Gendered realities:

How language encodes bias and reflects society's stereotypes

Dominic Schmitz

Heinrich Heine University Düsseldorf, Germany

Students' Conference MA Comparative Studies, Winter 2024/2025

Journeys Across Worlds: Deconstructing Realities through Language and Literature

Male as norm

" *Ein Mensch ist männlich, es sei denn, das Gegenteil ist erwiesen.*

'A person is male unless it is proven otherwise.'

– Luise Pusch (1988) "

- much of society is centred around men and men's needs, priorities, and values

- this **androcentrism** positions men as the gender-neutral standard while marking women as gender-specific (Bailey et al. 2020)

- examples of androcentrism include the use of male images and male research participants to represent everyone

Male as norm

- language is affected by androcentrism as well

Ärzte retten Menschenleben 'doctors save lives'

if you see someone in trouble, help **him**

man *shall not live on bread alone*

- even seemingly gender-neutral words like *person* and *people* are more likely to be associated with men than with women (Bailey et al. 2022)

Linguistics and gender

- in linguistic research, four main 'types' of gender are referred to (cf. Kotthoff & Nübling 2024)

1. **grammatical gender**

   noun classes which are reflected in the behaviour of associated words, e.g.

   ein braver Hund 'a good dog', *eine brave Katze* 'a good cat', *ein braves Pferd* 'a good horse'

2. **natural gender**

   aligns with the concept of sex, e.g.

   a man and his vs. *a women and her* vs. *a house and its*

3. **lexico-semantic gender**

   intrinsic sex-related characteristics in many words used to refer to animate beings, e.g.

   the class 'female' in *mother* or *sister* vs. the class 'male' in *father* or *brother*

4. **conceptual gender**

   the association of words with gender stereotypes

Linguistics and gender

- in many languages with grammatical gender, role nouns referring to male individuals are regarded as the gender-neutral standard = **generic masculines**

    Arzt 'doctor [either male or of any gender]'

    Lehrer 'teacher [either male or of any gender]'

- role nouns referring to female individuals are clearly marked and gender-specific

    *Ärzt**in*** 'doctor [female]'

    *Lehrer**in*** 'teacher [female]'

- where grammatical + lexico-semantic gender and social gender do not match, one typically finds derogatory intentions (Nübling 2020; Werner 2012)

    Italian *checca* 'fairy (a pejorative term for an effeminate gay man)'

    German *Frauenzimmer* 'wench'

Linguistics and gender

- in many languages with grammatical gender, role nouns referring to male individuals are regarded as the gender-neutral standard = **generic masculines**

  Arzt 'doctor [either male or of any gender]'

  Lehrer 'teacher [either male or of any gender]'

- in other words, *Arzt* and *Lehrer* sometimes refer to individuals of any gender

  Ärzte *retten Menschenleben* 'doctors save lives'

  Lehrer *unterrichten Schüler* 'teacher teach pupils'

- and sometimes to male individuals

  Ärzte *verdienen mehr als Ärztinnen*

  'male doctors earn more than female doctors'

  Lehrer *sind beliebter als ihre weiblichen Kolleginnen*

  'teachers are more popular than their female colleagues'

→ **Can a grammatically masculine role noun truly be gender-neutral?**

Study 1
Gender bias in generic masculines

Schmitz, Dominic. 2024. Instances of bias: The gendered semantics of generic masculines in German revealed by instance vectors. *Zeitschrift für Sprachwissenschaft, 43*(2).

Rationale

- grammatically **male** role nouns are used both to refer to

    - male individuals   = specific masculine

    - individuals of any gender   = generic masculine

- grammatically **female** role nouns are used to refer to

    - female individuals only   = specific feminine

- generic masculines are traditionally assumed to be **gender-neutral**

- if generic masculines are gender-neutral, they should be as semantically similar to specific masculines as to specific feminines

Semantic similarity

- to capture the semantics of role nouns, an approached based on the idea of **distributional semantics** is used

- distributional semantics assumes that "you shall know a word by the company it keeps" (Firth 1957)

  - words which occur in similar contexts have similar meanings

  - words which occur in non-similar contexts have non-similar meanings

- judging from the counts of co-occurring words, *dog* and *cat* are somewhat similar (*tail*, *pet*) but not identical (*bark*, *meow*) in meaning

	bark	*meow*	*tail*	*pet*
dog	15	0	12	20
cat	0	18	10	22

Semantic similarity

- different algorithms are available to capture the semantics of words

  - they share the assumption of the distributional hypothesis

  - they represent meaning as a **numeric vector**, i.e.

    $\overrightarrow{dog} = (15,0,12,20)$ and $\overrightarrow{cat} = (0,18,10,22)$

  - they provide one such vector per word

- this means that these algorithms run into a problem when one word with two meanings is the focus of the investigation

- that is, one would end up with only one vector for *Arzt*, even though there is the generic masculine and the specific masculine version of *Arzt*
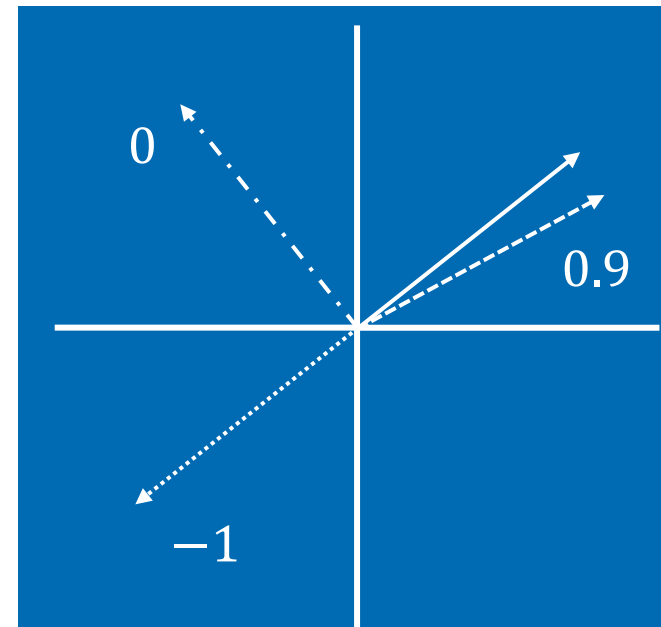
Semantic similarity

