Non-Verbal Plural Number Agreement in the Cross-Linguistic Context: Combining Corpus Findings with Two Kinds of Acceptability Rating Results for English, German, Polish, and Czech

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Abstract

Non-verbal plural number agreement (manifested as the distributive plural or singular) is an under-researched topic, especially from a cross-linguistic perspective. English, German, Polish, and Czech appear to differ with regard to number preference in objects, PP adverbials and PP postmodifiers congruent with plural nouns (subjects, NP heads as antecedents). The present paper aims to comprehensively study this phenomenon, which has potential implications for language teaching, stylistic usage, translation, and language typology research. To achieve this, we combine evidence from the literature, corpus-based studies, and exploratory corpus searches with two kinds of acceptability ratings: Likert-scale questionnaires, completed by 400 participants, and forced-choice questionnaires, filled out by 120 participants. Hence, in addition to investigating the topic of non-verbal plural number agreement, our article offers methodological insights: it showcases how the results obtained from two kinds of acceptability ratings differ and complement each other and whether they reflect findings from corpora. Our findings confirm that English, German, Polish, and Czech vary in their preferences concerning non-verbal number agreement. These differences seem to be context- and noun-related. In particular, there are two scenarios in which, unlike English, the other languages prefer the distributive singular over the distributive plural: when the context is abstract and non-literal and when the singular is used to make a generic or generalized reference. Thus, we see the cross-linguistic differences as a language-specific rhetoric strategy.

Keywords: English/German/Polish/Czech; non-verbal number agreement; distributiveness; distributive singular/plural; acceptability ratings; free variation

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1. Introduction

This study stems from the authors' observation that their native languages, Polish and Czech, exhibit different strategies than English regarding non-verbal plural number agreement. To illustrate, let us examine three sentences in English (1), Polish (2), and Czech (3).

(1) We owe that to *those* who have lost *their lives*. (COCA[1])

(2) Jesteśmy to winni *tym*, którzy stracili *życie*.
'We owe that to *those* who have lost *their life* (singular)'

(3) Dlužíme to *těm*, kteří přišli o *život.*
'We owe that to *those* who have lost *their life* (singular)'

Sentence (1) illustrates the default choice made by speakers of English, namely, the presence of agreement in number between the plural antecedent (*those*) and the correlated term (*lives*), known as *distributive plural* or *correlative distribution* (e.g., Quirk 1985: 768; Sørensen 1985). Our recent paper (Rudnicka and Klégr 2023) confirms that English strongly prefers the distributive plural. In contrast to that, sentences (2) and (3), which are the direct translations of (1) into Polish and Czech, contain the noun *life* (*życie, život*) in the *distributive singular* number. For speakers of Polish, the distributive singular is the default version and the presence of the plural form (*lives*/*życia*) in sentences like (2) would only be acceptable in gaming contexts. As in Polish, in Czech, the distributive singular would be the preferred option. Interestingly, recent findings from a corpus-based study comparing English and German (Rudnicka 2024) show that, with regard to the noun *life (Leben)*, German behaves very much like Polish and Czech, as it has an extreme preference for the distributive singular.[2]

Nevertheless, the bigger picture seems much more complex. The topic of non-verbal number agreement has been largely ignored in the research on agreement.[3] This is especially true in cross-linguistic comparisons.

[1] Corpus of Contemporary American English (COCA). See Davies (2008–).
[2] The similarity may be due to the long coexistence of these three languages.
[3] We consulted many books, chapters, and articles focused on *agreement*, none mentioning non-verbal plural number agreement: D'Alessandro, Fischer, and Hrafnbjargarson (2008); Halpert (2016); Boeckx (2006); Baker (2008); Keine

However, non-verbal number agreement has important implications for language teaching, stylistic usage, translation, and research on language typology. Therefore, the purpose of this paper is to address this research gap.

To achieve this goal, we conducted a contrastive study that compares four languages, namely, in alphabetical order, Czech, (British) English, German, and Polish. The data we present, use, and discuss was gathered through corpus linguistic techniques and two types of online-based acceptability ratings: Likert-scale questionnaires and forced-choice questionnaires. By utilizing these techniques, we supplement the frequency information from language corpora by the acceptability ratings provided by five hundred study participants who were sourced through the Prolific platform.[4] Since the languages we investigate represent two (typologically different) branches of the Indo-European family of languages—Germanic and Slavonic—and English serves as a point of reference, from now on, they will be referred to in the order English, German, Polish, and Czech.

The structure of the article reflects and follows from the methodological complexity of the research. In the next section, we review the research literature for each language and discuss the available corpus data. In section 3, we move on to the acceptability ratings and present our approach, methodology, and results. The fourth section discusses the acceptability ratings in relation to the corpus data, while the final section sums up the study's conclusions.

2. Non-verbal plural number agreement in English, German, Polish, and Czech

To the best of our knowledge, no research comparing English, German, Polish, and Czech with regard to non-verbal plural number agreement has been conducted thus far.[5] Moreover, with just a few notable exceptions, there is very little literature on the subject available for the individual languages. Below, the situation in each of the four languages is briefly

(2010); Bondaruk, Dalmi, and Grosu (2014); Camacho-Taboada et al. (2013); Fleischer, Rieken, and Widmer (2015).

[4] https://www.prolific.com/.

