



Number and definiteness in kinds across languages: Insights from an experimental study

Imke Driemel², Johannes Hein², Desiré Carioti³, Jakob Wünsch¹, Vina Tsakali⁴, Artemis Alexiadou^{1,2}, Uli Sauerland¹
& Maria Teresa Guasti³



45. Jahrestagung der Deutschen Gesellschaft für Sprachwissenschaft, Universität zu Köln, 8th-10th March, 2023

Bare plural vs. definite plural

Across languages, **kind** and generic readings are expressed differently (Krifka et al. 1995, Chierchia 1998, Longobardi 1994, Ionin et al. 2011, Lazaridou-Chatzigoga and Alexiadou 2019).

- | | |
|--|----------------|
| (1) a. (*The) dogs are widespread. | English |
| b. (Die) Pandabären sind vom Aussterben bedroht.
the.PL panda.PL are from extinction facing
'Pandas are facing extinction.' | German |
| c. *(I) cani sono diffusi.
the.PL dog.PL are widespread
'Dogs are widespread.' | Italian |
| d. *(Ta) pulja dodo ehun pleon afanisti.
the.PL bird.PL dodo have already disappeared
'Dodo birds have already disappeared.' | Greek |

Bare plural vs. definite plural

Across languages, kind and **generic** readings are expressed differently (Krifka et al. 1995, Chierchia 1998, Longobardi 1994, Ionin et al. 2011, Lazaridou-Chatzigoga and Alexiadou 2019).

- | | |
|---|----------------|
| (2) a. (*The) dogs love to play. | English |
| b. (Die) Bieher bauen Dämme.
the.PL beaver.PL build dams
'Beavers build dams.' | German |
| c. *(I) cani amano giocare.
the.PL dog.PL love to.play
'Dogs love to play.' | Italian |
| d. *(I) ghatas ine aksiolatreftha plasmata.
the.PL cat.PL are adorable creatures
'Cats are adorable creatures.' | Greek |

Theoretical accounts

Chierchia (1998):

- ▶ Arguments in English (3a) are mapped to kinds with the kind operator \cap (function from worlds to the sum of all instances of the kind in that world).
- ▶ Arguments in Italian/Greek (3b) are mapped to properties; they receive a kind reading via $\wedge \iota$.
- ▶ The definite determiner overtly realizes ι (and not \cap).

(3) *Kinds*

a. **Engl:** *rare* (\cap (*dogs*))

b. **Ita/Gr:** *rare* ($\wedge \iota$ (*dogs*))

- ▶ The Blocking Principle enforces overt over covert type-shifting.

Theoretical accounts

Chierchia (1998):

- ▶ Why do cross-linguistic patterns for kind readings replicate for generic readings?
- ▶ Generics (4) are often argued to be built on kinds; they involve a G_N operator (Carlson 1977, Krifka et al. 1995) which introduces quantification over situations.

(4) *Generics*

a. **Engl:** $G_N x, s [\cup \text{dog}(x) \wedge C(x, s)] [\textit{love.play}(x, s)]$

b. **Ita/Gr:** $G_N x, s [x \leq \iota \text{dogs} \wedge C(x, s)] [\textit{love.play}(x, s)]$

Theoretical accounts

Dayal (2004):

- ▶ Dayal adopts Chierchia's semantics in for Germanic AND extends it to Romance languages.
- ▶ Cross-linguistic split derived via canonical ranking: $\iota > \cap$
- ▶ Romance lexicalizes both ι and \cap , English only ι .

(5) a. **Engl/Ita/Gr** kinds:

rare ($\cap(\text{dogs})$)

b. **Engl/Ita/Gr** generics:

$\text{GN } x, s$ [$\cup \cap \text{dog}(x) \wedge C(x, s)$] [*love.play*(x, s)]

- ▶ **German** optionality: (i) patterns with Romance; (ii) Blocking Principle inactive in kind/generic domain.

Bare plural vs. definite plural in Germanic

Optionality in **German**?

(6) daß (die) Elefanten wertvolle Zähne haben.
that the.PL elephant.PL precious teeth have
'that elephants have precious teeth' (Brugger 1994)

- ▶ Optionality for German widely believed in theoretical literature (Brugger 1994, Longobardi 1994, Krifka et al. 1995, Dayal 2004, Oosterhof 2004, Schaden 2012).
- ▶ Results from experimental studies so far inconclusive (cf. Barton et al. 2015, Czipionka and Kupisch 2019).

