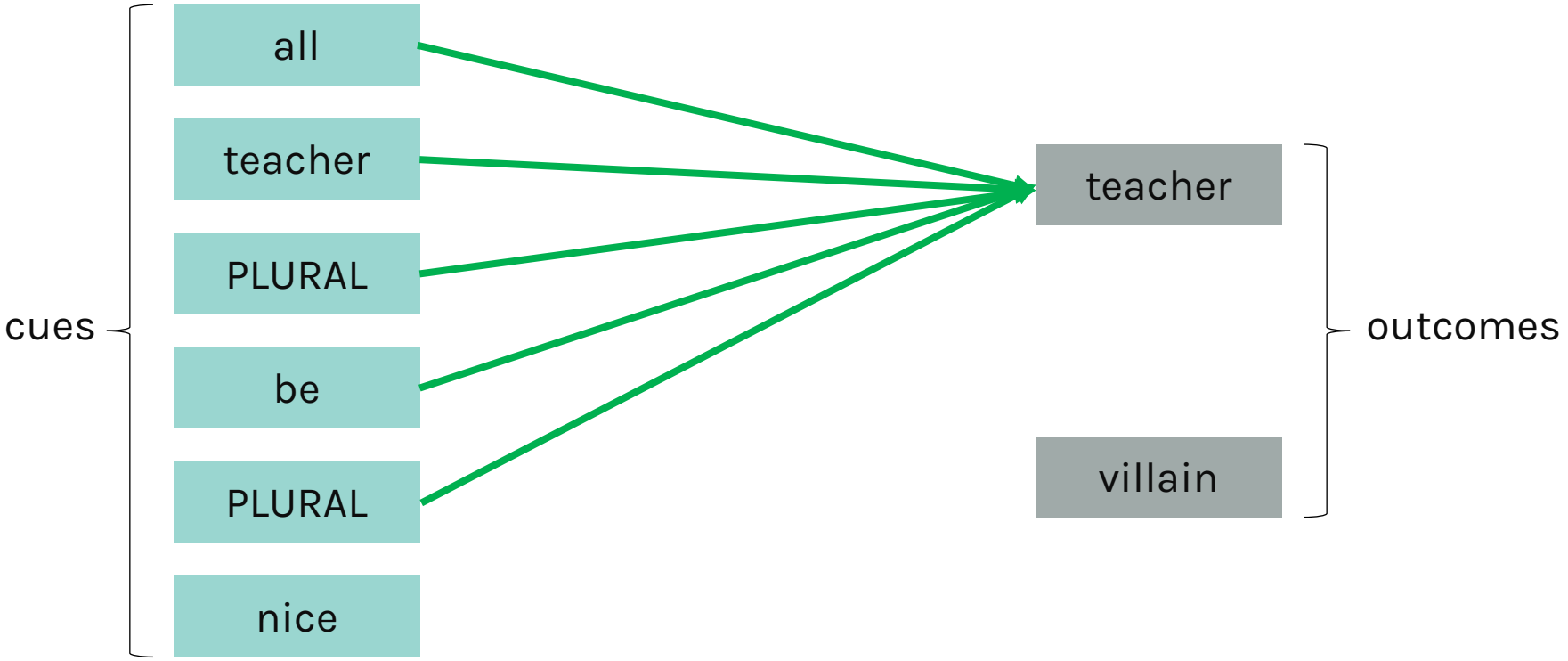

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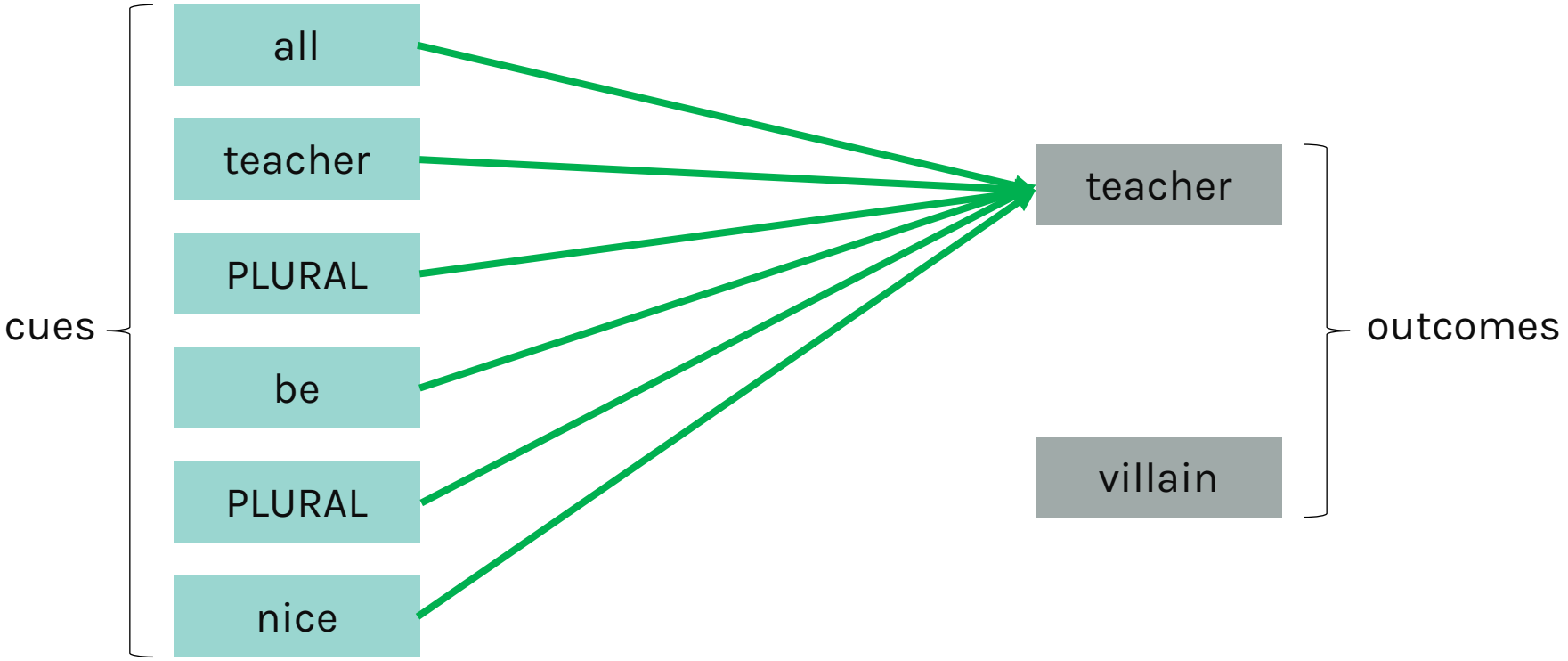