[5] A corpus-based pilot study comparing English and German has recently been conducted by Rudnicka (2024).

outlined as regards existing research on the topic, the available corpus data, and the results of exploratory corpus searches (in the case of Polish).

2.1 English

Although it is mentioned more than in the other three languages, we have found the topic of non-verbal plural number agreement in English to be under-researched with almost no full-length studies focusing on it entirely. The exception is Sørensen's article (1985) looking at different scenarios in which the distributive singular can be used instead of the default distributive plural. Our recent chapter (Rudnicka and Klégr 2023), which builds on Sørensen's work, presents a corpus study resulting in a classification of factors influencing the presence or absence of distributive agreement, and links the findings to the topic of free variation.[6] In the study, we looked at two non-idiomatic but relatively fixed constructions, *lose one's life* and *lose one's job*, in British and American English.[7] In British English data, 100% of cases of *lose one's life* and almost 93% of cases of *lose one's job* with a plural subject had a plural object (data extracted from the BNC);[8] in American English, the results were 97% and 91%, respectively (data from COCA). We assume that this reflects the general tendency in English for the distributive plural and is likely to apply to other non-idiomatic English constructions. It is in keeping with the view generally held in the literature on the use of the distributive plural in English, although it shows that the use of the singular is, at least at times, also acceptable, see Zandvoort (1957: 263), Schibsbye (1961: 11), Sørensen (1985: 338), Quirk et al. (1985: 768), and Dušková et al. (2006: 430). In particular, we identified two scenarios in which the distributive singular seems to be an alternative to the distributive plural in English, namely singularization to achieve generalization (Wood 1957: 289) and abstract and non-literal uses (Rudnicka and Klégr 2023: 95). However, as

[6] We define free variation as 'the availability in a given discourse situation of two (or more) options none of which a calculation based on an exhaustive set of factors singles out as clearly the most appropriate in that situation' Cappelle (2009: 19).

[7] We use the expression *non-idiomatic phrases* to refer to the opposite of invariable set phrases or idiomatic expressions, such as *at the end of one's tether*, which are used in the singular regardless of their singular and plural reference (Sørensen 1985: 342–343; Rudnicka and Klégr 2023: 78).

[8] British National Corpus (BNC). See Davies (2004–).

the corpus data shows, even if the distributive singular is an occasional alternative, it is rarely chosen over the default, plural option.

2.2 German

In German, as in English, the topic of distributive sg/pl seems to be understudied, despite many works focusing on verbal agreement (e.g., Robbins 1995; Schrodt 2005; Lee 2012; Wegerer 2012; Kehl 2019). One of the very few mentions of non-verbal number agreement can be found in Duden, a well-known monolingual dictionary. In the entry 'Number agreement in German',[9] we read that even though it may not seem entirely logical, an object referring to a subject in the plural is usually in the divisive or distributive singular. However, further on, a distinction in meaning is made: with more idiomatic phrases, the distributive singular seems to be preferred, whereas in the case of a literal meaning, the distributive plural should be chosen. This claim contradicts the non-metaphorical and literal examples given on Duden's webpage, which also feature a distributive singular congruent term (e.g., Die *Hunde wedelten mit dem Schwanz (nicht: den Schwänzen)*, translating into English as *The dogs wagged their tails (not: tails)*). This shows how complex the topic of syntactic agreement is in the German language. Rudnicka's (2024) pilot study featuring Oslo Multilingual Corpus data compares three different nouns, namely *life/lives (Leben/Leben)*, *head(s) (Kopf/Köpfe)*, and *voice(s) (Stimme/Stimmen*) in English and German original texts and translations.[10] The results confirm that while English strongly prefers the distributive plural, German shows more variation, which is:

- noun-related—with the noun *Leben* (*life/lives*) being found in the distributive singular across the board, see (4), with just one exception found in the translation from English into German, see (5); or
- context-related—with the nouns *Kopf/Köpfe* (*head(s)*) and *Stimme/Stimmen* (*voice(s)*), which tend to be used in the

[9] 'Kongruenz im Numerus' ('Number agreement in German') Duden online. URL: https://www.duden.de/sprachwissen/sprachratgeber/Kongruenz-im-Numerus (accessed 31 July 2023).

[10] Oslo Multilingual Corpus (OMC), 1999–2008. http://www.hf.uio.no/ilos/english/services/omc/.

distributive singular if the context is more abstract or if used in a generic or generalizing context, see (6).

(4) Das ist gut so, denn das ist ein wertvoller Schatz in *ihrem Leben*. (OMC/RVW1)
That is good, since it is a great treasure in *their lives*. (OMC/RVW1TE[11])

(5) […] black woman and the old yellow woman sat in the kitchen for hours, blending *their lives* so that what lay behind one and ahead of the other became indistinguishable. (OMC/GN1)
[…] schwarze Frau und die alte gelbe Frau saßen stundenlang in der Küche und ließen *ihre Leben* ineinander verlaufen, bis nicht mehr auszumachen war, was die eine schon hinter sich hatte und was der anderen noch bevorstand. (OMC/GNTD)

(6) An einem Tisch saßen vier Kartenspieler, sämtlich mit den Hüten auf *dem Kopf*; und am Tisch daneben drei junge Frauen […]. (OMC/PH1)
At one table sat four card players, all wearing hats, and at the next, three young women […]. (OMC/PH1TE)