Bare plural vs. definite plural in Germanic

Two acceptability judgement studies (yes/no task) on the optionality of bare plural and definite plural in German generic contexts:

- ▶ [Barton et al. \(2015\)](#): Every target sentence was introduced by *Every child knows...*
 - ▶ Bare plurals accepted 100% of the time
 - ▶ Definite plurals accepted 68% of the time

Bare plural vs. definite plural in Germanic

Two acceptability judgement studies (yes/no task) on the optionality of bare plural and definite plural in German generic contexts:

- ▶ Barton et al. (2015): Every target sentence was introduced by *Every child knows...*
 - ▶ Bare plurals accepted 100% of the time
 - ▶ Definite plurals accepted 68% of the time
- ▶ Czipionka and Kupisch (2019): Target sentences were introduced by visual and auditive stimuli.



Eisbären sind weiß. → 98% acceptance

Die Eisbären sind weiß. → 98% acceptance

'(The) polar bears are white.'

Eisbären sind weiß. → 84% acceptance

Die Eisbären sind weiß. → 17% acceptance

'(The) polar bears are white.'

Definite singular

Another way to express kind readings is by using the definite singular (Vendler 1967, Carlson 1977, Krifka et al. 1995, Dayal 2004, Lazaridou-Chatzigoga and Alexiadou 2019).

- (7) a. The lion is likely to become extinct. **English**
- b. Der Pandabär ist vom Aussterben bedroht. **German**
the.SG panda.SG is from extinction facing
'The panda is facing extinction.'
- c. Il cane é diffuso. **Italian**
the.SG dog.SG is widespread
'The dog is widespread.'
- d. To psaroni ine puli. **Greek**
the.SG starling.SG is bird
'The starling is a bird.'

Definite singular

Well defined kind restriction (WDK): The use of definite singulars seems to be restricted to well-established kinds (Geoffrey and Pan 1975, Carlson 1977, Krifka et al. 1995, Dayal 2004, Ionin et al. 2011).

(8) **English:**

- a. The polar bear is slowly disappearing.
- b. ??The white bear is slowly disappearing. (Carlson 2011)

(9) **Italian:**

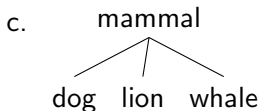
#La tigre a tre zampe è facile da cacciare.
the.SG tiger.SG with three legs is easy to hunt
'The tigre with three legs is easy to hunt.' (Dayal 2004)

Definite singular

Dayal (2004) argues that singular definites with kind readings are derived by the regular determiner ι which combines with a noun ranging over taxonomic entities.

(10) *Definite singulars as taxonomic entities*

- a. The lion might become extinct.
- b. $\llbracket the_{tax} \rrbracket = \lambda P. \iota X [P(X)]$, where X ranges over entities in the taxonomic domain



The taxonomic reading comes close to a generic statement but is crucially not built with a kind operator. Definite singulars are also predicted to be felicitous only for well defined kinds (taxonomies have to be established).

Definite singular

For Romance in particular, the WDK restriction has been disputed, see Vergnaud and Zubizarreta (1992: 644) for French and Borik and Espinal (2015: 199,fn.27) for Spanish.

(11) **French:**

Le tigre blessé est dangereux. \rightsquigarrow *kind*
the.SG tiger.SG wounded is dangerous
'The wounded tiger is dangerous.'

(12) **Spanish:**

El tigre herido es peligroso. \rightsquigarrow *kind*
the.SG tiger.SG wounded is dangerous
'The wounded tiger is dangerous.'

Definite singular

A rating study (scale: 1-4) for English, Spanish, Brazilian Portuguese reveal a WDK effect for Romance (Ionin et al. 2011). There was also a WDK effect found in a replicated study for Greek (Lazaridou-Chatzigoga and Alexiadou 2019).

(13) **WDK:** *I really like going to the zoo. Unfortunately, there are many animals that can't be found in a zoo, or anywhere else. It's very sad. For example ...*

- a. The dodo bird is extinct. $M = 3.55$
- b. El pájaro dodo está en extinción $M = 3.77$
the.SG bird.SG dodo is in extinction **(Spanish)**
- c. To puli dodo ehi pleon afanisti $M = 3.69$
the.SG bird.SG dodo has already disappeared **(Greek)**

Definite singular

For both Spanish and English the mean rating was worse for non-well defined kinds, though the effect was stronger for English (Ionin et al. 2011). For Greek, the mean rating was unexpectedly high (Lazaridou-Chatzigoga and Alexiadou 2019: 258).

