Definiteness, uniqueness, and maximality in languages with and without articles*

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12 August 2019
To appear in *Journal of Semantics*

Abstract

We present a number of experiments testing influential hypotheses about the meaning of definite descriptions (in languages with articles, represented here by German) and bare nominals (in articleless languages, represented here by Russian). Our results are in line with the commonly entertained hypothesis that definite descriptions convey uniqueness (if singular) or maximality (if plural), but fail to support two hypotheses about bare nominal interpretation, namely that singular bare nominals convey uniqueness (Dayal 2004) and that topical bare nominals convey uniqueness/maximality (Geist 2010, among many others). Uniqueness or maximality inferences are expected to arise via covert type-shifting under these approaches. Our results are compatible with what we take to be the null hypothesis, namely that bare nominals in articleless languages are existential and free of presuppositional semantics, even if they correspond—in their use—to definite descriptions (Heim 2011).

1 Introduction

The semantic notion that underlies definite descriptions is often assumed to be a linguistic universal, whether it corresponds to familiarity (Krámský 1972), identifiability (Lyons 1999), or uniqueness/maximality (Chierchia 1998; Dayal 2004; Geist 2010; Schwarz 2013; among many others). An implication of this assumption is that languages without definite articles (henceforth articleless languages) can convey the same meaning as definite descriptions do, albeit with different formal means. Consider the examples below. While English obligatorily distinguishes between definite and indefinite nominals (*the cat* vs. *a cat*), Russian can resort to a bare nominal (*košk*a), which is considered ambiguous and as such can correspond to a definite or indefinite. Various factors are believed to affect the correspondence, including syntactic position, case, grammatical number, word order, prosody, givenness, or topicality.

*The materials in this paper were presented, in various stages of development, at an SFB colloquium in Cologne, an SFB colloquium in Tübingen, a colloquium in Prague, in a guest lecture series in Stuttgart, at a workshop in Barcelona at the occasion of Veronika King's PhD defence, at the 4th Expert meeting of the Time in translation project in Utrecht, at the Colloquium Semantics and Pragmatics Exchange in Düsseldorf, in the ZAS Semantics Circle in Berlin, in a linguistic lecture series in Bochum, and in the Slavic colloquium in Berlin. We profited greatly from the feedback we got at these occasions. Thanks go to: Ana Aguilar-Guevara, Nadine Bade, Petr Biskup, Ellen Brandner, Jan Chromý, Jakub Dotlačil, Hana Filip, Berit Gehrke, Ljudmila Geist, Jana Häussler, Halima Husić, Daniel Hole, Katja Jasinskaja, Veronika King, Manfred Krifka, Bert Le Bruyn, Denisa Lenertová, Maria Martynova, Roland Meyer, Fereshteh Modaressi, Uli Sauerland, Natalia Slioussar, Petra Schumacher, Stephanie Solt, Henriëtte de Swart, Luka Szucsich, Barbara Tomaszewicz, and Martin Wągiel. Special thanks goes to Florian Schwarz, whose careful feedback was crucial for us. We also greatly profited from the feedback of a number of anonymous reviewers and the handling editor Roger Schwarzschild. All remaining errors are our own. Finally, we are grateful to the following people for helping us with the experimental practicalities: Darja Benert (Russian recordings and translation), Marta Wierzba (German recordings), Sandra Hoppe (Polish recordings for a pilot experiment), Maria Nagornaya (experiment administration in Moscow), and Fabienne Salfner (and via her the Priority Program Experimental Pragmatics, for experiment administration in Berlin).

(1) a. *English*
The / A cat slept.

b. *Russian*
Koška spala.
cat slept
(i) The cat slept.
(ii) A cat slept.

We have devised an experimental design, based on the Covered Box paradigm (due to Jesse Snedeker; see Romoli et al. 2011; Pearson et al. 2011; Huang et al. 2013), to test some of the prominent or commonly entertained hypotheses about the meaning of definite descriptions in languages with articles and bare nominals (henceforth bare NPs) in articleless languages. The overarching research question is whether bare nominals in articleless languages can convey the same meaning as definite descriptions do, albeit with different formal devices, which we will call DEFINITENESS CORRELATES. It has been standard to answer this question in the affirmative. The aim of our paper is to see whether this standard answer stands up to empirical scrutiny. We will see that it does not.