2.3 Polish

According to Stroińska (1992: 429), Slavic languages have diverse and relatively complex systems of grammatical agreement. With regard to Polish, Lyskawa (2020: 3) claims that verbs typically agree with their nominative subjects (in number, person, and gender); however, '[t]here is no object agreement in Polish'. When it comes to various aspects of syntax concerning the numeral phrases and, for instance, Polish distributive *po*, which is similar to the English *each*, there are several works that can be consulted (e.g., Franks 1995; Przepiórkowski 2008, 2010; Przepiórkowski and Patejuk 2013); however, none deals with the fact that both the distributive plural and the distributive singular seem to be possible in the Polish language nor whether there are any differences in meaning between the two options. Intriguingly, the compendium by Franks (1995: 132) features an interesting sentence, *Tych pięć kobiet czyta książkę*, which can

[11] No T indicates original, and TE/TD indicates English/German translation.

be translated into English as *These five women(plural) reads(third person singular) a book(singular)*. However, the apparent lack of agreement between the plural number of *women* results from the fact that the verb form is dictated by *five* (the subject), and not *women* (the postmodifier).[12]

To our knowledge, there are no empirical studies conducted on the Polish language on this topic. Thus, we decided to run exploratory searches to learn more about the presence of both distributive singular and plural forms of selected nouns in the Polish data. We used the National Corpus of Polish (NKJP),[13] the biggest publicly available corpus of Polish (with approximately 1.8 billion words of text). In particular, we conducted six searches to see whether, in the presence of a plural antecedent, a plural or singular congruent term is used more frequently. We searched for the following nouns within non-idiomatic but fairly fixed phrases: *head(s)* and *voice(s)* and one noun in a simile (*as poor as a church mouse/mice*). The expressions unquestionably refer to a plural antecedent and feature either a singular or plural congruent term: *mieli na głowie*/*mieli na głowach* (*they had on their head*/*they had on their heads*), *w ich głosie/w ich głosach (in their voice*/*in their voices*), *byli biedni jak mysz kościelna*/*byli biedni jak myszy kościelne* (*they were poor as a church mouse*/*they were poor as church mice*). Table 1 presents the results of these six exploratory searches. As can be seen, instances of both the distributive singular and the distributive plural were found. However, the distributive plural tends to occur more frequently for every phrase (77.5 %). Additionally, in the case of the distributive singular of *they had on their head*, six out of nine uses were in a metaphorical rather than literal context.[14] Thus, the

[12] Polish and Czech work in this way with numerals from 5 upwards: numerals 1 to 4 function as premodifiers to the head noun, numerals 5 and more function as singular heads with the following noun as the postmodifier and corresponding agreement; see ASČ Counselling Centre: Once again on the type of 'five people', 'several comments': ASČ (ascestinaru.cz). We thank Reviewer 2 for this suggestion and the link.

[13] See the website of the NKJP: http://nkjp.pl/index.php?page=0&lang=1 (accessed 1 August 2023).

[14] In Polish *to have something on one's head* metaphorically means *to have something important to do*, but the connotation is often negative, implying that the task is unpleasant: see https://wsjp.pl/haslo/podglad/22713/ktos-ma-na-glowie-cos. However, a literal meaning is also possible, e.g., *to wear a hat on one's head*.

investigation of non-verbal number agreement by studying the actual acceptability of forms such as the ones featured in Table 1 is a worthwhile task promising to throw new light on the subject of agreement.

Table 1: Results of six exploratory searches in the NKJP

Phrase	**Form of agreement** distributive sg	distributive pl	**raw frequency total**
mieli na głowie (they had on their head)	9		**9**
mieli na głowach (they had on their heads)		88	**88**
w ich głosie (in their voice)	19		**19**
w ich głosach (in their voices)		25	**25**
byli biedni jak mysz kościelna (they were poor as a church mouse)	11		**11**
byli biedni jak myszy kościelne (they were poor as church mice)		21	**21**
Total	**39**	**134**	**173**

2.4 Czech

As far as the description of distributive relations within a clause are concerned, the situation in Czech appears to be the same as in the other three languages, perhaps even more extreme. The latest and most comprehensive description of contemporary Czech, *Nový encyklopedický slovník češtiny* (2017)[15] contains only two entries mentioning distributiveness (one on distributive predicates in connection with quantifiers, the other on distributive and collective predicates). The authors of the entries quote only foreign sources, none of which relate to Czech. The mentions in the Czech literature of non-verbal agreement within a clause are scattered as incidental remarks in connection with different topics. The only dedicated article that we found on the subject concerning Czech is a fairly recent corpus study by Štícha (2023). It deals with non-verbal number agreement between the antecedent and the

[15] New Encyclopedic Dictionary of Czech, https://www.czechency.org/ (accessed 13 October 2023).

nominal complement of the postmodifying prepositional phrase characterised as a comitative instrumental (*lidé s deštníky/deštníkem—people with umbrellas/with an umbrella*).[16] The study lists only three references, a short article on the comitative instrumental (without reference to agreement) and two general Czech grammars. In brief, the phenomenon under investigation and the factors determining the choice between the distributive plural and singular in Czech can be described as an unploughed field.