(14) **Non-WDK:** *My brother has been in a bad mood lately. And no wonder: his apartment is so uncomfortable, it must be very depressing to live there. And he has a very dim and unpleasant overhead light. I told him he should buy a new lamp, something pleasant. For example, I know that ...*

- | | |
|---|--------------------------------|
| a. The green lamp is very relaxing. | $M = 2.01$ |
| b. La lámpara verde es muy relajante
the.SG lamp.SG green is very relaxing | $M = 2.52$
(Spanish) |
| c. I prasini lamba ine poli halarotiki
the.SG lamp.SG green is very relaxing | $M = 3.29$
(Greek) |

Goals of this study

We conducted a **comparative judgment study**. We will present a subset of the results with the following goals:

- ① Verify the cross-linguistic picture (based on Italian, Greek, German, English).
- ② Investigate optionality between definite and bare plural in German.
- ③ Investigate WDK for Romance and Greek.

Study design

- ▶ Generic/kind readings of different noun types are very subtle and might include more than one option.
- ▶ Binary FORCED-CHOICE TASKS have high statistical power (Sprouse and Almeida 2017, Marty et al. 2020).
- ▶ Our method includes a FORCED-CHOICE TASK in a more complex THURSTONE design: forced-choice is performed between all possible pairs of alternatives → scaling of each rating is derived by individual choices
- ▶ We include 4 noun types in our investigation:
 - ▶ definite plural
 - ▶ bare plural
 - ▶ definite singular
 - ▶ indefinite singular
- ▶ THURSTONE SCALING derives a scaling of speakers' preferences, quantifying the distance between all 4 options (Thurstone 1927, Montag 2006, Cattelan 2012).

Study design

- ▶ Participants: 602 adult participants aged between 18 and 58 recruited online through Prolific/SONA: 152 English speakers ($M = 29.5$), 155 German speakers ($M = 24.5$), 144 Italian-speakers ($M = 23.4$), and 152 Greek-speakers ($M = 24.5$).
- ▶ We set up 9 contexts that enforced a certain reading:
 - ▶ episodic existential (control)
 - ▶ uniqueness based definite singular (control)
 - ▶ uniqueness based definite plural (control)
 - ▶ kind well defined
 - ▶ kind non-well defined
 - ▶ generic well-defined
 - ▶ generic non-well defined
 - ▶ generic with speaker distance
 - ▶ generic with normative flavour

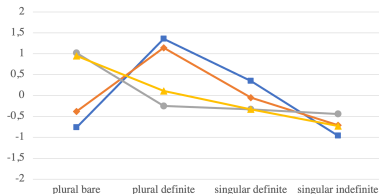
Comparative judgments and THURSTONE SCALING

There are many pests in the world that make our lives difficult. They eat our supplies, disturb our sleep, or plainly get on our nerves. For example:

1. Mosquitos give us itchy bites in the summer.
2. The mosquitos give us itchy bites in the summer.
3. The mosquito gives us itchy bites in the summer.
4. A mosquito gives us itchy bites in the summer.

Thurstone method:

- ▶ Participants are presented with 6 paired forced-choice trials for each context. The 6 pairs include the 4 alternatives in all their possible combinations.
- ▶ THURSTONE SCALING derives a linear rating of all 4 noun types from two-way comparisons.
- ▶ From percentage of how often a noun type is chosen in each pair a z-score is derived.



Thurstone Method (trials)

There are many pests in the world that make our lives difficult. They eat our supplies, disturb our sleep, or plainly get on our nerves. For example:

- Mosquitos give us itchy bites in the summer.
- The mosquitos give us itchy bites in the summer.

Thurstone Method (trials)

There are many pests in the world that make our lives difficult. They eat our supplies, disturb our sleep, or plainly get on our nerves. For example:

- The mosquitos give us itchy bites in the summer.
- The mosquito gives us itchy bites in the summer.

Thurstone Method (trials)

There are many pests in the world that make our lives difficult. They eat our supplies, disturb our sleep, or plainly get on our nerves. For example:

- A mosquito gives us itchy bites in the summer.
- The mosquito gives us itchy bites in the summer.

Thurstone Method (trials)

There are many pests in the world that make our lives difficult. They eat our supplies, disturb our sleep, or plainly get on our nerves. For example:

- Mosquitos give us itchy bites in the summer.
- The mosquito gives us itchy bites in the summer.