The definiteness correlates we investigate are grammatical number (building on Dayal's 2004 work) and topicality; in the latter case, we approach topicality via word order and prosody (building on Geist 2010). On the semantic side, we concentrate on UNIQUENESS (for singulars) and MAXIMALITY (for plurals)—concepts that are broadly agreed to underlie the morphological category of definiteness. We use German as a representative of a language with articles and Russian as a representative of an articleless language. The particular hypotheses we test are (i) that German definite descriptions (as opposed to indefinites) convey uniqueness/maximality, (ii) that Russian singular bare NPs convey uniqueness (as opposed to plural bare NPs, which do not necessarily convey maximality), (iii) that Russian preverbal (topical) bare NPs (as opposed to postverbal ones) convey uniqueness/maximality, (iv) that Russian unstressed (topical) bare NPs (as opposed to stressed ones) convey uniqueness/maximality. Finally, (v) we performed a crosslinguistic comparison, in order to see whether German definiteness conveys uniqueness/maximality more clearly than Russian definiteness correlates.

The experimental results confirm hypothesis (i), but fail to confirm hypotheses (ii)–(iv). This means that definite articles interact with uniqueness/maximality more strongly than definiteness correlates, which might as well not interact with uniqueness/maximality at all. The results are problematic for the standard view that the semantic notions of uniqueness and maximality are operative in articleless languages (in the form of covert type shifts) and that they can be activated by means of what we call here definiteness correlates. On the other hand, they are compatible with what could be considered the null hypothesis (recently briefly considered by Heim 2011), namely that the lack of definite articles translates to the lack of definiteness-related semantics.

Finally, even though hypothesis (i) was confirmed by our results, explorative comparisons with filler experiments demonstrate that the effect brought about by uniqueness/maximality violations is weaker than one might expect—significantly weaker than the effect caused by scalar implicature violations, for instance, and comparable to the effect caused by violations of pragmatic exhaustive inferences.[1]

The paper is organized as follows. In section 2 we provide the necessary background on the interpretation of definite descriptions and bare NPs. Section 3 introduces a number of approaches to the semantics of bare NPs—Heim's (2011) hypothesis that all bare NPs correspond to indefinites, Dayal's (2004) proposal that the correspondence between bare NPs and (in)definites depends on grammatical number, and finally Geist's (2010) formalization of the traditional view that topical bare NPs correspond to definite descriptions. Section 4 describes in detail the experimental design we used for testing the selected hypotheses. Section 5 discusses the individual (sub)experiments—one per each hypothesis. Section 6 discusses the filler experiments. The paper is concluded by a general discussion (section 7).

[1]The term "filler experiments" refers to small subexperiments that did not test the core hypotheses and contained items functioning as fillers/controls to the items in the main experiments. The structure of our experimental design will become evident in section 4.

2 Background

2.1 Definite descriptions

According to a broadly accepted theory (ever since Frege 1892 and Russell 1905), a singular definite description conveys that there is exactly one individual that satisfies the description. The majority view is that this implication a presupposition (Frege 1892; Strawson 1950; Elbourne 2013), understood as a definedness condition.[2] For instance, the meaning of *the cat* is defined if and only if there is exactly one cat; if defined, *the cat* denotes / refers to that cat (we use smallcaps for metalanguage). We follow standard notation and use the ι-formula $\iota x\,\textsc{cat}(x)$ (type e) to encode this presupposition and the determinate meaning.[3] The pertinent presupposition will be referred to as the UNIQUENESS PRESUPPOSITION, but sometimes also as the UNIQUENESS INFERENCE (where the nature of the inference is not at stake).

(2) a. The cat slept.
b. $\textsc{slept}(\iota x\ \textsc{cat}(x))$

This so called UNIQUENESS THEORY of singular definite descriptions is usually coupled with the MAXIMALITY THEORY of plural definite descriptions, according to which a plural definite description denotes / refers to the maximal plural entity that satisfies the description (Sharvy 1980; Link 1983). This meaning is captured by the σ-formula in (3-b).

(3) a. The cats slept.
b. $\textsc{slept}(\sigma x\ \textsc{cat}(x))$

Combining uniqueness and maximality in a unified theory is attractive because uniqueness is a special case of maximality: if there is exactly one entity that satisfies the description, it is also the maximal one.[4]

2.2 Bare noun phrases in articleless languages

It standard to assume that in Russian it is possible to express the above meanings by (4-a) and (4-b), respectively.[5] Some scholars would argue that the indicated interpretation is not just "available", but—due to the preverbal position of the subject—necessary; we will turn to this issue shortly.