3. Cross-linguistic acceptability ratings

As stated above, our main objective is to conduct a cross-linguistic study on the acceptability/naturalness of a number of sentences containing a plural antecedent and a plural or singular congruent term. The study aims to assess the acceptability/naturalness of several sentences as used by native speakers of the four languages: (British) English, German, Polish, and Czech. This section provides a detailed explanation of our methodology (section 3.1), broken down into several sub-sections due to the complexity of the study.

3.1 Methodology

This cross-linguistic comparison consists of two parts: Part 1: Assessment of acceptability on the Likert-scale; and Part 2: Preference testing with forced-choice questionnaires. For each part, we use the same test sentences, and, crucially, for each of the studies, we recruit a new set of participants so that the participants filling in the Likert-scale questionnaire (Part 1) do not take part in the preference testing (Part 2).

The two kinds of surveys are intended to provide information of different types. In the study applying the Likert scale, we obtain evaluation scores for particular sentences and compare the scores both intra-linguistically—to discover intra-linguistic preferences typical for each language; and cross-linguistically—to compare the scores obtained by each variant between the different languages. In contrast, the forced-choice questionnaires straightforwardly indicate the participants'

[16] The term 'comitative' or 'comitative instrumental' (used in inflected languages) refers to the form of a noun or prepositional phrase expressing the meaning 'along with' or 'accompanied by'.

preferences. At the same time, they will not offer any information about how the participants would assess the dispreferred option.

However, before we describe the two parts of the study in detail, with section 3.2 focusing on the assessment of acceptability on the Likert-scale and section 3.3 on the forced-choice questionnaires, let us start by introducing the terminology (3.1.1), the test sentences (3.1.2), and the Prolific platform (3.1.3).

3.1.1 Terminology

We use the term *acceptability judgments*/*ratings* rather than *grammaticality judgments*/*assessment* as many scholars (e.g., Chomsky 1965: 10; Ionin and Zyzik 2014; Spinner and Gass 2019) argue that the two are distinct constructs. Acceptability refers to how *good* (or *natural*) or *bad* (*unnatural*/*weird*) a sentence sounds to language users; at the same time, grammaticality cannot be directly tested. It is possible to have acceptable but ungrammatical sentences and vice versa (Leivada and Westergaard 2020: 1).

3.1.2 Test sentences

We chose to use invented sentences representing different scenarios discussed in the literature, such as Sørensen (1985) and Rudnicka and Klégr (2023), which allow for some flexibility in choosing the preferred number of congruent terms when dealing with a plural subject in English.[17] We avoid using 'numerically self-evident'[18] situations such as singularia/pluralia tantum, highly-idiomatic phrases, or uncountable nouns. We aimed for the sentences to be similarly long, of similar complexity, and neutral in content.

Since there are indications that agreement may be influenced by the character of the nouns involved and idiomaticity, we used this opportunity to test this possibility by choosing several categories of nouns (and nouns as parts of idiomatic expressions, similes and semi-idiomatic phrases)

[17] English is a reference point in our study because, of the languages we look at, it is the one where the topic of non-verbal agreement has been given most attention.

[18] Based on methodology suggested in Rudnicka's (2024) comparison of English and German.

congruent with personal antecedents in the hope of achieving more precise and layered results. Below are fifteen test sentences in English grouped, for clarity, into categories based on the noun they feature. The nouns in the variation of which we are interested, are italicized. For each of the languages, we prepared exact and authentic-sounding translations.[19]

Body-parts-related nouns
Most people raised their *hand(s)* for the proposal.
You could hear excitement in their *voice(s).*
The ladies had beautiful hats on their *head(s).*
Afterwards, all participants got *(a) headache/headaches*.

Objects to be handled
Have you all brought your *camera(s)*?
Passengers can buy their *ticket(s)* on a tram or a bus.

Abstract and metaphorical matters
There the baby seals spend the first month of their *life/lives*.
Wives are more sensitive to the quality of their *marriage(s)* than husbands are.
The causes of their *death(s)* are unknown.

Location and place
Why do these pensioners never go out of their *house(s)*?
Lockdowns gave people more opportunity to spend time in their *garden(s).*
Some boys even fell off their *chair(s)* in their exaggerated hilarity.

Similes and a semi-idiom
They are said to be as sly as *a fox*/as *foxes*.
My father's relatives were as poor as *a church mouse*/as *church mice*.
As usual, in the moment of decision, the politicians buried their *head(s) in the sand.*

[19] The translations were arrived at in consultation with native speakers. Only regarding one sentence in German (featuring *headache(s)*), did we have a different translation. The native speaker recommended *food poisoning* instead.

3.1.3 Prolific

The Prolific platform combines good recruitment standards with reasonable costs, clearly informing participants that they are being recruited to participate in a research study (Palan and Schitter 2018). Other advantages of Prolifc include an inventory of good data storage and handling practices and the ability to filter participants with more than 100 demographic filters (e.g., gender, first language).[20]

For us, one of the benefits of using Prolific is the assumption that the participants taking part in our study represent the same, probably relatively homogenous, category ('people who are active on Prolific') for each of the languages.[21]

3.2 Part 1: Assessment of acceptability on the Likert-scale

The notions *Likert response format* or *Likert-type scale* refer to a scale according to which the study participants evaluate content. In principle, it rates attitudes on a five- or seven-point scale from one extreme to the other. Additionally, the Likert-scale survey typically includes a neutral or moderate option. Likert scales are popular for measuring opinions, agreement, and behaviours.