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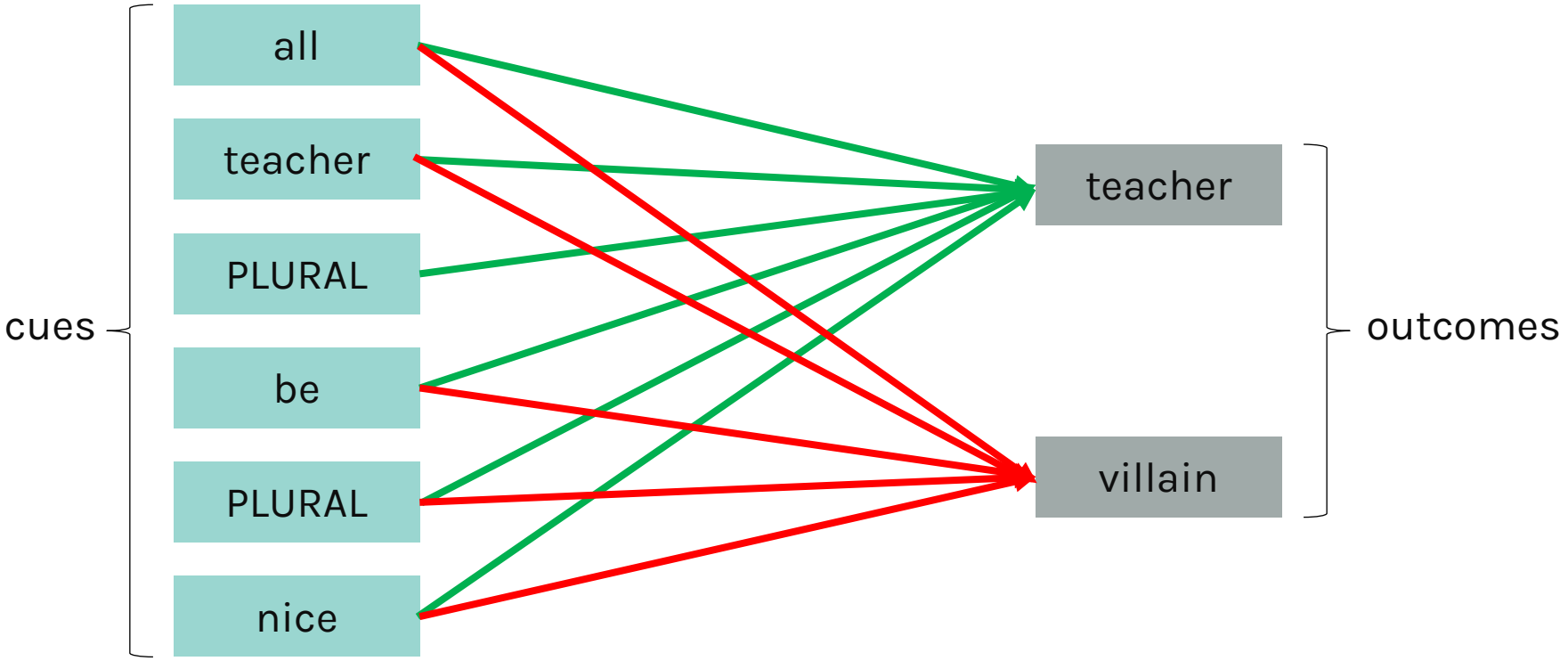

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	all	teacher	PLURAL	be	nice	villain	evil
teacher	+	+	++	+	+	-	-
villain	-	-	-	-	-		

Method

Semantic vectors

- repeating this procedure for 830,000 sentences, we obtained association weights for all target words, inflectional functions, and a huge number of other words
- taking these rows of association weights, we obtain semantic vectors of individual words and inflectional functions of length 7,500
- for example:

$\overrightarrow{teacher}$	all	teacher	PLURAL	be	nice	villain	evil
teacher	0.31	1.0	0.57	0.43	0.15	0.00071	0.0007
villain	0.0003	0.001	0.0005	0.0004	0.0091	1.0	0.96