Thurstone Method (trials)

There are many pests in the world that make our lives difficult. They eat our supplies, disturb our sleep, or plainly get on our nerves. For example:

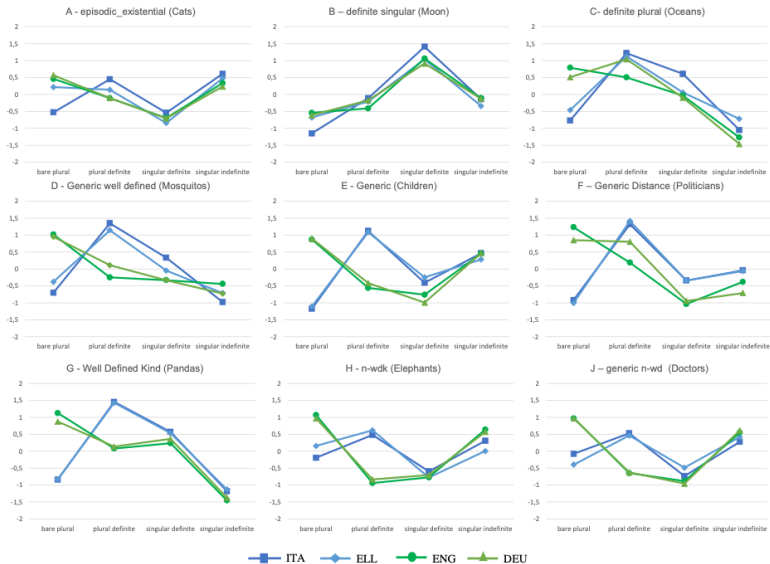
- Mosquitos give us itchy bites in the summer.
- A mosquito gives us itchy bites in the summer.

Thurstone Method (trials)

There are many pests in the world that make our lives difficult. They eat our supplies, disturb our sleep, or plainly get on our nerves. For example:

- The mosquitos give us itchy bites in the summer.
- A mosquito gives us itchy bites in the summer.

Results



Bare plural vs. definite plural across languages

The constant growth of the human population on earth has taken and still is taking its toll on other life on the planet, plant or animal. For example:

1. Pandas are almost extinct.
2. The pandas are almost extinct.
3. The panda is almost extinct.
4. A panda is almost extinct.

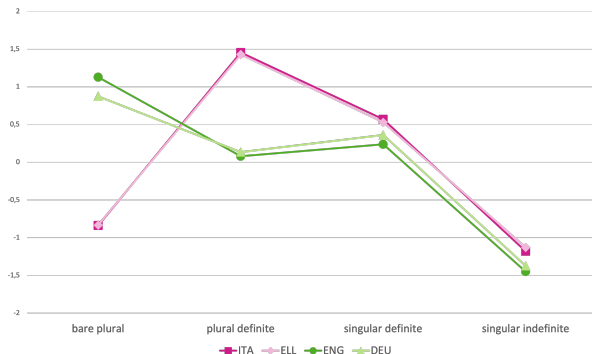


Fig. 1: Kind well defined context

Bare plural vs. definite plural across languages

There are many pests in the world that make our lives difficult. They eat our supplies, disturb our sleep, or plainly get on our nerves. For example:

1. Mosquitos give us itchy bites in the summer.
2. The mosquitos give us itchy bites in the summer.
3. The mosquito gives us itchy bites in the summer.
4. A mosquito gives us itchy bites in the summer.

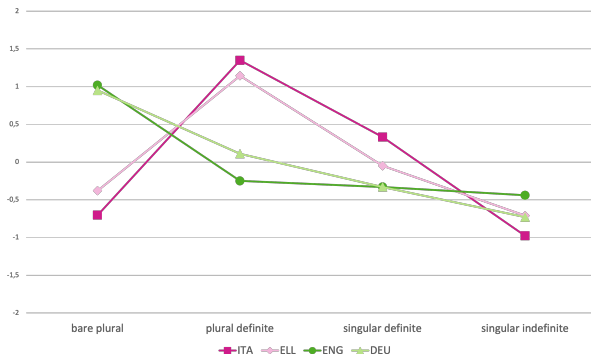


Fig. 2: Generic well defined context

Bare plural vs. definite plural across languages

Fig. 1: Kind well defined context

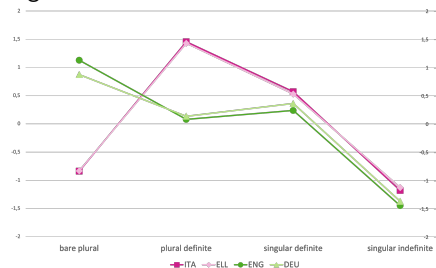
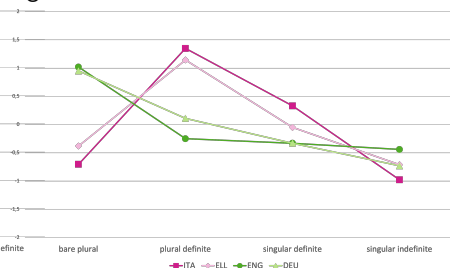