The participants in our study were to evaluate each sentence on a scale from 1 (very unnatural/unacceptable) to 5 (fully natural/acceptable), with three other options available between the top-end and low-end of the scale (2: somewhat unnatural/weird; 3: hard to say; 4: quite natural/acceptable). The next section presents the design of our Likert-scale questionnaire (3.2.1). Section 3.2.2 deals with the data cleaning and is followed by a section presenting the study results (3.2.3).

3.2.1 The Likert-scale questionnaire's design

Our Likert-scale questionnaires did not only feature the fifteen test sentences (see section 3.1.2), but following the advice in Cowart (1997:

[20] The Prolific platform has a feature that allows one to filter participants based on their demographics. This means that even if we did not ask participants what their first language was, we could specify language requirements in advance so that only native speakers of the relevant languages could take the surveys.

[21] This would not be so, if we recruited participants from different environments, e.g., university students, vs. friends and family.

52) and Bross (2019: 34), we included an approximately equivalent number of filler sentences (fifteen and fourteen, respectively) in the questionnaires.

Filler sentences serve three purposes: to conceal the pattern of experimental items (Cowart 1997: 51; Schütze and Sprouse 2013: 39), to help participants become familiar with the task (Bross 2019: 33), and to compare the 'normalcy' of participants' responses to the test sentences. Similarly, they are crucial in recognizing those who may have inverted the rating scale.

We created two versions (A and B) of the questionnaire for each of the four languages. Both versions have the same structure and order of test sentences and fillers. However, wherever a test sentence contains a distributive singular noun in questionnaire A, there is a distributive plural equivalent in questionnaire B, and vice versa, so the sentences are minimal pairs that vary only in the syntactic property in question (see the Likert-scale dataset, Rudnicka 2023).

We used Google Forms, compatible with the Prolific platform, to prepare the questionnaires. Each version had a concise introduction explaining the task and stating that participants should not evaluate the content or veracity of the sentences, and that '[t]his survey is not about grammatical rules straight out of a textbook, but about how we really use language on a daily basis'. After completing the survey, a 'Thank you' message appeared with a link that marked the submission as complete. Participants could only complete either version A or B of the questionnaire, not both.[22]

We collected 400 responses from 100 participants per language.[23] The participants were mainly from the younger age groups (aged between 18 and 45), with slight gender variation between languages. This variation is not expected to impact the sentence ratings.

3.2.2 Data cleaning

Since '[t]he initial data file will always contain mistakes' (Dörnyei 2022: 86), prior to conducting any analysis, we needed to clean up the data. Our study included 14 filler sentences, 6 of which were benchmarks used to

[22] Prolific has a function whereby we can exclude participants who already took part in one of our studies.

[23] The data is openly available online (Rudnicka 2023).

assess submission quality. Half of them had sounded unnatural (e.g., contained language mistakes) and were not expected to be fully acceptable.[24] In order to evaluate the submissions in a consistent way across the datasets, we developed the following data-cleaning strategy:

- The scores for the six benchmark sentences were copied to separate datasets for each language.
- During the first visual exploration, three participants who inverted the response scale were identified,[25] and the answers were modified to fit the correct and intended scale.
- For each language separately, the scores for the benchmark sentences were analyzed in R[26] to detect outliers (see further section 3.2.3).[27]
- Outliers towards the low (1 and 2) and high end (4 and 5) were considered meaningful. We did not consider the score of 3 (meaning 'hard to say'), which sometimes appears as an outlier, to be 'against expectations'.[28]
- We identified outliers and reviewed data to find answers that did not meet our expectations, such as well-formed sentences with low scores (e.g., 2) or ill-formed sentences with high scores (i.e., 4 or 5).
- Submissions with at least one outlier score and at least two benchmark sentences graded 'against expectations' were deemed unreliable and removed from our datasets. In total, we removed 2–5% of submissions.[29]

[24] An example of a non-acceptable sentence: *John have went to Italy*; an acceptable sentence: *Anne raised her hand.*

[25] There were two errors in the German dataset and one in Czech, despite clear instructions.

[26] R version 4.2.3, http://www.r-project.org.

[27] Six box plots (one per benchmark sentence) per language showed outliers.

[28] Surveys test acceptability, not grammaticality. 'Hard to say' is never 'against expectations'.

[29] Czech: two removed. English/German: three removed. Polish: five removed.

3.2.3 Results: intra-linguistic differences in acceptability

We are aware that, when evaluating the results obtained from Likert-scale questionnaires (ordinal data), the use of means and standard deviations is not recommended (Stevens 1951: 26; Bross 2019: 47). At the same time, the same experts suggest that using them might indeed be beneficial (Stevens 1951: 26; Bross 2019: 47). Also, parametric tests, like the t-test, require interval, normally-distributed data, but they may still yield meaningful results when used to analyse Likert-scale data (De Winter and Dodou 2010; Norman 2010; Bross 2019: 47). We conducted 60 t-tests to check for the presence of statistically significant intra-linguistic differences for each of the languages. Following the Neyman-Pearson tradition, we do not treat smaller p-values as more substantial evidence, so we did not provide the exact p-values for the noun pairs in question (but, naturally, for each statistically-significant result, the p-value is < 0.05). Tables 2–6 contain the means and medians for each noun-related category specified in 3.1.2. The statistically significant results are in bold. The English words in the left-most column are shorthand for the corresponding lexical items in all the languages and will be used throughout for convenience. To explain what these tables show, we can take the example of English *death* vs. *deaths* in Table 4: the mean for singular *death* is 3.7 and for plural *deaths* 4.4, yielding a statistically significant result in the sense that the plural form is significantly more frequently accepted by the informants. In the case of singular death (*der Tod*) vs. plural deaths (*die Tode*) in German, the informants equally accept both variants.