(4) a. Koška spala.
cat slept
Available: 'The cat slept.'

[2]Various other hypotheses have been explored, including that uniqueness/maximality is asserted (Russell 1905; King 2001), conversationally implicated (Szabó 2000; Ludlow & Segal 2004), or conventionally implicated (Horn & Abbott 2012).

[3]We adopt Coppock & Beaver's (2015) terminological convention and distinguish between a DETERMINATE interpretation (denotation of type e expressions) and an INDETERMINATE interpretation (interpretation as an existential quantifier). We sometimes abbreviate "NP with (in)determinate interpretation" as "(in)determinate NP".

[4]Some recent approaches to definite descriptions take the uniqueness and/or maximality approach to definite descriptions as a starting point and argue for various refinements. For instance, Coppock & Beaver (2015) argue that singular definite descriptions presuppose "weak uniqueness" (cardinality equal to or smaller than 1) and, on top of that, are by default predicative rather than determinate (a position first argued for by Graff 2001); von Fintel et al. (2014) argue that maximality should be replaced by maximal informativeness; Schein (2019) argues that the part-of relation, considered essential for plural and mass definite descriptions, should be replaced by an overlap relation. These refinements pay off in some special circumstances but do not differ significantly from what we call here the standard account, as far as the canonical uses of definite descriptions are concerned.

[5]Russian potentially stands for a sizeable group of languages; 40% of the more than 600 investigated languages in Dryer 2013 have no definite articles. For recent theoretically informed discussion of some of them, see Dayal (2011); Schwarz (2013); Modarresi (2014); Jenks (2018); Cisneros (forthcoming); Collins (online first); and the references cited therein.

b. Koški spali.
cats slept
Available: 'The cats slept.'

These examples clearly demonstrate that definite descriptions in languages with articles correspond, at least in some cases, to bare NPs in articleless languages. But bare NPs can apparently also correspond to indefinites. Examples of that are provided in (5), where the indefinite paraphrase is adequate, although arguably not the only one available.

(5) a. Na kovrike ležala koška.
on mat lay cat
Available: 'There was a cat lying on the mat.'

b. Na kovrike ležali koški.
on mat lay cats
Available: 'There were cats lying on the mat.'

Table 1 provides an overview of the commonly entertained meanings of bare NPs in articleless languages. As is clear from this overview, some meanings assigned to bare NPs correspond to indefinite NPs, others to definite NPs.[6] It is commonly assumed that not all of these meanings are always equally available as denotations for bare NPs, despite them being interrelated via general type-shifting principles (postulated by Partee 1987 and Chierchia 1998, among others). Various restrictions on these meanings or the type-shifts that relate them have been proposed, giving rise to accounts that make different predictions—sometimes complementary, sometimes contradictory. We will now turn to selected accounts, whose predictions we tested experimentally.

SG	INDEF	1	**Property**	$\lambda x[\textsc{cat}(x)]$	(the property of being) a cat
		2	**Quantifer**	$\lambda Q \exists x[\textsc{cat}(x) \wedge Q(x)]$	(the set of properties that at least) some cat (has)
	DEF	3	**Entity**	$\iota x\ \textsc{cat}(x)$	the (single) cat
		4	**Kind**	$^{\cap}\textsc{cat}$	the species / taxonomical kind called "cat"
PL	INDEF	1	**Property**	$\lambda x[\textsc{cats}(x)]$	(the property of being) cats
		2	**Quantifer**	$\lambda Q \exists x[\textsc{cats}(x) \wedge Q(x)]$	(the set of properties that at least) some cats (have)
	DEF	3	**Entity**	$\sigma x\ \textsc{cat}(x)$	(all) the cats
		4	**Kind**	$^{\cap}\textsc{cats}$	the abstract representative of (all) the cats

Table 1: Bare NP meanings

3 Bare NP theories and factors affecting bare NP interpretation

3.1 Bare NPs are always indeterminate (Heim 2011)

Heim's (2011:1006) response to the observation that bare NPs in articleless languages can either correspond to definites or to indefinites is the following: bare NPs always denote existential quantifiers, but—due to the lack of definite articles in the grammatical system—can also be used in situations where a definite description would be appropriate in a language with articles.[7] In order to understand Heim's (2011) position, we need to say a little bit about how (the meanings of) indefinite and definite NPs relate to one another. The basic recognition is that a sentence with a definite NP asymmetrically entails (is logically stronger

[6] The table presents a standard, but simplified view. Definite descriptions are sometimes considered to be predicative (Graff 2001; Coppock & Beaver 2015) or quantificational (Russell 1905; Neale 1990; King 2001). Also, plural indefinites (= bare plurals) can have kind interpretations in languages like German or English (see, e.g., Chierchia 1998). What will be important to us is the presence of uniqueness/maximality inferences—something that is usually preserved independently of a particular analysis.