Fig. 2: Generic well defined context



- ▶ 2 clusters: best candidate in Italian/Greek is definite plural; best candidate in German/English is bare plural
- ▶ The 2 cluster are visible across contexts (kind and generic)
- ▶ No significant difference in the kind context between English vs. German ($\chi^2(3) = 52.3, p > 0.05$), and Italian vs. Greek ($\chi^2(3) = 30.6, p > 0.05$)
- ▶ Results call into question the claim that there is optionality between bare plural and definite plural in German.

Definite singular: WDK

Life is tough for animals in the wild. Any weakness can lead to sudden death by diseases, blood loss, or predators. That is why...

1. wounded elephants are rare in the wild.
2. the wounded elephants are rare in the wild.
3. the wounded elephant is rare in the wild.
4. a wounded elephant is rare in the wild.

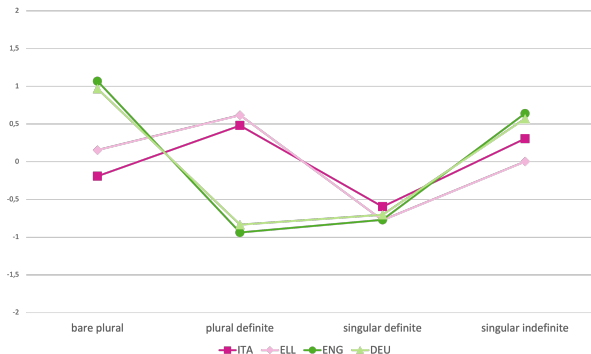


Fig. 4: Kind non-well defined context

Definite singular: WDK

Fig. 1: Kind well defined context

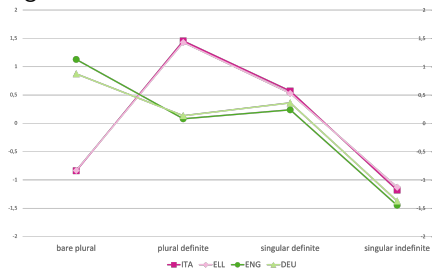
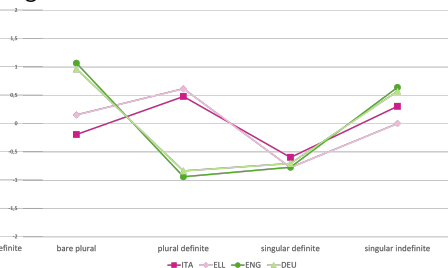


Fig. 4: Kind non-well defined context



- ▶ We found the WDK effect for both languages clusters but they manifest in different ways.
- ▶ WDKs: definite singular is in each language roughly 1 SD apart from the best candidate (Italian/Greek definite plural; German/English bare plural)
- ▶ N-WDKs: For German/English distance increases (2 SDs); no increase for Greek/Italian (but both definite singular and plural are chosen less)
- ▶ Possible explanation: NWDKs are interpreted as existentials.
- ▶ Motivation: (i) in all languages the singular indefinite increases; (ii) distance increase for German/English due to bare plurals being interpreted as existential

Summary

- ▶ For generics and kinds, the optimal candidate is the bare plural in German/English, and the definite plural in Greek/Italian
- ▶ We could not verify optionality between bare plural and definite plural in German (*pace* Brugger 1994, Longobardi 1994, Krifka et al. 1995, Dayal 2004, Oosterhof 2004, Schaden 2012, Barton et al. 2015); our results align with Cypionka and Kupisch (2019)
- ▶ The results support the universality of the Blocking Principle (Chierchia 1998); no exception for German
- ▶ We found the WDK restriction across Germanic, Romance and Greek, though the effects play out differently in German/English vs. Greek/Italian. Overall, the results provide support for the definite singular as a taxonomic determiner (Dayal 2004).