- one solution to this issue: **instance vectors** (Lapesa et al. 2018)

  - instance vectors are vectors computed for each attestation of a given target word within a given text corpus

  - each instance vector is the average of n context words preceding and following the target word in a given attestation

  - vectors for context words are computed 'the regular way', using one of the aforementioned approaches
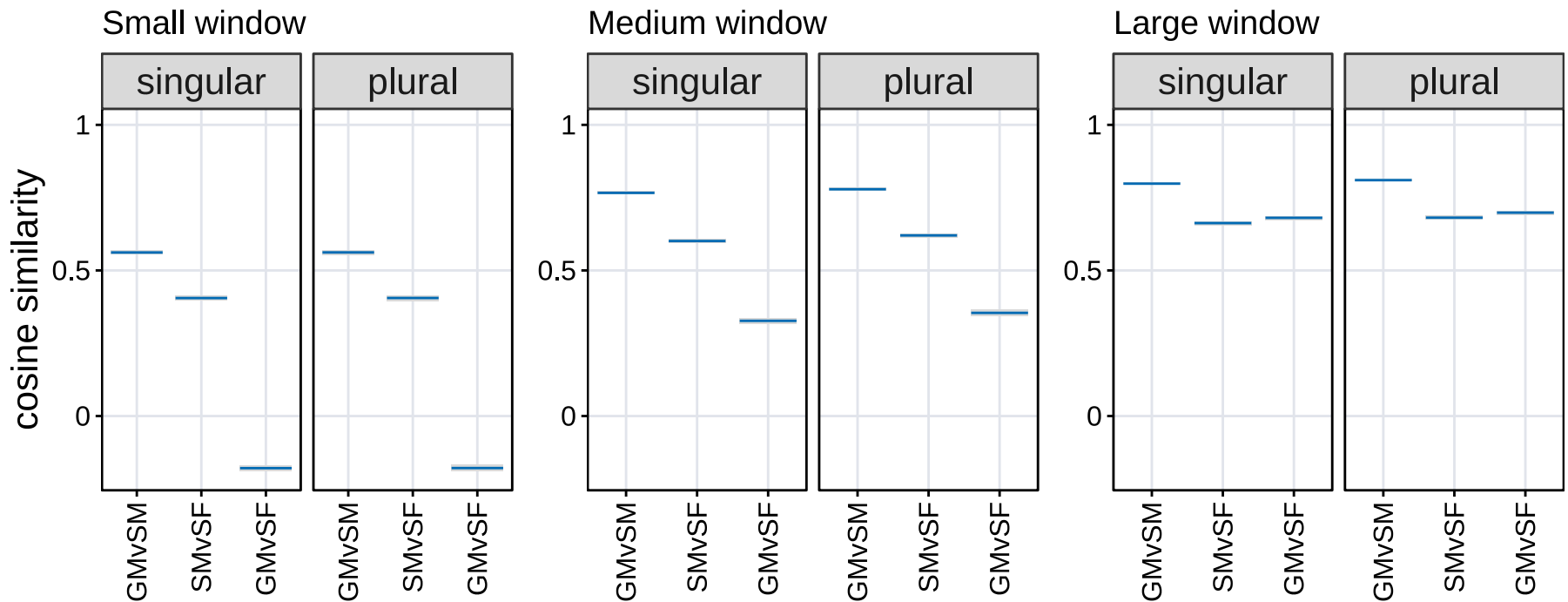
Semantic similarity

- the similarities of the resulting instance vectors can then be assessed mathematically, e.g. via cosine similarity

- **cosine similarity** measures the similarity between two vectors by computing the cosine of the angle between them

  - cosine similarity values are always in the interval of $[-1,1]$

  - 1   = semantically identical

  - 0   = no semantic similarity

  - -1 = antonymy

- then, the cosine similarity measures are analysed statistically

Results

- the final cosine similarity data consists of more than 350,000 cosine similarity values of 75 target word paradigms (e.g. *Arzt*, *Arzt*, *Ärztin*) per context window size n

Results

- no matter the context window size n, the highest semantic similarity is found for generic masculines and specific masculines

- the starting point for the rationale was:
  "if generic masculines are gender-neutral, they should be as semantically similar to specific masculines as to specific feminines"

- clearly, this is not the case

- generic masculines are not gender-neutral but biased towards the male, as they are clearly more semantically similar to specific masculines than to specific feminines

- this is in line with findings of previous studies (e.g. Demarmels 2017, Garnham et al. 2012, Gygax et al. 2008, Irmen & Kurovskaja 2010, Misersky et al. 2019, Schmitz et al. 2023, Stahlberg & Sczesny 2001)

Conclusion and outlook

- male as norm remains true, i.e. generic masculines are still commonly used

- while generic masculines are assumed to be gender-neutral, the present study and previous linguistic research show that they are not

- generic masculines show a clear male bias

- this raises further questions, one of which is the following:

Is this male bias activated when handling an L2 without a similar grammatical gender system?

Study 2

German L1 gender bias in L2 English

Schmitz, Dominic, Julia Elisabeth Blessing-Plötner, Nazire Cinar, Nguyet Minh Dang, Henrike Hoffmanns, Nadja Khadouj, Aaron Luther, Imran Peksen, and Tomma Lilli Robke. 2025. Form identity and gendered associations: L2 English *-er* facilitates the bias of L1 German *-er*. In Dominic Schmitz, Simon David Stein and Viktoria Schneider (eds). *Linguistic intersections of language and gender: Of gender bias and gender fairness*. Berlin, Boston: düsseldorf university press.