In English, for each of the seven nouns with a statistically significant result: *head(s)*, *voice(s)*, *ticket(s)*, *camera(s)*, *death(s)*, *house(s)*, and *church mouse/mice*, the plural form was the one with higher acceptability. In German, for four of the five nouns, namely *hand*, *headache*, *life*, and *house*, the preferred forms seem to be the singular ones (except for *voice(s)*, where the plural is preferred).

Czech and Polish show a tendency even more opposite to English; for both, the singular form is the one with higher acceptability ratings, wherever there is a statistically significant difference. In Czech, these are five such nouns, *hands*, *headache*, *camera*, *life*, and *head(s) in the sand*, whereas in Polish, only three nouns, *hand(s)*, *life*/*lives*, and *death(s)*, have a significant acceptability preference for the singular form.

Table 2: *Body-parts* noun category—Likert-scale results

Lang.	**English**		**German**		**Czech**		**Polish**	
variant	mean	median	mean	median	mean	median	mean	median
hand	4.3	5	**4.8**	5	**4.5**	5	**4.7**	5
hands	4.2	5	**4.5**	5	**3.9**	4	**4.4**	5
head	**3.6**	4	3.8	4	4.4	5	4.6	5
heads	**4.5**	5	3.9	4	4.6	5	4.5	5
headache	4.3	5	**4.9**	5	**4.8**	5	4.5	5
headaches	4.1	4	**4.3**	5	**3.1**	3	4.6	5
voice	**4.4**	5	**3.5**	3	4.6	5	4.5	5
voices	**4.8**	5	**4.3**	5	4.4	5	4.1	5

Table 3: *Objects to be handled* noun category—Likert-scale results

Lang.	**English**		**German**		**Czech**		**Polish**	
variant	mean	median	mean	median	mean	median	mean	median
ticket	**4.2**	4	4.8	5	4.6	5	4.5	5
tickets	**4.6**	5	4.6	5	4.6	5	4.6	5
camera	**3.9**	4	4.8	5	**4.7**	5	4.1	4
cameras	**4.7**	5	4.7	5	**4.5**	5	4.4	5

Table 4: *Abstract and metaphorical matters* noun category—Likert-scale results

Lang.	**English**		**German**		**Czech**		**Polish**	
variant	mean	median	mean	median	mean	median	mean	median
life	3.4	3.5	**4.8**	5	**4.3**	4.5	**4.5**	5
lives	3.3	3	**2.8**	3	**3.7**	4	**2.6**	2
death	**3.7**	4	4	4	3.7	4	**4.1**	5
deaths	**4.4**	5	3.7	4	3.8	4	**3.4**	4
marriage	3.9	4	4.1	4	3.6	4	3.7	4
marriages	3.9	4	3.9	4	3.7	4	3.5	4

Table 5: *Location / places* noun category—Likert-scale results

Lang.	**English**		**German**		**Czech**		**Polish**	
variant	mean	median	mean	median	mean	median	mean	median
house	**3.7**	4	**4.7**	5	4	4	4.4	5
houses	**4.2**	5	**4**	4	4.3	4	4.5	5
garden	4.4	5	4.1	4	4.3	4.5	4.1	4
gardens	4.4	5	3.8	4	4.3	5	4.2	4
chair	3.5	4	4	4	3.6	4	3.1	3
chairs	3.3	3	4	4	3.2	3	3.1	3

Table 6: *Similes and a semi-idiom* noun category—Likert-scale results

Lang.	**English**		**German**		**Czech**		**Polish**	
variant	mean	median	mean	median	mean	median	mean	median
fox	4.2	5	3.9	4	4	4	3.5	4
foxes	4.3	4	4.1	4	3.9	4	3.9	4
church mouse	**3**	3	4	4	4	4	3.8	4
church mice	**3.8**	4	4.2	4	4.1	4	3.7	4
head in the sand	3.8	4	4.3	4	**4.2**	4	4.3	5
heads in the sand	3.9	4	4.2	4.5	**3.9**	4	4.5	5

3.2.4 Results: cross-linguistic differences in acceptability

In the present part of the Likert-scale study, the point of interest is the potential differences between the acceptability scores attributed to the sentences in each language compared to English. Applying the same principles as before, we used an unpaired, two-sided t-test with an alpha value of 0.05 to compare the ratings of test sentences by native speakers of different languages. This time, a total of 90 t-tests were run in R.[30] As the mean values used for testing match the results in Tables 2–6, we will not repeat the tables, but instead describe the statistically significant results.

Let us start with the category of *body-parts-related* nouns. Here, the singular form of the noun *hand* has a significantly higher acceptability score in German and Polish than in English. The situation looks similar for the singular *head*, in Czech and Polish. Regarding the plural version *heads*, German participants' assessment of the sentence in question is significantly lower than the corresponding score for English.