[7] See Borik (2016) (recently further developed by Borik & Seres 2018) for a related proposal and for empirical arguments from Russian.

than) a sentence with a corresponding indefinite: whenever (6-a) is true, (6-b) is true, too, but crucially not conversely.

(6) a. The cat slept on the couch.
b. A cat slept on the couch.

The reason why replacing a definite by an indefinite often leads to infelicity—as e.g. in (7)—is pragmatic: using a form with weak meaning (indefinite NP) implicates that the corresponding form with strong meaning (definite NP) is not supported in the common ground. Consequently, while (7-a) *presupposes* that there is exactly one seat (7-a-ii), (7-b) *implicates* that this presupposition is not true (7-b-ii), which, in combination with the assertion, leads to the strengthened implication that there are at least two seats (7-b-iii). We call this the ANTI-UNIQUENESS IMPLICATION of indefinite NPs.[8]

(7) The bicycle was fine after (Heim 2011:1005)

a. the seat was replaced.
(i) *Assertion:* $\textsc{replaced}(\iota x\, \textsc{seat}(x))$
(ii) *Presupposition:* $|\textsc{seat}| = 1$

b. #a seat was replaced.
(i) *Assertion:* $\exists x[\textsc{seat}(x) \wedge \textsc{replaced}(x)]$
(ii) *Implicature:* $|\textsc{seat}| \neq 1$
(iii) *Assertion+Implicature:* $|\textsc{seat}| > 1$

Crucially, the implicature is not always drawn: (6-b) does not imply that there were multiple cats. This supports the stance that the anti-uniqueness implication of indefinites is pragmatic in nature.[9]

Turning back to articleless languages, the idea is that, in the absence of a definite article in the grammar or a language, there is nothing that could generate the anti-uniqueness implication and the bare NP—by hypothesis a presupposition-free existential quantifier—remains felicitous in situations where uniqueness is satisfied in the common ground and where a definite description would have to be used in a language with articles.

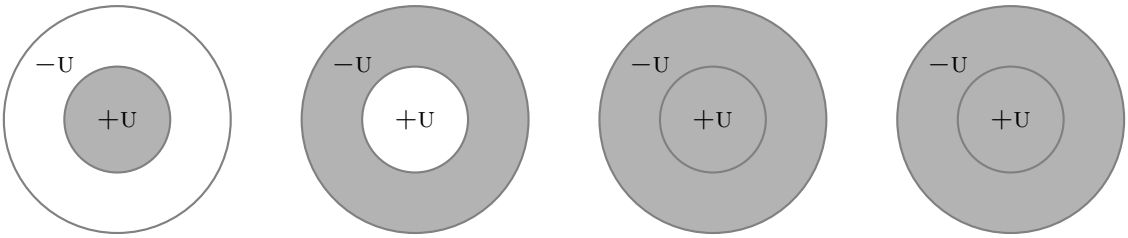
(8) 'The bicycle was fine,'
posle togo kak zamenili sedlo.
after that as replaced seat
'. . . after we replaced the seat.'
(i) *Assertion:* $\exists x[\textsc{seat}(x) \wedge \textsc{replaced}(x)]$
(ii) *No implicature generated due to the absence of the definite article!*

Figure 1 visualizes the pattern as predicted by Heim (1991, 2011): Definite NPs are only applicable in situations where uniqueness is satisfied (+U). Indefinite NPs are applicable in situations where uniqueness is not satisfied (−U)—if the implicature is drawn—or in both kinds of situations—if the implicature is not drawn. Finally, bare NPs in articleless languages behave like English indefinites with the difference that the pertinent implicature is never drawn because there is no definite article to trigger it.