English role nouns

- in English role nouns, gender is typically either

- **natural**

  a man and his vs. *a women and her*

- **lexico-semantic**

  the class 'female' in *mother* or *sister* vs. the class 'male' in *father* or *brother*

- or **conceptual**

  firefighter = male vs. *nurse* = female

- most role nouns only contain conceptual gender information

- that is, you cannot deduct a person's gender from a role noun's form nor from its

  semantic content

Task 1: Story continuation

- participants were instructed to write three short stories with at least five sentences

- for each short story, participants were prompted with a first sentence in English

    *The **hairdresser** woke up late today.*

    *The **programmer** needs a new computer.*

    *The **singer** works on a new song.*

- participants wrote a continuation of at least 5 sentences in German

- the stereotypicality of the target words is female, male, and neutral (cf. Misersky et al. 2014)

Task 1: Rationale

- if participants were to pick up on only the stereotypicality information, i.e. the conceptual gender information, of the target words,

- then their story continuations in German should show

  - a majority of masculine forms for *programmar*

  - a majority of feminine forms for *hairdresser*

  - and likely an even distribution of masculine and feminine forms for *singer*

Task 1: Results

- male stereotypicality: *programmer*

    - 7% are feminine

    - 93% are masculine

- female stereotypicality: *hairdresser*

    - 57% are feminine

    - 43% are masculine

- neutral stereotypicality: *singer*

    - 48% are feminine
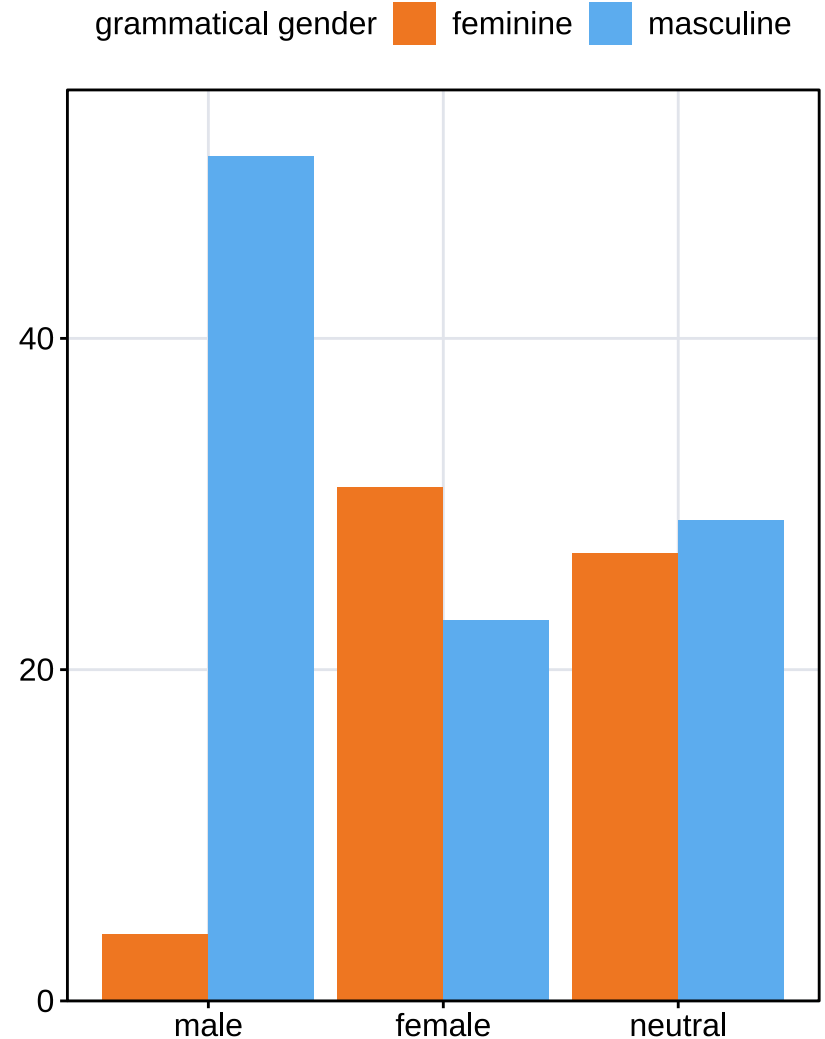
    - 52% are masculine