In the category of *objects to be handled*, the singular *ticket* and *camera* have significantly higher scores in German and Czech than in English. For sentences featuring plural *cameras*, the sentence in English obtained significantly higher acceptance ratings than in Czech and Polish.

For abstract and metaphorical matters, the difference in acceptability score of the sentences containing *life* in singular form is significant, with

[30] We compared English with the other three languages and had two versions of the form, A and B, each with fifteen test sentences. Thus, we conducted 45 tests for version A and another 45 for version B.

German, Czech, and Polish all preferring the singular. In Polish, there is also a difference regarding the plural noun *lives*; the t-test detects a significantly lower acceptance than the acceptance of *lives* in English. Interestingly, the sentence containing the plural noun *deaths* has the highest acceptability in English and is significantly different from German, Czech, and Polish.

With *location and place* noun category, significant differences were detected only between English and German, with the sentence containing the singular form *house* rated much higher in German than in English, and with the sentence featuring the plural *gardens* rated significantly lower in German than in English.

In the *similes* category, the rating of the sentence with the singular form of *church mouse* is significantly higher in German, Czech, and Polish than in English. However, regarding the *sly as a fox/sly as foxes* simile, the situation is more balanced, with just one significant difference, which was between English and Polish (Polish participants rated the singular version lower than did English participants).

3.3 Part 2: Preference testing with forced-choice questionnaires

In our understanding of a forced-choice task, we followed Sprouse and Almeida (2017: 13–14) and asked our participants to select the more acceptable sentence out of a pair using a radio button. Undecided participants could choose both, as explained in the instructions. The fourteen test sentences are exactly the same as in the Likert-scale study (see section 3.1.2) and are not accompanied by any fillers.[31] We had 120 responses from 30 participants per language in this study. Demographically, the groups were similar to the Likert-scale study.

3.3.1 Results: forced-choice questionnaires

Most participants picked one of the variants; there are only a few 'undecided' responses. We present the percentages in Tables 7–11.

[31] One sentence (containing *headache(s)*) was removed from the forced-choice task due to the discrepancy between the German translation and the one used in the Likert-scale study.

Table 7: *Body-parts* noun category—forced-choice results

Language	**English**	**German**	**Czech**	**Polish**
variant	%	%	%	%
hand	**73%**	**100%**	**97%**	**70%**
hands	27%	0%	3%	30%
undecided	0%	0%	0%	0%
head	17%	37%	30%	27%
heads	**80%**	**60%**	**67%**	**70%**
undecided	3%	3%	3%	3%
voice	37%	33%	47%	50%
voices	**60%**	**63%**	**50%**	50%
undecided	3%	3%	3%	0%

Table 8: *Objects to be handled* noun category—forced-choice results

Language	**English**	**German**	**Czech**	**Polish**
variant	%	%	%	%
ticket	30%	17%	**67%**	**50%**
tickets	**70%**	**83%**	23%	43%
undecided	0%	0%	10%	7%
camera	27%	**77%**	**80%**	**63%**
cameras	**70%**	20%	20%	37%
undecided	3%	3%	0%	0%

Table 9: *Abstract and metaphorical matters* noun category—forced-choice results

Language	**English**	**German**	**Czech**	**Polish**
variant	%	%	%	%
life	37%	**90%**	**90%**	**100%**
lives	**63%**	7%	10%	0%
undecided	0%	3%	0%	0%
death	20%	**60%**	**67%**	**93%**
deaths	**80%**	37%	27%	3%
undecided	0%	3%	7%	3%
marriage	**57%**	**80%**	**70%**	**60%**
marriages	43%	17%	27%	33%
undecided	0%	3%	3%	7%

Table 10: *Locations/ places* noun category—forced-choice results

Language	**English**	**German**	**Czech**	**Polish**
variant	%	%	%	%
house	30%	**93%**	30%	**87%**
houses	**67%**	3%	**63%**	13%
undecided	3%	3%	7%	0%
garden	**60%**	**83%**	**53%**	**80%**
gardens	37%	17%	37%	17%
undecided	3%	0%	10%	3%
chair	23%	47%	**87%**	3%
chairs	**77%**	**53%**	13%	**97%**
undecided	0%	0%	0%	0%

Table 11: *Similes and a semi-idiom* noun category—forced-choice results

Language	**English**	**German**	**Czech**	**Polish**
variant	%	%	%	%
fox	**77%**	**60%**	**57%**	**53%**
foxes	23%	37%	40%	43%
undecided	0%	3%	3%	3%
church mouse	**53%**	**70%**	**57%**	**67%**
church mice	47%	30%	43%	33%
undecided	0%	0%	0%	0%
head in the sand	10%	37%	50%	30%
heads in the sand	**87%**	**57%**	50%	**70%**
undecided	3%	7%	0%	0%

To summarize, there are a few nouns for which the differences between languages are marked. One such example is the noun category of *abstract and metaphorical matters*; since for *life/lives*, and *death(s)*, only English prefers the distributive plural. In the case of *marriage(s)*, the distributive singular is preferred in every language. With regard to other noun categories, the preferences seem to be more varied.