Heim's (2011) idea that bare NPs are essentially broadly applicable indefinites leaves plenty of issues open (as we will see shortly, the empirical picture is complex), but it is useful for us as the null hypothesis, whereby a single form (bare NP) corresponds to a single meaning (existential quantifier) and where the lack of definite articles translates to the lack of uniqueness or maximality implications.

[8]This type of account goes back to Hawkins (1981), who, however assumed the Russellian (1905) semantics of definite descriptions. For reanalyses in terms of the Fregean (1892) analysis, see Heim (1991) and Sauerland (2008).

[9]The question why the anti-uniqueness implication arises in some cases (such as (7-b)) but not in others (such as (6-b)) has not been, to the best of our knowledge, systematically investigated. One possibility, briefly mentioned in 5.1, is that indefinites that introduce new discourse referents do not really compete with definites and hence do not trigger this implicature.



The cat slept *A cat slept* +I *A cat slept* −I *Koška spala*

Figure 1: Definite, Indefinite ±I(MPLICATURE), Bare

3.2 Bare NPs correspond to definites (if singular) (Dayal 2004)

Dayal (2004) follows Chierchia (1998) in assuming that nominals in Russian are "born" either as property-denoting or as kind-denoting (denotation 1 and 4 in Table 1, respectively). The former meaning is directly applicable to bare NPs in predicative positions (9) and the latter meaning is applicable to bare NPs such as those in (10).[10]

(9) a. Murka koška.
M. cat
'Murka is a cat.'
$\lambda x[\textsc{cat}(x)](\textsc{Murka}) = \textsc{cat}(\textsc{Murka})$

b. Vasilisa i Murka koški.
V. and M. cats
'Vasilisa and Murka are cats.'
$\lambda x[\textsc{cats}(x)](\textsc{Vasilisa} \oplus \textsc{Murka}) = \textsc{cats}(\textsc{Vasilisa} \oplus \textsc{Murka})$

(10) a. Koška byla priručena 9000 let nazad.
cat was domesticated 9000 years ago
'The cat was domesticated 9000 years ago.'
$\textsc{was domesticated 9000 years ago}(^{\cap}\textsc{cat})$

b. Koški rodstvenniki tigrov.
cats related tigers.GEN
'Cats are related to tigers.'
$\textsc{related to}(^{\cap}\textsc{tigers})(^{\cap}\textsc{cats})$

The use of bare NPs in argument positions of entity-selecting predicates, as in (11), requires more work in this approach. There are two hypothetical options: either the property CAT/CATS shifts to an entity (IOTA-shift), yielding $\iota x\ \textsc{cat}(x)$ (the single cat there is) and $\sigma x\ \textsc{cat}(x)$ (all the cats there are), respectively, or to an existential quantifier (EX-shift), yielding $\lambda Q \exists x[\textsc{cat/cats}(x) \wedge Q(x)]$. These two shifts lead to the meanings of definites (11-a) and indefinites (11-b), respectively.

(11) Na stupenkax {sidela koška / sideli koški}.
on stairs sat.SG cat sat.PL cats

a. '{The cat was / The cats were} sitting on the stairs.'
$\textsc{sitting on the stairs}(\iota/\sigma x\ \textsc{cat}(x))$ IOTA-shift

b. '{A cat was / Cats were} sitting on the stairs.'
$\exists x[\textsc{cat/cats}(x) \wedge \textsc{sitting on the stairs}(x)]$ EX-shift

Dayal (2004) argues, however, that this approach overgenerates: the range of truth-conditions derivable by the EX-shift is broader than attested. This is exemplified by (12) (from Dayal 2004:405), where the bare NP—*kot* 'cat' or *myš'* 'mouse' respectively—either receives (i) a

[10] An anonymous reviewer remarks that s/he "find[s] it very hard to get the kind-reading for a singular NP". Our consultant confirms that the plural is better than the singular, but does not consider the singular unacceptable.

determinate reading or (ii) a narrow scoping existential reading, but crucially not (iii) a wide scoping existential reading (a generalization corroborated by Geist 2010, see below; yet, see Borik 2016 for a conflicting view). If EX-shift were a general interpretive option, bare NPs should scope similarly as English indefinites do (see e.g. Abusch 1993).[11]