Task 1: Results

- male stereotypicality: *programmer*

  - 7% are feminine

  - 93% are masculine

- female stereotypicality: *hairdresser*

  - 57% are feminine

  - 43% are masculine

expected

- neutral stereotypicality: *singer*

  - 48% are feminine

  - 52% are masculine

grammatical gender ▮ feminine ▮ masculine

Task 1: Results

- male stereotypicality: *programmer*

  - 7% are feminine

  - 93% are masculine

- female stereotypicality: *hairdresser*

  - 57% are feminine

  - 43% are masculine

- neutral stereotypicality: *singer*

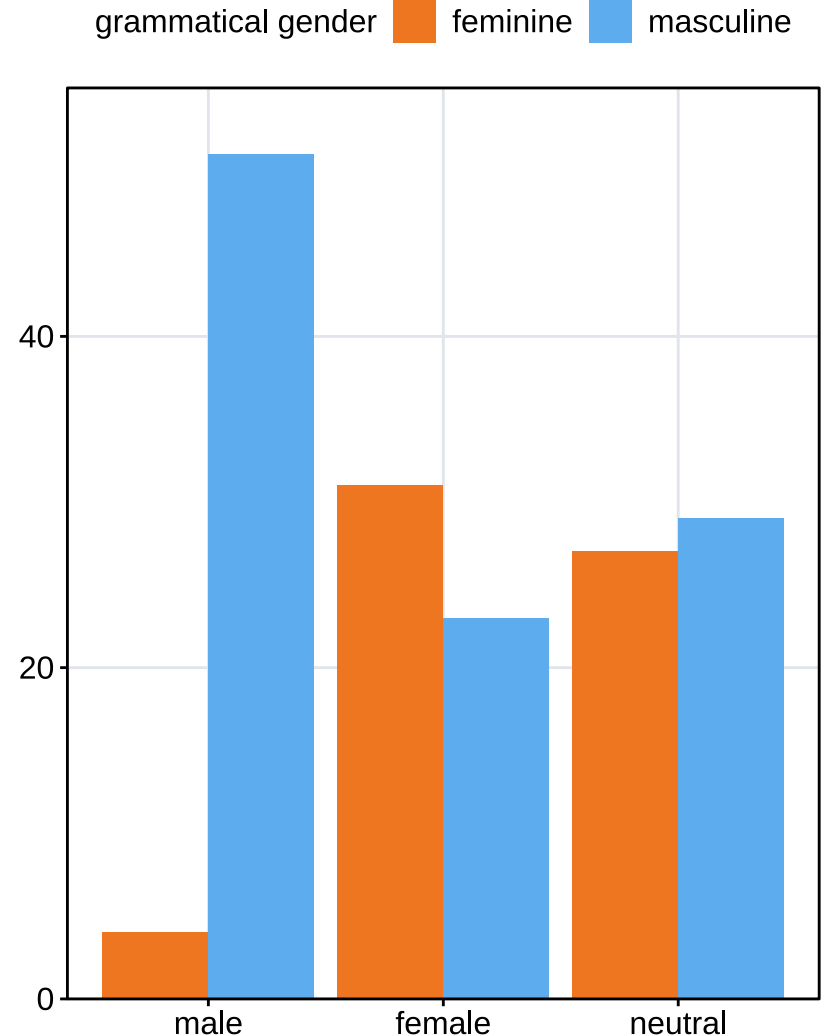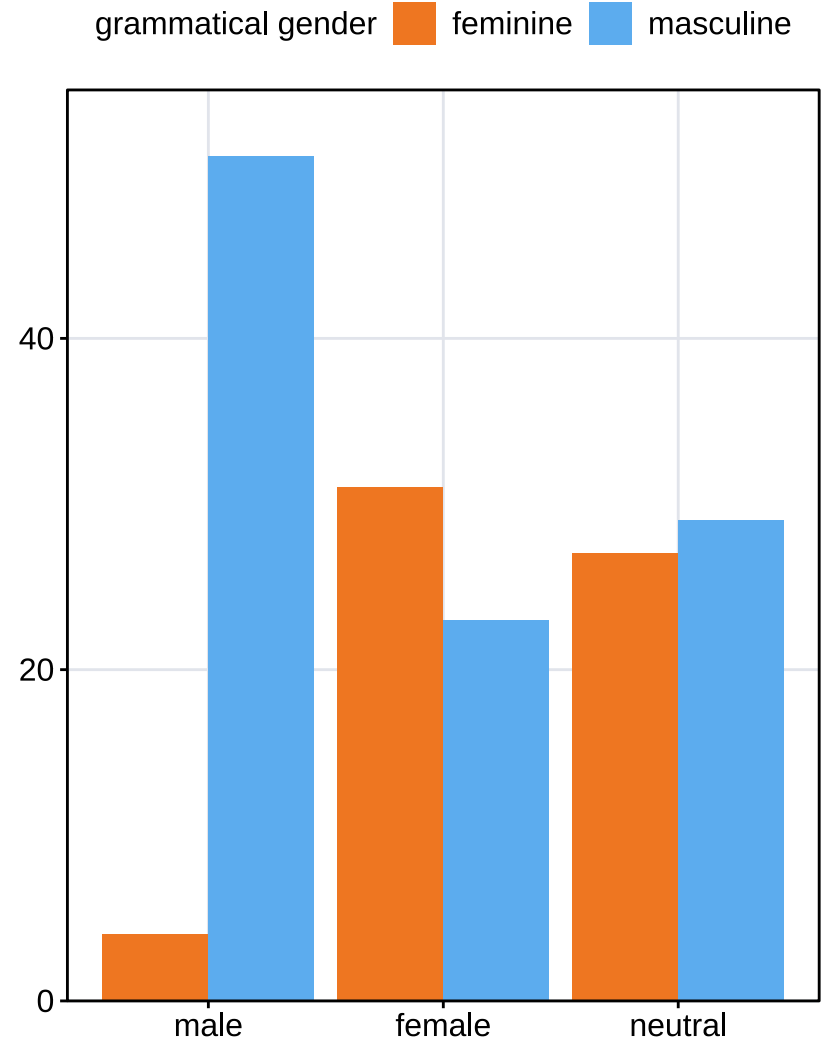 - 48% are feminine

  - 52% are masculine

unexpected

Task 2: Rationale

- clearly, the female stereotypicality of *hairdresser* did not lead to a prevalence of feminine forms

- idea: does the *-er* suffix affect associations with *hairdresser* in such a way that they 'become' more male?

- that is, the *-er* suffix is found in a huge number of German masculine role nouns

- hence, form identity might lead to a transfer of the male bias (cf. Study 1) from German to English

Task 2: Translation

- participants were asked to translate words from English to German, following their first intuition rather than overthinking their translations

- they were told that the experiment was not looking for perfect answers, that errors were not an issue, and that they were allowed to skip words they do not know

- for each stereotypicality eight words were used, half of them ending in *-er*

  - male
    programmer, publisher, killer, football player
    magician, mechanic, professor, inspector

  - female
    hairdresser, wedding planner, primary school teacher, fortune teller
    assistant, flight attendant, receptionist, florist

  - neutral
    singer, customer, designer, piano player
    author, journalist, astrologist, biologist