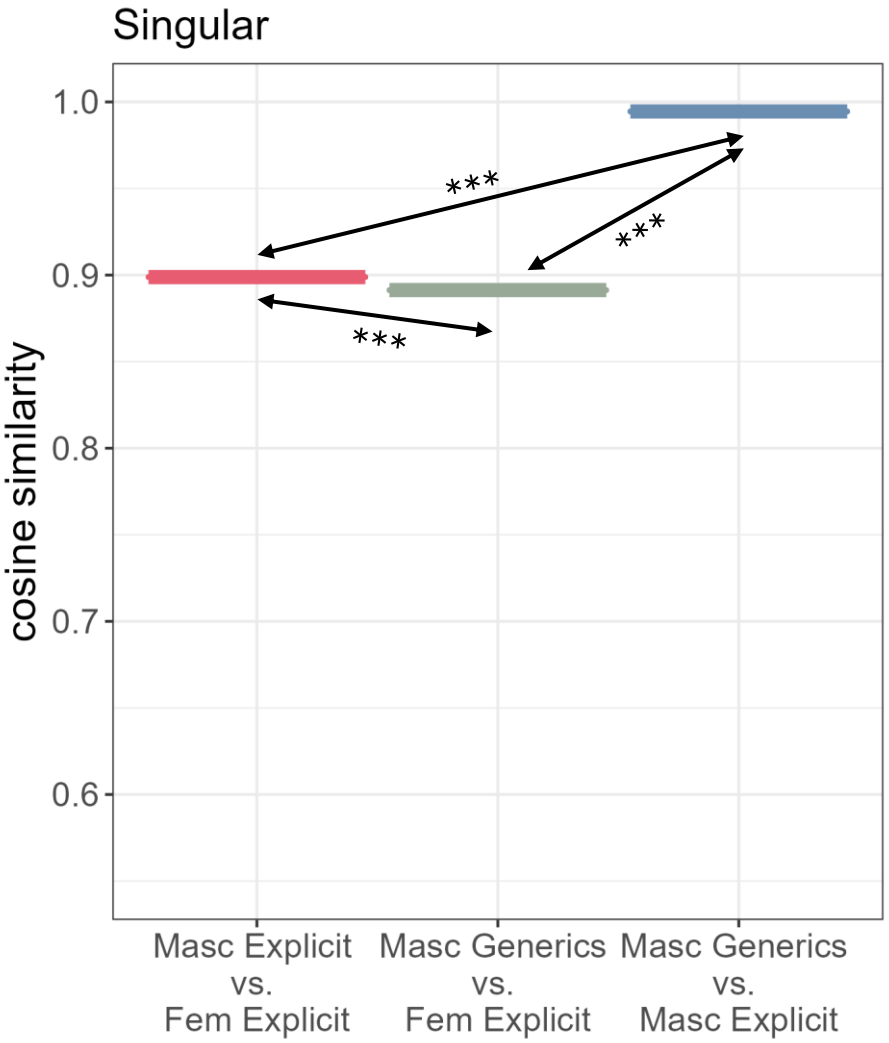
Method

Semantic vectors

- the members of our target word paradigms are complex words
- thus, their semantics need to be assembled

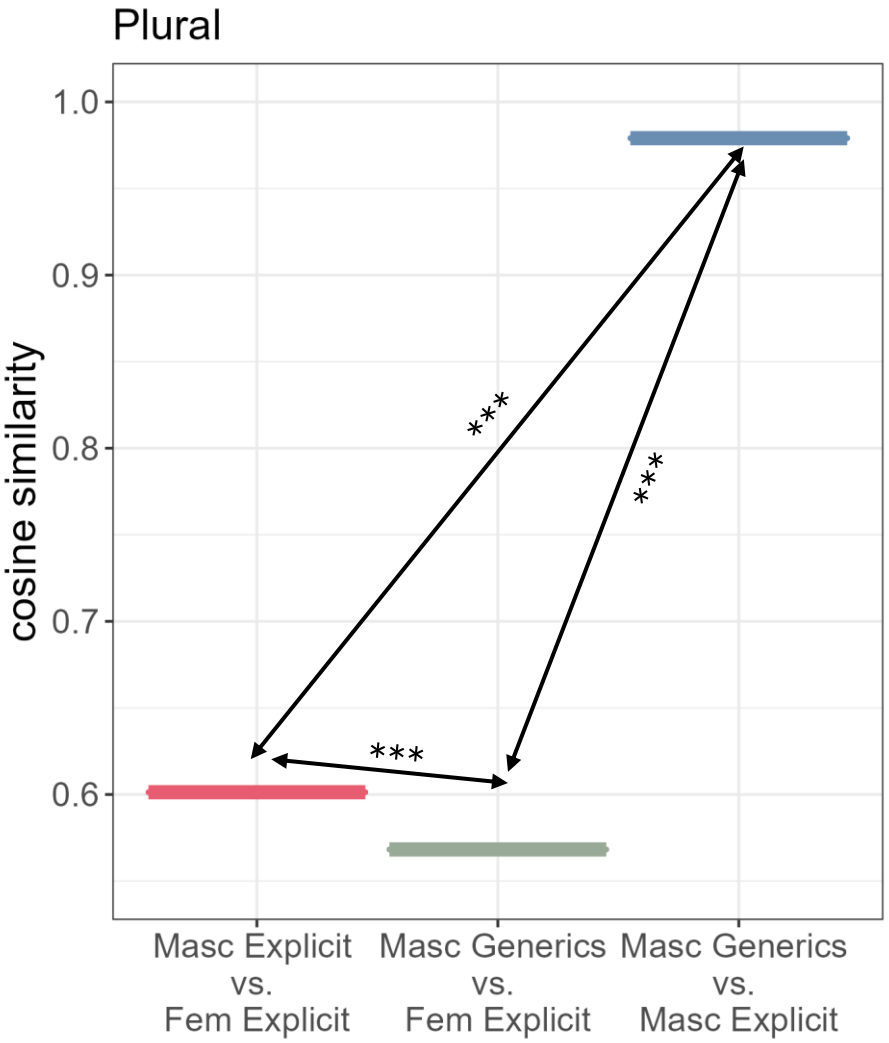
target form	base		number		gram. gender		genericity
Lehrer	$\overrightarrow{Lehrer}$	+	$\overrightarrow{singular}$	+	$\overrightarrow{masculine}$	+	$\overrightarrow{generic}$
Lehrer	$\overrightarrow{Lehrer}$	+	$\overrightarrow{singular}$	+	$\overrightarrow{masculine}$	+	$\overrightarrow{explicit}$
Lehrerin	$\overrightarrow{Lehrer}$	+	$\overrightarrow{singular}$	+	$\overrightarrow{feminine}$	+	$\overrightarrow{explicit}$