(12) a. Kot ne sidit na stule.
cat NEG sits on stool
(i) 'The cat is not sitting on the stool.'
(ii) 'There isn't any cat sitting on the stool.' $\neg > \exists$
(iii) *'A cat is not sitting on the stool.' $*\exists > \neg$

b. Mne kažetsja, čto v komnate myš'.
me seems that in room mouse
(i) 'The mouse seems to me to be in the room.'
(ii) 'It seems to me that there's a mouse in the room.' SEEM $> \exists$
(iii) *'A mouse seems to me to be in the room.' $*\exists >$ SEEM

Dayal's (2004) response to this situation is to ban the EX-shift altogether: bare NPs in articleless languages either refer to kinds (directly or by NOM-shift, turning properties to kinds) or to particulars (by IOTA-shift).[12] This solves the problem with wide-scope readings (iii), but creates a new one, namely how to account for narrow-scope readings (ii). This is where Dayal's (2004) story diverges for singulars and plurals and where our treatment of the singular number as a definiteness correlate steps in. Consider her example (13) (Dayal 2004:406):[13]

(13) a. #Sobaka byla vezde.
dog.SG was everywhere
'The dog/A particular dog (the same one) was everywhere.'
b. Sobaki byli vezde.
dogs.PL were everywhere
'There were dogs (different groups) everywhere.'

Dayal's (2004) interpretation of these facts (see also Dayal 2011) is the following. The universal quantification in *byla/i vezde* 'was/were everywhere' is an integral part of the predication and as such cannot be "underscoped" by genuine quantifiers. The reason why *sobaki* 'dogs' appears to take narrow scope is that the existence quantification stems from the very predicate—via the process of DERIVED KIND PREDICATION (DKP) (see Chierchia 1998 for a formal definition), introducing existential quantification over particular INSTANCES of a kind. DKP is applied in situations where a kind is fed into a predicate that expects a particular entity: it is incoherent to say that a *kind* is located in some particular position; see (14-a). In this case, DKP salvages the computation by introducing existential quantification over the instances of the kind denoted by *sobaki* 'dogs', see (14-b) ($^{\cup\cap}$DOGS is the function that characterizes the set of instances of $^{\cap}$DOGS).

(14) a. $\forall x[\text{PLACE}(x) \rightarrow \text{IN}(x)(^{\cap}\text{DOGS})]$ **sort clash**
b. $\forall x[\text{PLACE}(x) \rightarrow \exists y[^{\cup\cap}\text{DOGS}(y) \wedge \text{IN}(x)(y)]]$ **resolution by DKP**

Let us now turn to singulars. Dayal (2004, 2011) proposes that while singular bare NPs can denote kinds (cf. (10-a)), they do not allow access to kind instances.[14] For this reason,

[11]Some authors have taken issue with Dayal's (2004) empirical generalizations about Russian. See, e.g., Bronnikov (2006) or Borik (2016).

[12]This stipulation is dubbed the REVISED MEANING PRESERVATION (Dayal 2004:419, revising Chierchia's 1998 proposal) and it states that NOM-shift and IOTA-shift are preferred over EX-shift, which is thought of as more complex because it introduces quantification. Since the two preferential shifts cover the whole range of possible sorts (kinds and particulars), the EX-shift simply never applies.

[13]Dayal's (2004) translation of (13-a) apparently contradicts her conclusion that bare NPs—if (apparently) they correspond to indefinites—cannot be specific. We believe that the translation 'a particular dog' (as an alternative to 'the dog') reflects Dayal's temporary agnosticism concerning the interpretation of the bare NP; the translation compatible with her final proposal is 'the dog' only (modulo the issue of familiarity; see below).

[14]Dayal (2004) formulates this as a singleton requirement on the instantiation set. Dayal (2011:1100), perhaps

the DKP is inapplicable to singulars and—after the exclusion of the EX-shift—the IOTA-shift (from properties; see (15-b)) remains the only option to turn a bare singular into an individual-denoting expression, see (15-c). That, however, derives the absurd reading that a single entity was in multiple places at the same time—a reading that is indeed attested.