Task 2: Results
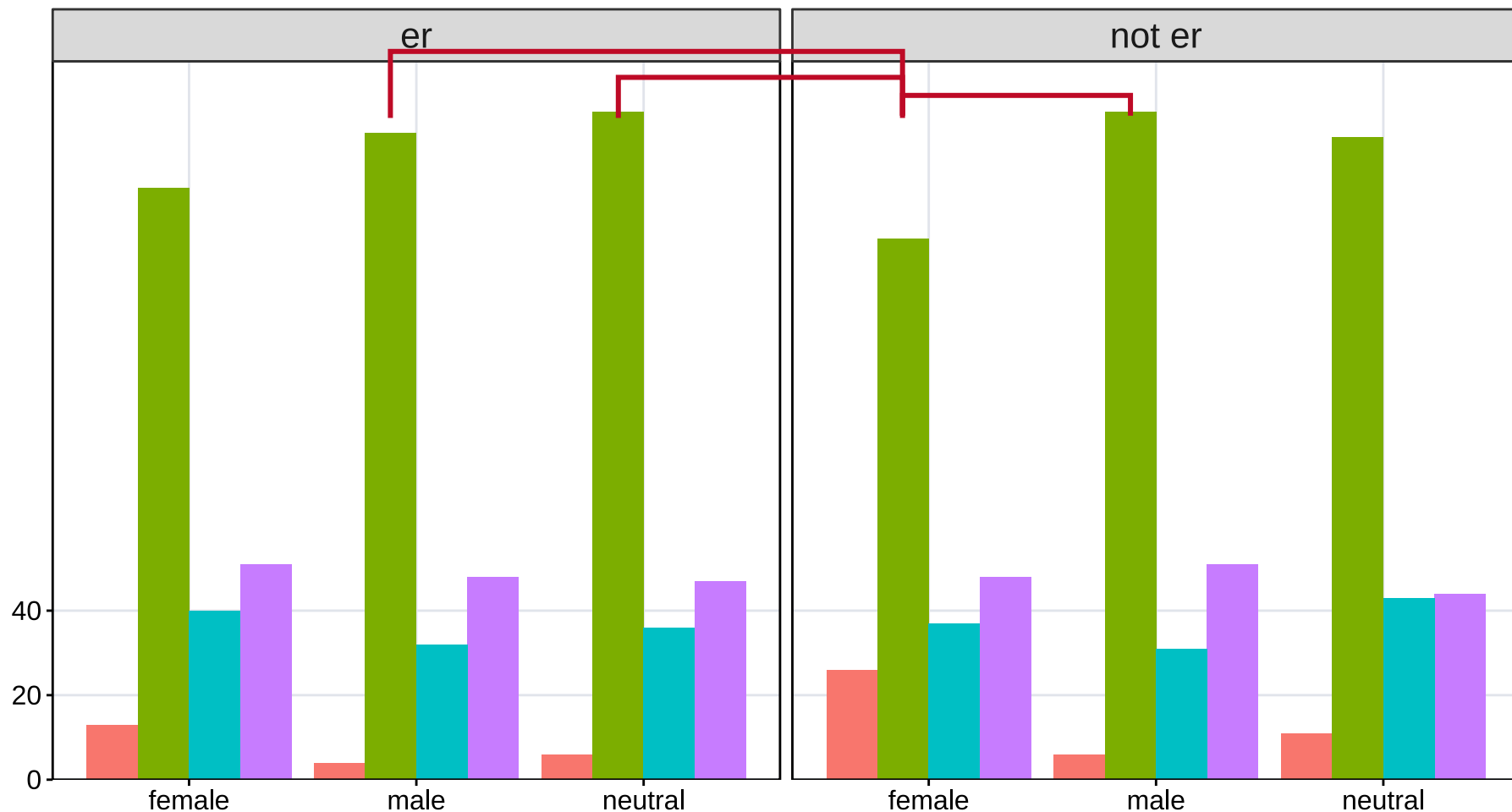
Task 2: Results

- stereotypically **male** words **ending in -*er*** showed significantly more masculine translations than stereotypically **female** words **not ending in -*er***

- stereotypically **neutral** words **ending in -*er*** showed significantly more masculine translations than stereotypically **female** words **not ending in -*er***

- stereotypically **male** words **not ending in -*er*** showed significantly more masculine translations than stereotypically **female** words **not ending in -*er***

- the results suggest that stereotypically female role nouns not ending in -*er* are 'least male', while stereotypically male forms, no matter their ending, are 'most male'

Conclusion

- we started from the following question:

  Is this male bias [of German role nouns] activated when handling an L2 without a similar grammatical gender system?

- the results of Study 2 suggest that the male bias is indeed activated

- additionally, the bias appears to be modulated by the availability of certain cues, i.e. the *-er* suffix

- that is, not only stereotypical/conceptual gender information influenced English to German translations but so did the form of the English words

Study 3
Gender in English 3rd-person pronouns

Schmitz, Dominic. 2025. Pronoun comprehension from a discriminative perspective: A proof of concept. In Dominic Schmitz, Simon David Stein and Viktoria Schneider (eds). *Linguistic intersections of language and gender: Of gender bias and gender fairness*. Berlin, Boston: düsseldorf university press.

Background

- in recent years, the use of appropriate third-person pronouns has gained increased attention

- especially singular *they* and neopronouns are the focus of scientific and public discussion

- in English linguistics, this attention overwhelmingly manifests in form of sociolinguistic and syntactic research (e.g. Conrod 2020, Han & Moulton 2022, Konnelly et al. 2020)

- however, we only know very little about the comprehension of different third-person pronouns

Background

- in contemporary English, one can differentiate at least four types of singular *they* (Conrod 2020)

    - **generic indefinite**

      *Someone ran out of the classroom, but **they** forgot their backpack.*

    - **generic definite**

      *The ideal student completes the homework, but not if **they** have an emergency.*

  - **specific definite ungendered**

    *The math teacher is talented, but **they** hand back grades late.*

  - **specific definite gendered**

    *James is great at laundry, but **they** never wash **their** dishes.*

Rationale

- compare the comprehension of generic *they* to that of *he* and *she* and to that of plural *they*

- method

  1. assess **the semantics** of the pronouns using a similar approach as for role nouns in German, i.e. distributional semantics and instance vectors

  2. using the instance vectors, **simulate a mental lexicon** and the comprehension processes within it

  3. from these processes, **derive measures to then statistically analyse** potential differences and similarities between the comprehension of the pertinent pronouns

The mental lexicon

- where we store all the words we know, along with their **meanings**, **forms**, and their **usage**

- example:

  - forms

    /kæt/, <cat>

  - meaning

    a small, furry animal with a big personality
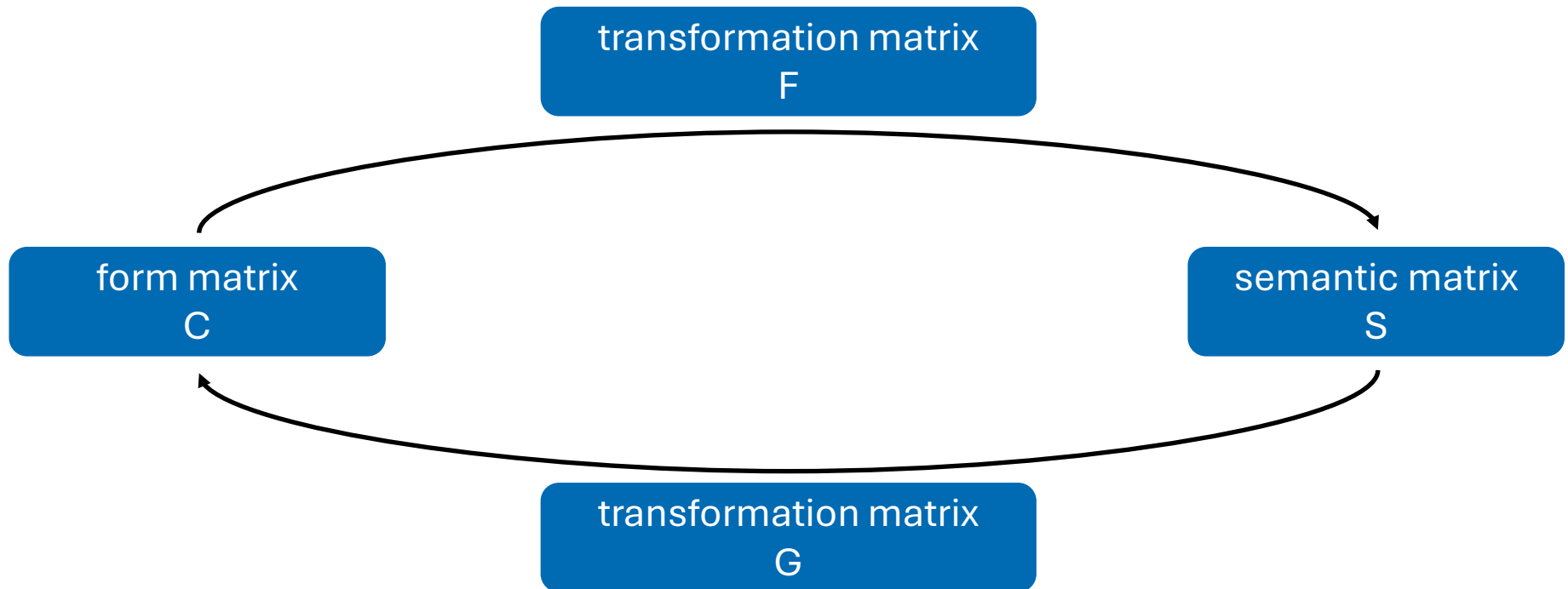
  - usage

    cat:kitten :: dog:puppy

- highly organised and constantly active when we listen, speak, read, write, sign

The discriminative lexicon

- a **model of the mental lexicon** which assumes mappings between meanings and forms which are based on the usage of words (Chuang & Baayen 2021)

- its computational implementation is called **linear discriminative learning** (Baayen et al. 2019)

```
                    ┌─────────────────────┐
                    │ transformation matrix│
                    │          F           │
                    └─────────────────────┘

┌──────────────┐                          ┌──────────────────┐
│  form matrix │                          │ semantic matrix  │
│       C      │                          │        S         │
└──────────────┘                          └──────────────────┘

                    ┌─────────────────────┐
                    │ transformation matrix│
                    │          G           │
                    └─────────────────────┘
```

Form matrix

- form is represented based on orthography via so-called **trigraphs**

- trigraphs are strings of 3 letters

- the start and end of a word are marked by a hashmark

- hashmarks are also counted

| target form	#ca	cat	at#	cap	ap#	#ba	bat
cat	1	1	1	0	0	0	0
cap	1	0	0	1	1	0	0
bat	0	0	1	0	0	1	1

Semantic matrix

- meaning is represented based on the vectors computed via distributional semantic methods, e.g. instance vectors

- semantic vectors are numeric vectors with n dimensions

- in the present study, vectors have 300 dimensions

target form	D1	D2	D3	D4	D5	...	D300
cat	0.075	0.018	0.114	0.028	0.095	...	0.050
cap	0.014	0.009	0.023	0.082	0.004	...	0.074
bat	0.114	0.104	0.115	0.077	0.105	...	0.111

The discriminative lexicon

- a **model of the mental lexicon** which assumes mappings between meanings and forms which are based on the usage of words (Chuang & Baayen 2021)

- its computational implementation is called **linear discriminative learning** (Baayen et al. 2019)

transformation matrix F

target form	#ca	cat	at#	cap	ap#	#ba	bat
cat	1	1	1	0	0	0	0
cap	1	0	0	1	1	0	0
bat	0	0	1	0	0	1	1

target form	D1	D2	D3	D4	D5	...	D300
cat	0.075	0.018	0.114	0.028	0.095	...	0.050
cap	0.014	0.009	0.023	0.082	0.004	...	0.074
bat	0.114	0.104	0.115	0.077	0.105	...	0.111