Bias Check



- masculine generics and the explicit masculine are semantically most similar
- the explicit feminine is more similar to the explicit masculine than to masculine generics
- all comparisons are highly significant

Bias Check



- masculine generics and the explicit masculine are semantically most similar
- the explicit feminine is more similar to the explicit masculine than to masculine generics
- all comparisons are highly significant
- differences are more pronounced

Method

Forms

- we use trigrams as unit for a word's form
- trigrams / triphones have been shown to capture the form variability of words well (e.g. Chuang et al., 2020; Schmitz et al., 2021)

target form	#le:	le:r	e:rA	rA#	ArI	rIn	In#
Lehrer	1	1	1	1	0	0	0
Lehrer	1	1	1	1	0	0	0
Lehrerin	1	1	1	0	1	1	1

Method

- we simulate an individual's mental lexicon by implementing a linear discriminative learning network (e.g. Baayen et al., 2019)
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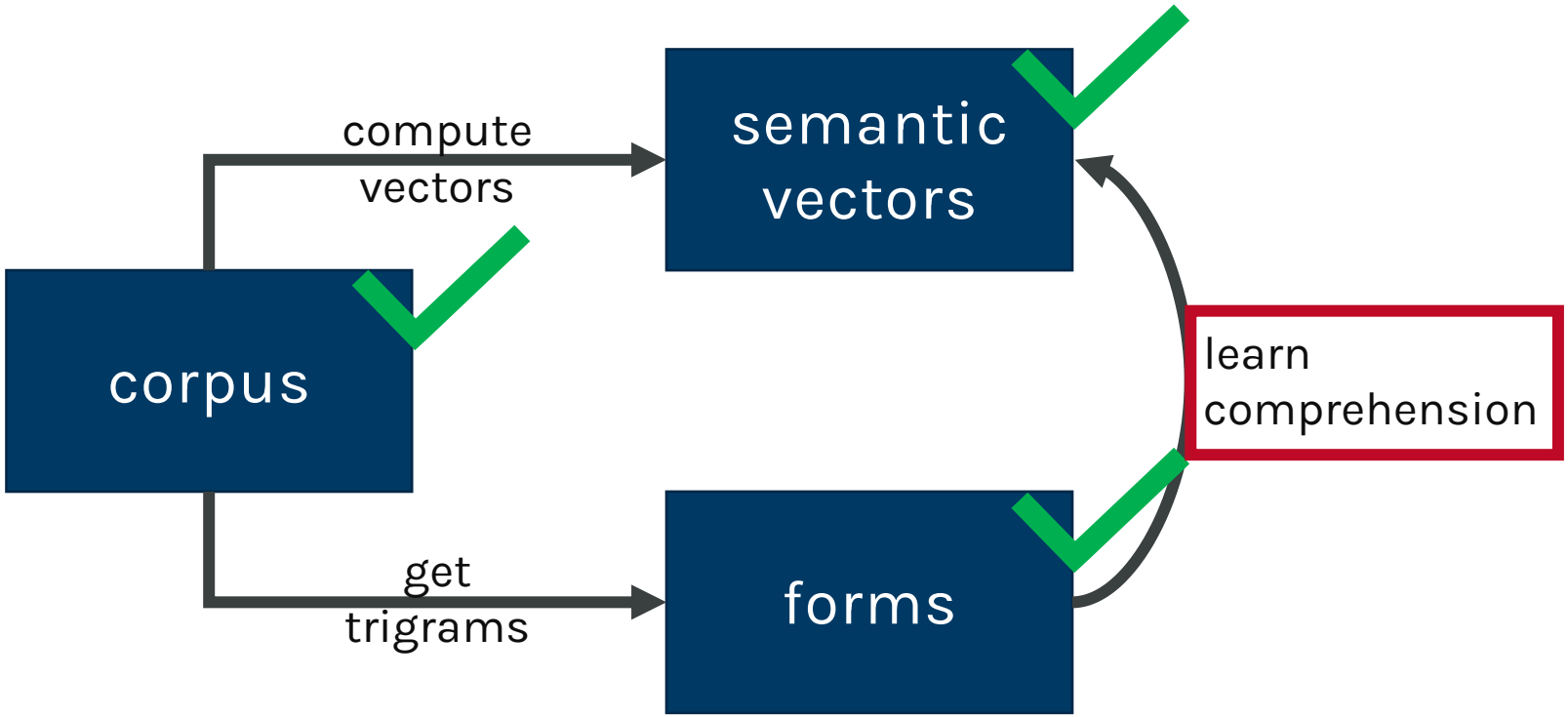
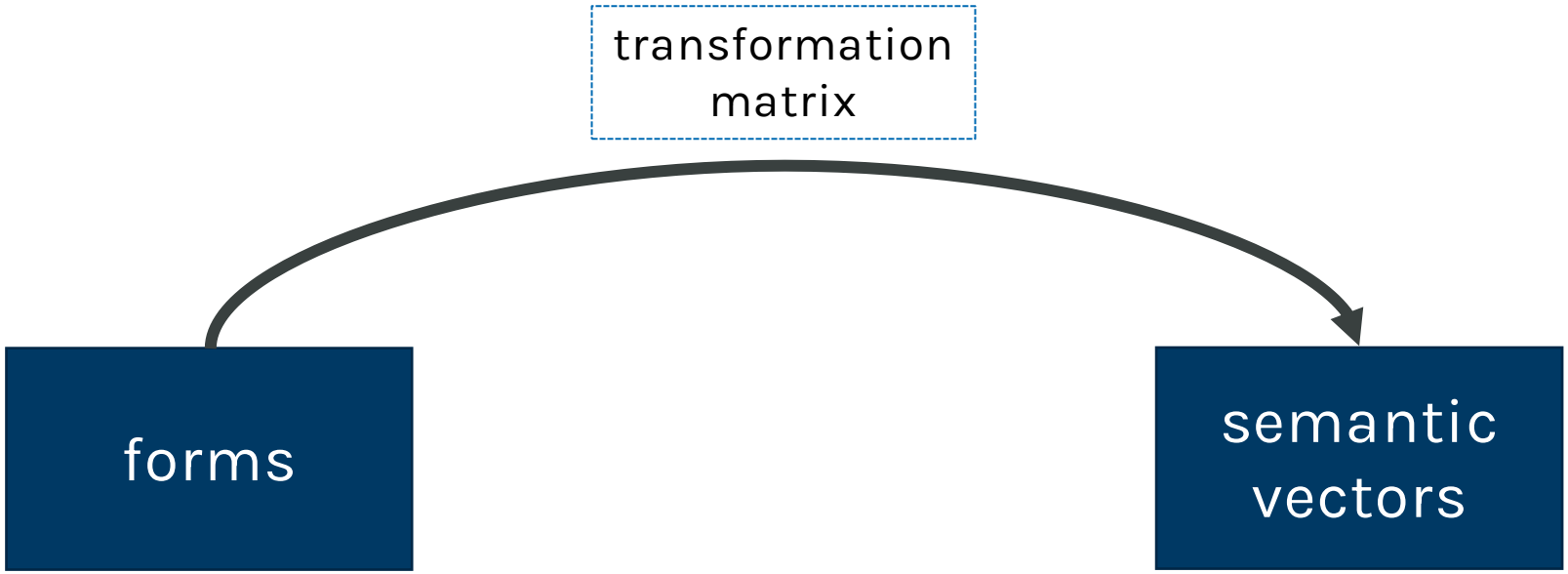