Bibliography I

- Acton, E. K. (2019). Pragmatics and the social life of the English definite article. *Language*, 95:37–65.
- Barton, D., Kolb, N., and Kupisch, T. (2015). Definite article use with generic reference in German: an empirical study. *Zeitschrift für Sprachwissenschaft*, 34:147–173.
- Borik, O. and Espinal, M. T. (2015). Reference to kinds and to other generic expressions in Spanish: definiteness and number. *The Linguistic Review*, 32:167–225.
- Brugger, G. (1994). Generic interpretations and expletive determiners. *University of Venice Working Papers in Linguistics*, 3:1–30.
- Carlson, G. (1977). *Reference to kinds in English*. PhD thesis, University of Massachusetts, Amherst.
- Carlson, G. (2011). Genericity. In von Stechow, P., Maienborn, C., and Portner, P., editors, *Semantics: An International Handbook of Natural Language Meaning*, volume 2 of *Handbooks of Linguistics and Communication Science*, page 1153–1185. Mouton de Gruyter, Berlin.
- Cattelan, M. (2012). Models for Paired Comparison Data: A Review with Emphasis on Dependent Data. *Statistical Science*, 27:412–433.
- Chierchia, G. (1998). Reference to kinds across languages. *Natural Language Semantics*, 6:339–405.
- Cohen, A. (2001). On the Generic Use of Indefinite Singulars. *Journal of Semantics*, 18:183–209.
- Czypionka, A. and Kupisch, T. (2019). (The) polar bears are pink. How (the) Germans interpret (the) definite articles in plural subject DPs. *The Journal of Comparative Germanic Linguistics*, 22:247–291.
- Dayal, V. (2004). Number marking and (in)definiteness in kind terms. *Linguistics and Philosophy*, 27:393–450.
- Geoffrey, N. and Pan, C. (1975). Inferring quantification in generic sentences. In *Papers from the 11th regional meeting, Chicago Linguistic Society*, pages 412–428.
- Greenberg, Y. (2003). *Manifestations of Genericity*. Routledge, London.
- Ionin, T., Montrul, S., and Santos, H. (2011). An experimental investigation of the expression of genericity in English, Spanish and Brazilian Portuguese. *Lingua*, 121:963–985.
- Krifka, M., Pelletier, F. J., Carlson, G. N., ter Meulen, A., Link, G., and Chierchia, G. (1995). Genericity: An introduction. In Pelletier, F. J. and Carlson, G. N., editors, *The Generic Book*, pages 1–124. The University of Chicago Press, Chicago/London.

Bibliography II

- Lazaridou-Chatzigoga, D. and Alexiadou, A. (2019). Genericity in Greek: an experimental investigation. In Gattnar, A., Hörnig, R., Störzer, M., and Featherston, S., editors, *Proceedings of Linguistic Evidence 2018: Experimental Data Drives Linguistic Theory*, pages 245–260. The University of Tübingen, Tübingen.
- Longobardi, G. (1994). Reference and proper names: A Theory of N-movement in Syntax and Logical Form. *Linguistic Inquiry*, 25:609–665.
- Marty, P., Chemla, E., and Sprouse, J. (2020). The effect of three basic task features on the sensitivity of acceptability judgment tasks. *Glossa: a journal of general linguistics*, 5:1–23.
- Montag, E. D. (2006). Empirical formula for creating error bars for the method of paired comparison. *Journal of Electronic Imaging*, 15:010502.
- Oosterhof, A. (2004). Generic noun phrases in Dutch. In Karlsson, F., editor, *Proceedings of the 20th Scandinavian Conference of Linguistics*, pages 1–22. University of Helsinki, Helsinki.
- Schaden, G. (2012). Two Ways of Referring to Generalities in German. In Mari, A., Beyssade, C., and Prete, F. D., editors, *Genericity*, page 157–175. Oxford University Press, Oxford.
- Sprouse, J. and Almeida, D. (2017). Design sensitivity and statistical power in acceptability judgment experiments. *Glossa: a journal of general linguistics*, 2:1–32.
- Thurstone, L. L. (1927). A law of comparative judgment. *Psychological Review*, 34:273.
- Vendler, Z. (1967). *Linguistics in Philosophy*. Cornell University Press.
- Vergnaud, J.-R. and Zubizarreta, M. L. (1992). The Definite Determiner and the Inalienable Constructions in French and in English. *Linguistic Inquiry*, 23:595–652.

Appendix I: Controls

I don't have any pets, so I planted lots of beautiful flowers in my garden for me to enjoy. When I went outside yesterday, they were all ruined and there were paw prints of many different sizes all over the ground. I think the following happened...