transformation matrix G
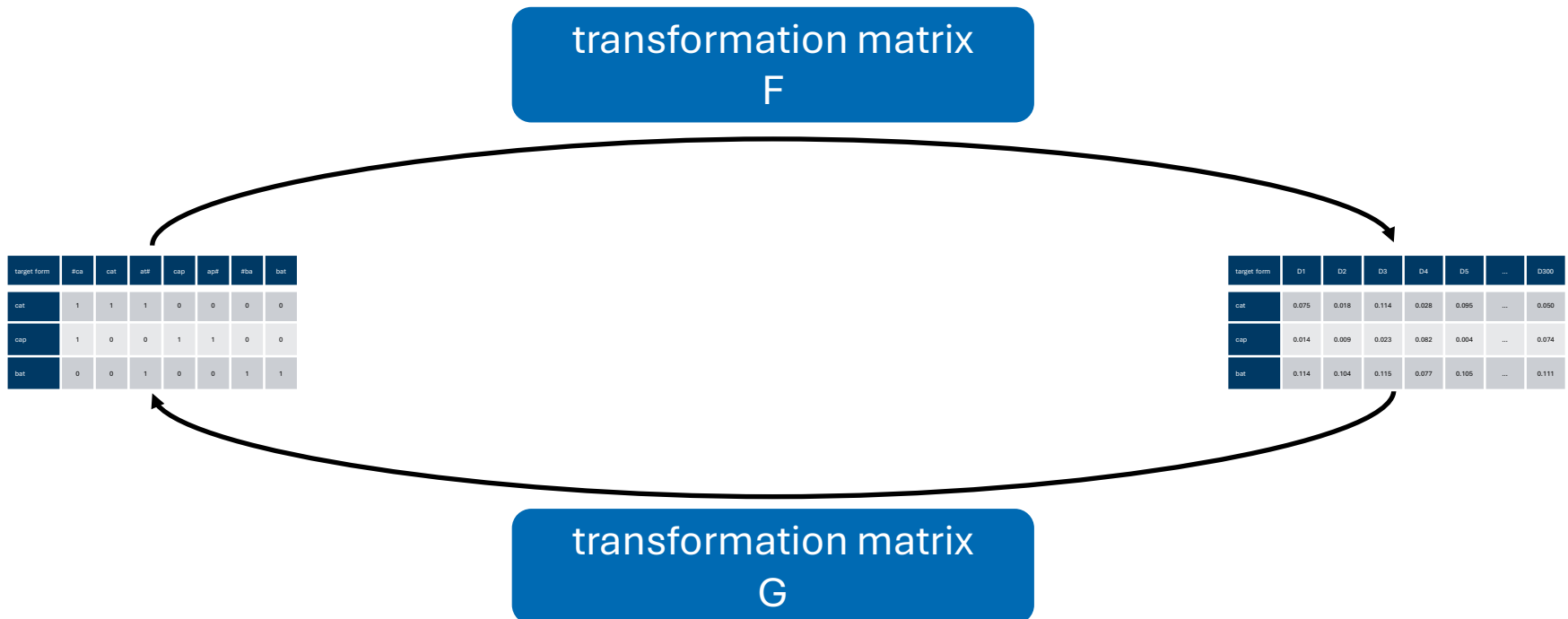
Transformation matrix F

- with the form matrix C and semantic matrix S available, we can compute a transformation matrix F

- this transformation matrix F is used to map the form matrix C onto the semantic matrix S = to simulate the comprehension process

- what does that mean?

  - for a simple multiplication like $2 * x = 6$, we can find the value of x

  - for a matrix multiplication like $C * F = S$, we also first need to find F

- matrix multiplication comes with a crucial characteristic

  - $C * F = S$ will never result in S, but in an approximated version $\hat{S}$

  - this approximated version reflects the outcome of the comprehension process

Comprehended semantic matrix $\hat{S}$

- from the comprehended semantics, one can extract different measures

1. **degree of semantic co-activation**

   reflects how many semantic dimensions are co-activated when a given word is

   retrieved from the lexicon

2. **degree of comprehension uncertainty**

   reflects how well the original and approximated semantics of a word align; a better

   alignment indicates better comprehension

3. **semantic neighbourhood density**

   reflects how many words are comprehended to have a very similar meaning

Results

	he	she	generic *they*	plural *they*
Degree of semantic co-activation	0.09	0.09	0.17	0.22

Results

	he	she	generic they	plural they
Degree of semantic co-activation	0.09	0.09	0.17	0.22
Degree of comprehension uncertainty	1,132,504	1,151,273	1,438,025	1,739,013

Results

	he	*she*	generic *they*	plural *they*
Degree of semantic co-activation	0.09	0.09	0.17	0.22
Degree of comprehension uncertainty	1,132,504	1,151,273	1,438,025	1,739,013
Semantic neighbourhood density	0.64	0.62	0.53	0.71

Discussion

- the comprehension of generic *they* is different than that of the 'traditional' third-person singular pronouns *he* and *she* and than that of plural *they*

- regarding the degrees of semantic co-activation and comprehension uncertainty, it is found between *he* and *she* at the lower and plural *they* at the higher end

- regarding its semantic neighbourhood density, it shows a less dense neighbourhood than *he*, *she*, and plural *they*

- overall, the present study is the first computational study on pronoun semantics and comprehension

Concluding remarks

Concluding remarks

today's main findings

1. generic masculines are not gender-neutral but show a male bias

2. this male bias is activated across languages, influencing L2 usage

3. generic *they* is a distinct pronoun but remains under-researched for now

Concluding remarks

"

Ein Mensch ist männlich, es sei denn, das Gegenteil ist erwiesen.

'A person is male unless it is proven otherwise.'

– Luise Pusch (1988)

"

- for now, at least, this statement remains accurate

  - generic masculines are favoured, alternatives are rejected by many

  - there is little to no public awareness on language biases and their transfer

  - generic *they* remains a hot topic, is rejected by many

- nonetheless, linguistic research on gender and language will continue helping us understand how language encodes bias and reflects society's stereotypes

Thank you!