Method

Learning comprehension

- comprehension is learnt by linearly mapping the matrix of forms onto the matrix of semantic vectors



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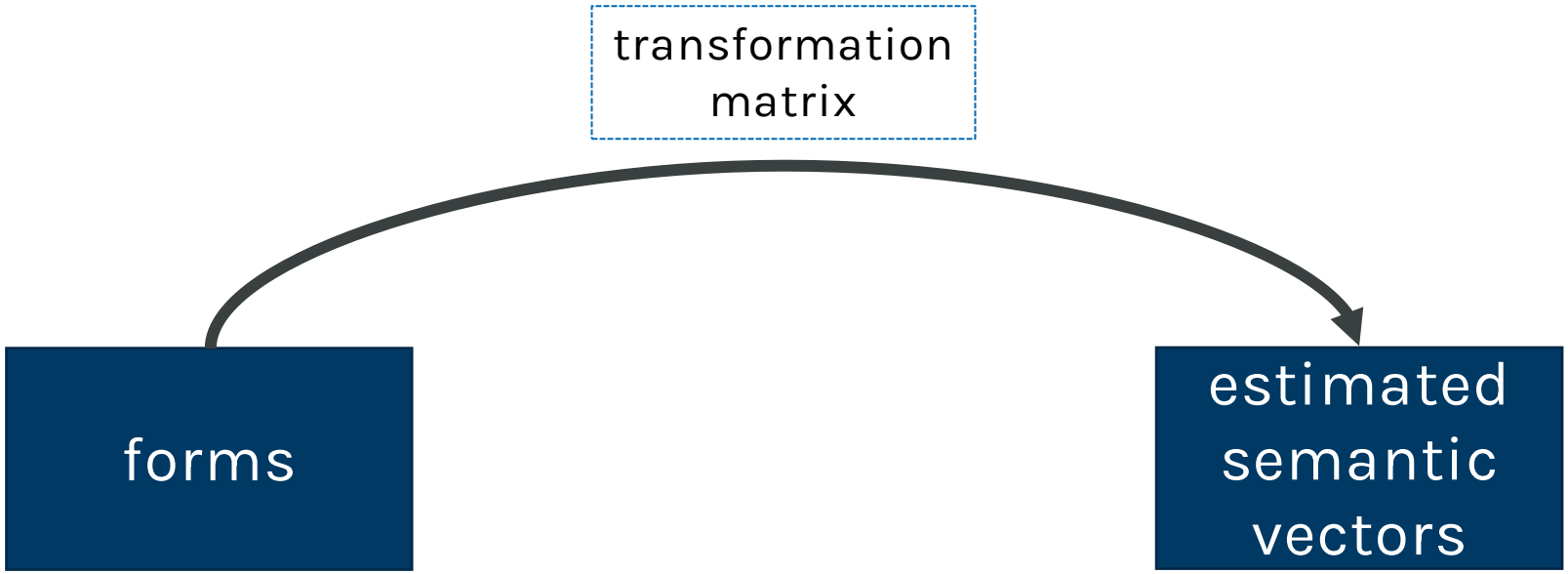
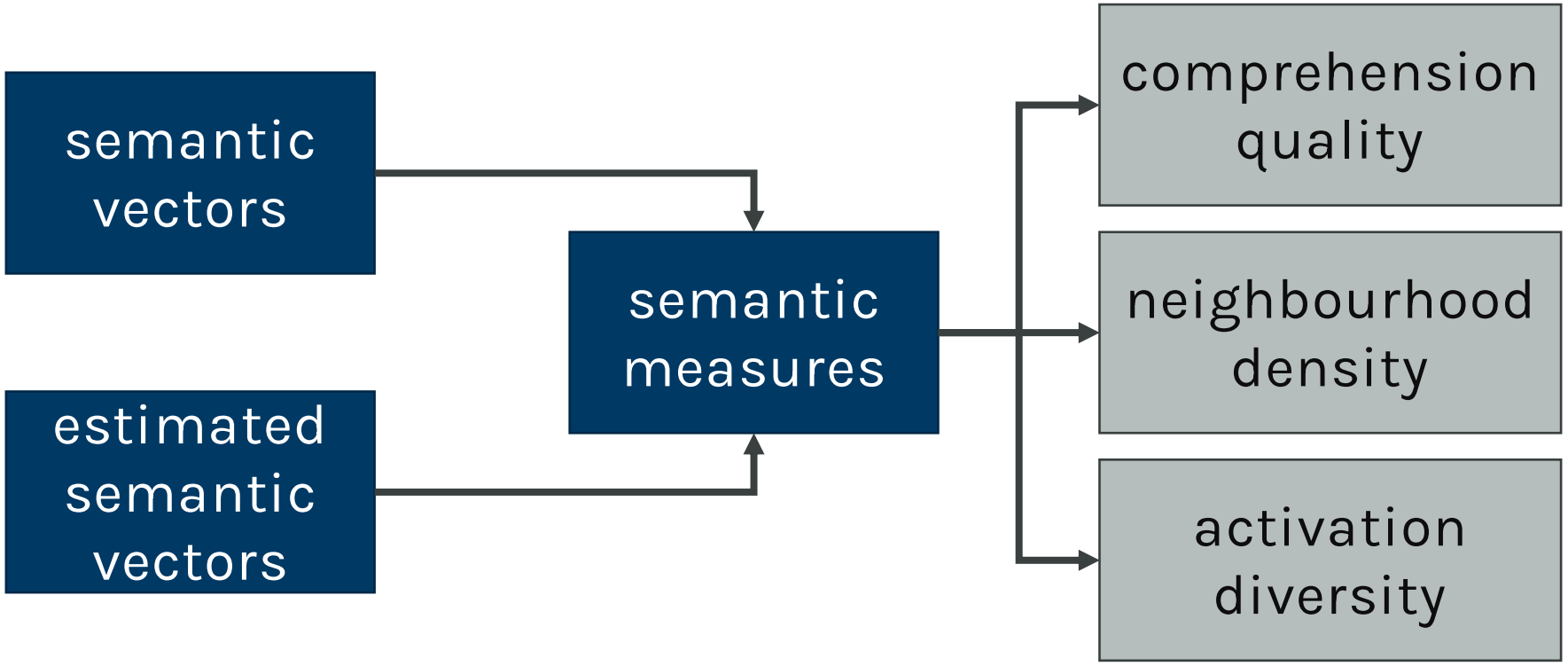