1. Cats had ruined my flowers during the night.
2. The cats had ruined my flowers during the night.
3. The cat had ruined my flowers during the night.
4. A cat had ruined my flowers during the night.

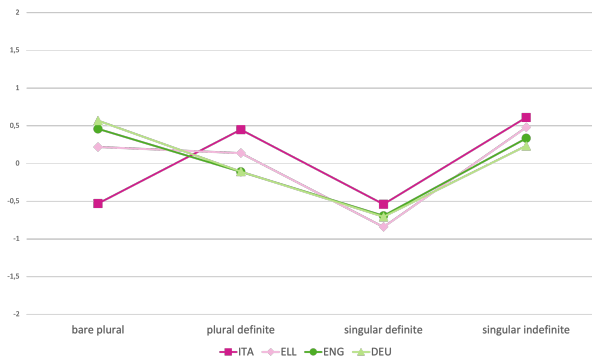


Fig. 6: Episodic context (control)

Appendix I: Controls

I recently bought a telescope and last night, for the first time, I wanted to watch the cosmic bodies around the earth up close. I had to hurry setting up the telescope because...

1. Moons were already rising at 11 pm.
2. The moons were already rising at 11 pm.
3. The moon was already rising at 11 pm.
4. A moon was already rising at 11 pm.

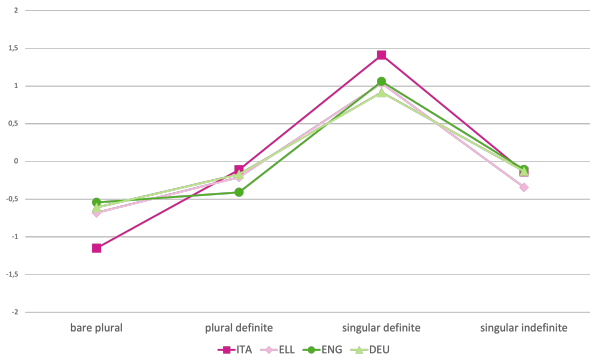


Fig. 7: Unique definite singular context (control)

Appendix I: Controls

Considering the amount of plastic in them, all oceans are by now dangerously polluted.

1. Oceans today are overcrowded with plastic bottles.
2. The oceans today are overcrowded with plastic bottles.
3. The ocean today is overcrowded with plastic bottles.
4. An ocean today is overcrowded with plastic bottles.

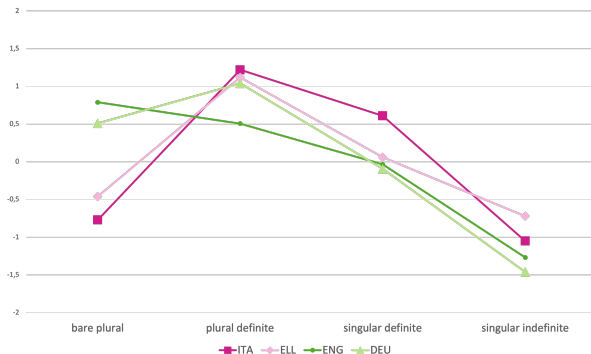


Fig. 8: Unique definite plural context (control)

Appendix II: WDK, generic contexts

My brother is seeking medical advice but he has no health insurance. Unfortunately, I cannot help him. But I know of a party happening later, where some of the guests might be doctors and he could find some help there. But I also tell him that doctors always get drunk at parties. So he should be careful since...

1. Drunk doctors give bad advice.
2. The drunk doctors give bad advice.
3. The drunk doctor gives bad advice.
4. A drunk doctor gives bad advice.