References 1/2

Baayen, R. H., Chuang, Y.-Y., Shafaei-Bajestan, E., & Blevins, J. P. (2019). The discriminative lexicon: A unified computational model for the lexicon and lexical processing in comprehension and production grounded not in (de)composition but in linear discriminative learning. *Complexity*, *2019*, 4895891. https://doi.org/10.1155/2019/4895891

Bailey, A. H., LaFrance, M., & Dovidio, J. F. (2020). Implicit androcentrism: Men are human, women are gendered. *Journal of Experimental Social Psychology*, *89*, 103980. https://doi.org/10.1016/J.JESP.2020.103980

Bailey, A. H., Williams, A., & Cimpian, A. (2022). Based on billions of words on the internet, people = men. *Science Advances*, *8*(13), eabm2463. https://doi.org/10.1126/sciadv.abm2463

Chuang, Y.-Y., & Baayen, R. H. (2021). Discriminative learning and the lexicon: NDL and LDL. *Oxford Research Encyclopedia of Linguistics*. https://doi.org/10.1093/ACREFORE/9780199384655.013.375

Conrod, K. (2020). Pronouns and gender in language. In *The Oxford Handbook of Language and Sexuality*. Oxford University Press. https://doi.org/10.1093/oxfordhb/9780190212926.013.63

Demarmels, S. (2017). „Gesucht: Assistentin oder Sekretär der Geschäftsleitung" – Gendersensitive Formulierungen in Stellenanzeigen aus der Perspektive der Textsorte. In M. Nielsen, K. Luttermann, & M. Lévy-Tödter (Eds.), *Stellenanzeigen als Instrument des Employer Branding in Europa: Interdisziplinäre und kontrastive Perspektiven* (pp. 249–270). Springer. https://doi.org/10.1007/978-3-658-12719-0_11

Firth, J.R. (1957). A synopsis of linguistic theory 1930-1955. Studies in Linguistic Analysis: 1–32. London: Longman.

Garnham, A., Gabriel, U., Sarrasin, O., Gygax, P., & Oakhill, J. (2012). Gender representation in different languages and grammatical marking on pronouns: When beauticians, musicians, and mechanics remain men. *Discourse Processes*, *49*(6), 481–500. https://doi.org/10.1080/0163853X.2012.688184

Gygax, P., Gabriel, U., Sarrasin, O., Oakhill, J., & Garnham, A. (2008). Generically intended, but specifically interpreted: When beauticians, musicians, and mechanics are all men. *Language and Cognitive Processes*, *23*(3), 464–485. https://doi.org/10.1080/01690960701702035

Han, C. H., & Moulton, K. (2022). Processing bound-variable singular they. *Canadian Journal of Linguistics/Revue Canadienne de Linguistique*, *67*(3), 267–301. https://doi.org/10.1017/CNJ.2022.30

Irmen, L., & Kurovskaja, J. (2010). On the semantic content of grammatical gender and its impact on the representation of human referents. *Experimental Psychology*, *57*(5), 367–375. https://doi.org/10.1027/1618-3169/a000044

Konnelly, L., Cowper, E., Konnelly, L., & Cowper, E. (2020). Gender diversity and morphosyntax: An account of singular they. *Glossa: A Journal of General Linguistics*, *5*(1). https://doi.org/10.5334/GJGL.1000

References 1/2

Kotthoff, H., & Nübling, D. (2024). *Genderlinguistik: Eine einführung in sprache, gespräch und geschlecht* (2., überarbeitete und erweiterte Auflage, p. 393) [Kartoniert]. Narr Francke Attempto Verlag GmbH + Co. KG.

Lapesa, G., Kawaletz, L., Plag, I., Andreou, M., Kisselew, M., & Padó, S. (2018). Disambiguation of newly derived nominalizations in context: A Distributional Semantics approach. *Word Structure*, *11*(3), 277–312. https://doi.org/10.3366/word.2018.0131

Misersky, J., Gygax, P. M., Canal, P., Gabriel, U., Garnham, A., Braun, F., Chiarini, T., Englund, K., Hanulikova, A., Öttl, A., Valdrova, J., Von Stockhausen, L., & Sczesny, S. (2014). Norms on the gender perception of role nouns in Czech, English, French, German, Italian, Norwegian, and Slovak. *Behavior Research Methods*, *46*(3), 841–871. https://doi.org/10.3758/S13428-013-0409-Z

Misersky, J., Majid, A., & Snijders, T. M. (2019). Grammatical gender in German influences how role-nouns are interpreted: Evidence from ERPs. *Discourse Processes*, *56*(8), 643–654. https://doi.org/10.1080/0163853X.2018.1541382

Nübling, D. (2020). Geschlecht in der Grammatik: Was Genus, Deklination und Binomiale uns über Geschlechter(un)ordnungen berichten. *Muttersprache*, *130*(1), 17–33.

Pusch, L. F. (1988). Die Kätzin, die Rättin und die Feminismaus. *Women in German Yearbook: Feminist Studies in German Literature & Culture*, *4*(1), 15–16.

Schmitz, D. (2024). Instances of bias: The gendered semantics of generic masculines in German revealed by instance vectors. *Zeitschrift für Sprachwissenschaft, 43*(2).

Schmitz, D. (2025). Pronoun comprehension from a discriminative perspective: A proof of concept. In Dominic Schmitz, Simon David Stein and Viktoria Schneider (eds). *Linguistic intersections of language and gender: Of gender bias and gender fairness*. Berlin, Boston: düsseldorf university press.

Schmitz, D., Schneider, V., & Esser, J. (2023). No genericity in sight: An exploration of the semantics of masculine generics in German. *Glossa Psycholinguistics*, *2*(1). https://doi.org/10.5070/G6011192

Schmitz, D., Blessing-Plötner, J.E., Cinar, N., Dang, N. M., Hoffmanns, H., Khadouj, N., Luther, A., Peksen, I. and Robke, T. L. (2025). Form identity and gendered associations: L2 English -er facilitates the bias of L1 German -er. In Dominic Schmitz, Simon David Stein and Viktoria Schneider (eds). *Linguistic intersections of language and gender: Of gender bias and gender fairness*. Berlin, Boston: düsseldorf university press.

Stahlberg, D., & Sczesny, S. (2001). Effekte des generischen Maskulinums und alternativer Sprachformen auf den gedanklichen Einbezug von Frauen. *Psychologische Rundschau*, *52*(3), 131–140. https://doi.org/10.1026//0033-3042.52.3.131

Werner, M. (2012). *Genus, Derivation und Quantifikation. Zur Funktion der Suffigierung und verwandter Phänomene im Deutschen*. De Gruyter.