Method

Learning comprehension

- using the original semantic vectors and the semantic vectors estimated by the comprehension learning, we can extract semantic measures



Analysis

Variables

- measures derived from the LDL implementation
  - COMPREHENSION QUALITY

    correlation of a target's original and estimated vectors
  - NEIGHBOURHOOD DENSITY

    correlation of a target with its 8 nearest neighbours
  - ACTIVATION DIVERSITY

    Euclidian distance of a target's vector
- STEREOTYPICALITY JUDGEMENTS taken from Gabriel et al. (2008)

Analysis

Multinomial logistic regression

- dependent variable: GENERICITY

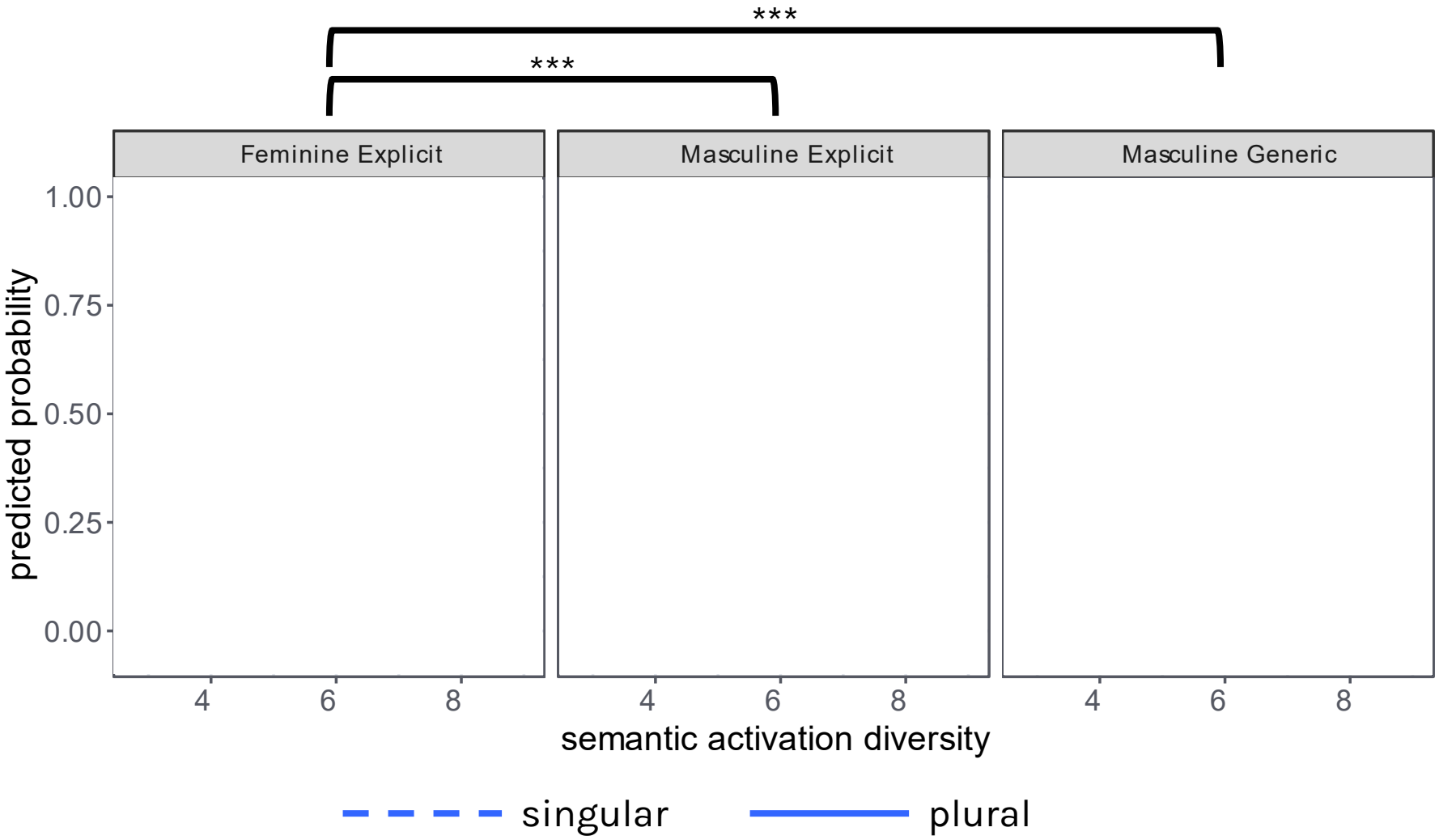
  singular masculine generic; singular masculine explicit; singular feminine explicit