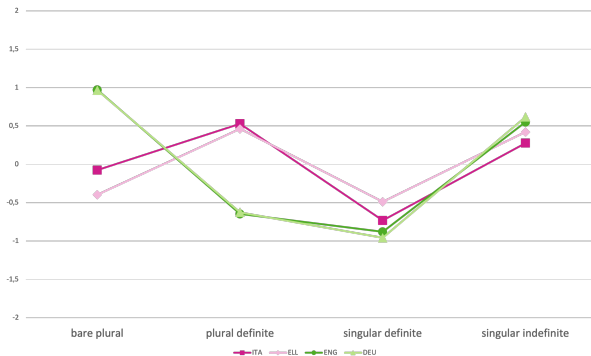


Fig. 9: Generic non-well defined context

Appendix II: WDK, generic contexts

Fig. 2: Generic well defined context

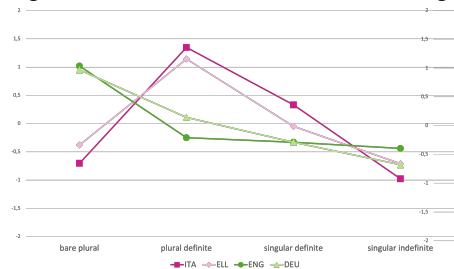
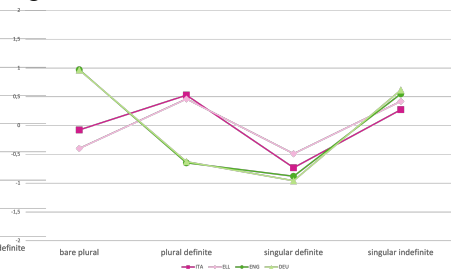


Fig. 9: Generic non-well defined context



- ▶ See discussion in Dayal (2004: 431-433) for the definite singular in generic statements...

Appendix III: distance effects in German

There is a place in town where people meet for a drink and a chat after work. As there are federal elections coming up soon, a lot of the discussions and debates revolve around politics. Yesterday, one guest seemed very upset and continuously complained that “voting is meaningless because...

1. Politicians do whatever they want after the election anyway.”
2. The politicians do whatever they want after the election anyway.”
3. The politician does whatever s/he wants after the election anyway.”
4. A politician does whatever s/he wants after the election anyway.”

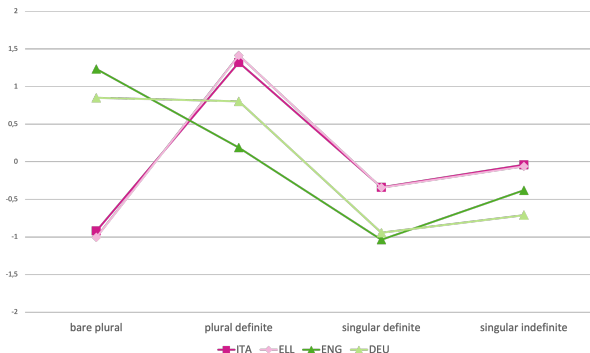


Fig. 3: Generic distance context

German :
bare plural and definite plural equally acceptable; in line with (Acton 2019)

Appendix IV: normative effects

A child was sent home for misbehaving in school. The parents are upset, and scold their child. They say in the end: "Remember, ...

1. children respect their teachers."
2. the children respect their teachers."
3. the child respects his/her teachers."
4. a child respects his/her teachers."

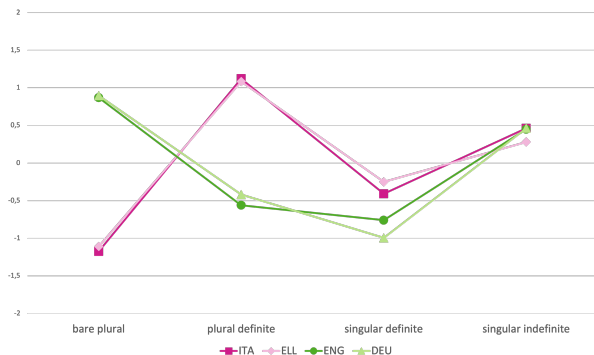


Fig. 5: Generic normative context

Appendix IV: normative effects

Fig. 2: Generic well defined context

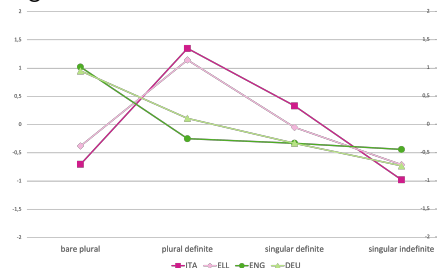
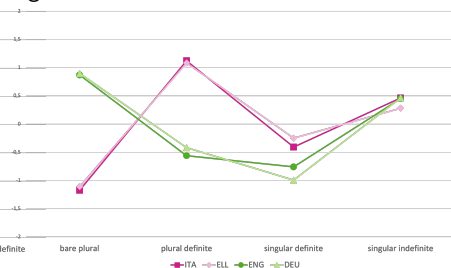


Fig. 5: Generic normative context



- ▶ In all languages, the indefinite singular is the least chosen in the generic context (Fig. 2).
- ▶ But if the generic context has a normative flavour the indefinite singular rise to the second best option (Fig. 5).
- ▶ Evidence for the claim that generic readings with normative flavour favour the singular indefinite (Cohen 2001, Greenberg 2003).