4. Discussion: combining the corpus data and results of two kinds of acceptability ratings

The results from both kinds of acceptability studies correspond to each other as regards most of the nouns. However, sometimes there is a variation between the tests. It is worth emphasizing that the forced-choice results show general preferences in a more visible way than the Likert-scale scores. In general, the acceptability ratings seem to confirm tendencies seen in the corpus data and literature. Let us look at the individual languages investigated in turn:

4.1 English

Our results confirm the general preference of English for the distributive plural, as attested in corpus data from COCA and the OMC. However, they also show that the noun and underlying meaning play a role in the assessment and tolerance for variation. A striking example of this is the *abstract and metaphorical matters* noun category, where there is more tolerance for variation. This aligns with our hypothesis that in abstract/non-literal contexts the difference between the plural and singular form is of less importance and, to generalize, the two forms seem to exist in free variation (Rudnicka and Klégr 2023: 95).

Another interesting observation is that although the distributive plural is preferred over the distributive singular corpora consulted, the latter is rarely marked as unacceptable, as the differences in the Likert-scale ratings were surprisingly small. Even though, according to the results of the t-test, the difference between the ratings of *voice* (rated with 4.4) and *voices* (rated with 4.8) was significant, if we look at the results as ordinal data and remember that a score of four means 'quite natural/acceptable', then both forms seem to be quite acceptable. Similarly, in a few cases, the results obtained for certain nouns seem to depend more on the overall evaluation of a given sentence than on the number of the noun in question; see *head(s) in the sand* (3.8 vs. 3.9), *chair(s)* (3.5 vs. 3.3), or *garden(s)* (4.4 vs. 4.4).

4.2 German

The German language prefers the distributive singular in contexts such as *abstract and metaphorical matters, locations and places* (except *chair(s)*) and *similes and a semi-idiom* (except for *head(s) in the sand)*. In the *body-*

parts nouns category, the results vary, with *head(s)* and *voice(s)* preferring the presence of agreement (the distributive plural), which is not the case with *hand(s)* (the distributive singular). Similarly, we see a very mixed picture in the *objects to be handled* category. These observations confirm the claims made in Duden (see section 2.2). The forced-choice study visualizes the preferences in a more marked way than the corpus-based pilot study (Rudnicka 2024), which registered a great deal of variation (except for the noun *Leben, life*/*lives*).

Although English and German belong to the Germanic branch of Indo-European languages, when it comes to their preferences for the presence or absence of non-verbal plural number agreement, German seems closer to the two Slavonic languages investigated in the study, as it uses the distributive singular in very much the same way as they do. Interestingly, the contexts in which this is most visible is, again, sentences that one could see as having a non-literal undertone or as generalizing statements.

4.3 Polish

Polish behaves much like German regarding the preference for the distributive singular in *abstract and metaphorical matters*, according to the exploratory corpus searches referred to in section 2.3. In other categories, the picture is mixed, with a seemingly random distribution of preferences in the forced-choice questionnaires, while in the Likert-scale data there are only slight differences. Interestingly, Polish shows the lowest number of statistically significant intra-linguistic differences between the Likert-scale ratings. This could mean that, out of the four languages, Polish is the language in which the distributive plural or singular preferences are most fluid and seemingly arbitrary (except for nouns from the *abstract and metaphorical matters*). This could support Lyskawa's (2020: 3) statement that in Polish there is no object agreement[32] (see section 2.3).

4.4 Czech

According to our results, Czech is the language with the most distinct preference for the distributive singular. It is most evident, especially in the

[32] Naturally, not all test sentences in the study refer to object agreement, some concern, e.g., adverbials.

objects to be handled and *abstract and metaphorical matters* noun categories. When it comes to similes and a semi-idiom, the picture is mixed, with the two similes being preferred in the distributive singular (but only to a slight degree, which is not reflected in the Likert-scale data) and the *head(s) in the sand* idiom not attracting any particular preference. Also, *body-parts* and *locations and places* nouns are noun-dependent categories, i.e., there are clear differences between the nouns investigated. These findings are in keeping with data in the Czech corpus.

5. Conclusions

The results of the present study show that English, German, Czech and Polish indeed show differences when it comes to their preferences concerning the presence of absence of agreement between the plural antecedent and the congruent term in the predicate part of the sentence. These differences seem to be dependent on the noun category of the correlated term and the context (the meaning of the whole sentence). We may summarise the findings as follows:

Cross-linguistic differences in agreement preferences can be seen as a language-specific rhetoric strategy. In German, Polish, and Czech, it is common to use the distributive singular when discussing abstract topics or making generalizations. There is certainly some degree of free variation in such contexts; however, the default option in German, Polish, and Czech is the distributive singular, as opposed to the distributive plural predominantly used in English (which, however, also allows for variation in abstract and generalizing contexts). The difference in language use may be influenced by geographical and cultural proximity.

Despite specific preferences found in the forced-choice data, the presence or lack of non-verbal plural number agreement is not, according to our Likert-scale ratings, seen as a mistake that needs to be flagged or makes the sentence ill-formed for the speakers of English, German, Polish, or Czech (with the exception of the noun *life* in languages other than English).

On the methodological side, the forced-choice questionnaires and Likert-scale acceptability scores complement each other and provide different insights. Results from the forced-choice questionnaires reveal the language-specific preferences in a more marked way than the Likert-scale results; they also appear to match the results of the corpus-based studies to a greater extent. The combined use of the two methods provides both a

'big picture' take on the number of agreement preferences in a language and a detailed and diversified view of the intricacies governing the choices.

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