  plural masculine generic; plural masculine explicit; plural feminine explicit

- explanatory variables
  - ACTIVATION DIVERSITY
  - a PC consisting of COMPREHENSION QUALITY & NEIGHBOURHOOD DENSITY
  - STEREOTYPICALITY JUDGEMENTS

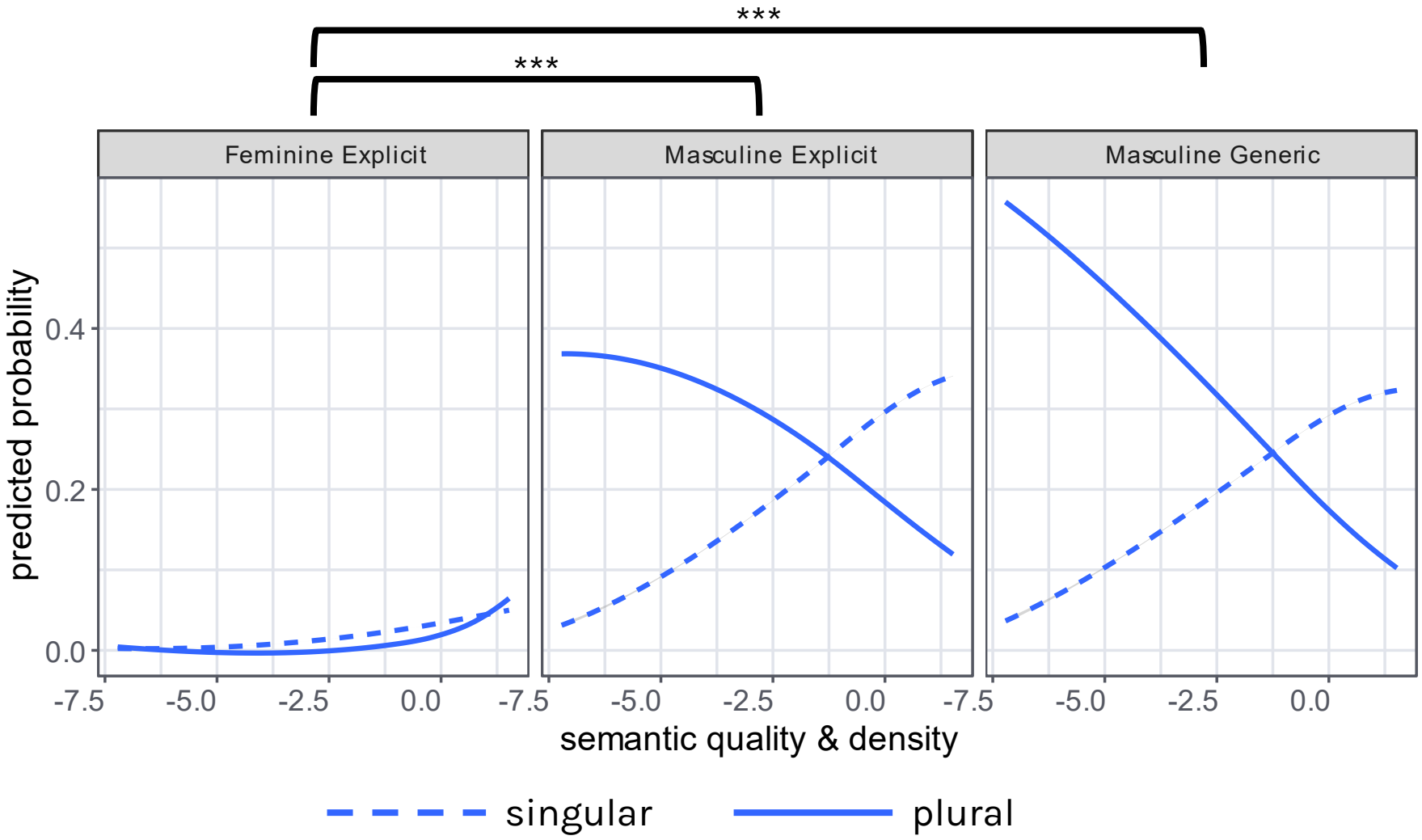
Results

Activation diversity



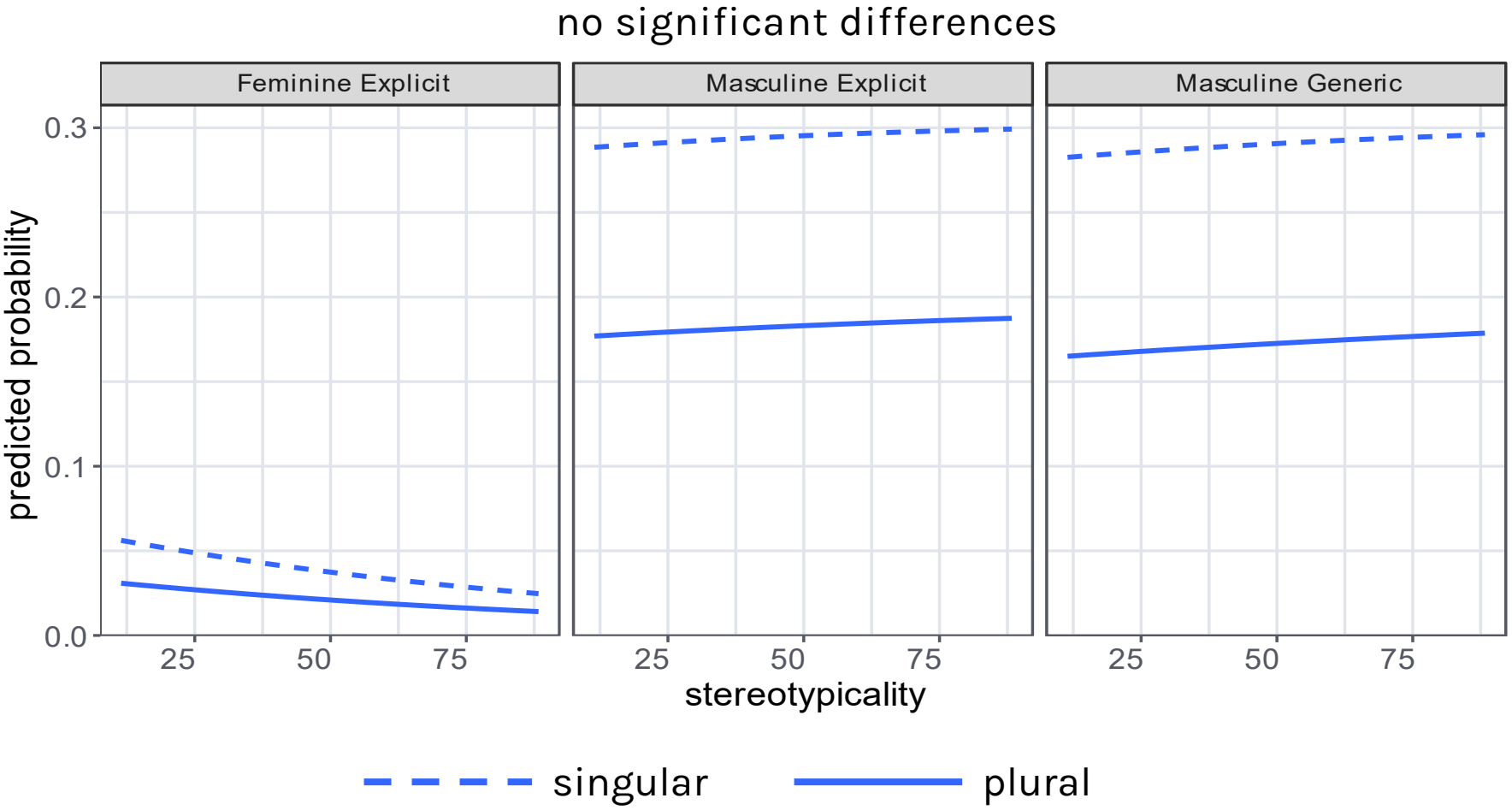
Results

Comprehension quality & neighbourhood density



Results

Stereotypicality judgements



Results

Summary

- masculine generic and masculine explicit forms are highly similar in terms of
  - ACTIVATION DIVERSITY

    → they co-activate entries in the mental lexicon to a similar extent
  - COMPREHENSION QUALITY & NEIGHBOURHOOD DENSITY

    → they are comprehended equally well

    → they live in similarly dense neighbourhoods
- feminine explicits are significantly different as compared to masculine forms in regard to all semantic measures
- stereotypicality judgements do not show a significant effect

Discussion

Research Question 1

Is the bias of masculine generics affected by stereotypicality?

→ no

Research Question 2

Does linear discriminative learning offer an insight into the underlying nature of the masculine generic's bias?

→ yes

Discussion

- our findings are in line with assumptions found in previous research
  - Stahlberg et al. (2001)

    masculine gender of [masculine] generics has a semantic component of “maleness”
  - Irmen & Linner (2005)

    semantic similarity of masculine generics and explicits due to their resonance with the lexicon and each other
  - Gygax et al. (2012) and Gygax et al. (2021)

    masculine generics activate the underlying representations of masculine explicits, leading to a semantic activation of masculine explicits, thus a male bias

Conclusion

- the male bias is due to the similar semantic features of the masculine generic and masculine explicit forms
- this leads to a ‘male bias’ in the language system itself
- thus, our findings confirm the bias found in previous behavioural studies (e.g. Demarmels, 2017; Garnham et al., 2012; Gygax et al., 2008; Irmen & Kurovskaja, 2010; Irmen & Linner, 2005; Koch, 2021; Misersky et al., 2019; Stahlberg & Sczesny, 2001)
- future research will show
  - whether the LDL measures computed for our data are predictive of behavioural measures
  - how (new) more neutral forms, e.g. *Lehrer*innen*, *LehrerInnen*, perform

Thank you!

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