(15) a. $\forall x[\textsc{place}(x) \rightarrow \textsc{in}(x)(^{\cap}\textsc{dog})]$ **sort clash**

b. $\forall x[\textsc{place}(x) \rightarrow \textsc{in}(x)(\textsc{dog})]$ **type clash**

c. $\forall x[\textsc{place}(x) \rightarrow \textsc{in}(x)(\iota y\ \textsc{dog}(y))]$ **resolution by IOTA-shift**

In sum, bare plurals can receive narrow-scoping existential readings via DKP, but bare singulars cannot—they refer to particular entities and thus correspond to definite descriptions. This still leaves us with the question of how apparently narrow-scoping existential bare singulars, cf. (12-a-ii) and (12-b-ii), are to be derived. Dayal (2004) offers the following tentative answer: Apparently narrow-scoping existential bare singulars are determinate, after all, only with two provisos: (i) determinate bare NPs, as opposed to definite descriptions, do not presuppose that their referent is familiar (Dayal 2004:408–409); (ii) the uniqueness presupposition—introduced by the IOTA-shift—might not be able to project across operators such as negation (which could in turn be related to the lack of familiarity; see Dayal 2004: p. 405, fn. 10). The bottom line important for our purposes is that bare singulars are expected to presuppose uniqueness (unless under operators), but bare plurals are not expected to presuppose maximality; their determinate interpretation can be side-stepped by DKP.

3.3 Bare NPs are ambiguous (if not topics) (Geist 2010)

Compared to Dayal (2004), Geist (2010) assumes a more permissive system, one where the EX-shift is available, alongside the IOTA-shift.[15] In other words, there is no absolute prohibition on the indeterminate (= existential) interpretation on bare NPs. Yet, Geist (2010) acknowledges that the distribution and interpretation of indeterminate bare NP is more restricted than one would expect under this hypothesis. Firstly, Geist (2010) confirms the observation that bare NPs—if indeterminate—cannot receive wide scope and/or specific interpretations; see (12).[16] The main reason for this is that Russian has morphological devices (so called "specificity markers"; see Ionin 2012) that are used to convey specific readings. An example of this is an unstressed version of the numeral *odin* 'one' (Geist 2010:211):[17]

(16) a. Džon xočet ženit'sja na fracuženke.
John wants marry.INF on French.woman
'John wants to marry a French woman (not a particular one).'

b. Džon xočet ženit'sja na odnoj fracuženke.
John wants marry.INF on one French.woman
'John wants to marry a French woman (a particular one).'

In addition, Geist is concerned with the observation that preverbal bare NPs—in contrast to postverbal ones—cannot correspond to indefinites (Geist 2010:200).

(17) a. Kniga ležit na tom stole.
book.NOM lies on that table

(i) 'The book is lying on that table.'
(ii) Unavailable: 'A book is lying on that table.'

more intuitively, compares this to the difference between *the players* (≈ bare plural) and *the team* (≈ bare singular) in sentences like *The players / *The team live(s) in different cities* (see Barker 1992). We tentatively adopt the latter conceptualization of the issue.

[15] A comparable system is devised by Chierchia (1998).

[16] Geist (2010:210) also notices that this restriction is not absolute and can be lifted by (post)modifying the NP; she acknowledges Birkenmaier (1979) for this observation. See also Borik (2016), who gives examples of unmodified specific bare NPs.

[17] As kindly pointed out by an anonymous reviewer, the bare NP in (16-a) also affords the determinate reading.

b. Na tom stole ležit kniga.
on that table lies book.NOM
(i) 'The book is lying on that table.'
(ii) 'A book is lying on that table.'

This effect of word order on the interpretation of bare NPs has been a well-known puzzle for at least half a century and has been discussed by many authors and for many articleless languages (Russian: Chvany 1973; King 1995; Brun 2001; Titov 2017; Czech: Krámský 1972; Hlavsa 1975; Kučerová 2007; Biskup 2011; Šimík & Burianová to appear; Polish: Szwedek 1974, 2011; Chinese: Li & Thompson 1976; Matthews & Yip 1994; Jenks 2018; Tagalog: Collins online first; among many others).[18] Geist (2010) captures the interaction as a "restriction on indefiniteness" (rather than a requirement to be interpreted as a definite) and derives it from a number of premises, listed in (18). Some of these are independently motivated and argued for, others less so (particularly (18-c)). The conclusion that one can draw from the premises is in (19): Even though bare NPs can be indeterminate in general, they must be non-specific, which in turn is incompatible with the requirement that topics are specific.

(18) a. Bare NPs can be indeterminate (via EX-shift) or determinate (via IOTA-shift).
b. Indeterminate bare NPs must be non-specific (modulo modification; see fn. 16)
c. Preverbal bare NPs are (usually) topics.
d. Topics must be specific (in the sense of being determinate; Reinhart 1981).

(19) Preverbal bare NPs (if topical) must not be indeterminate.

Not all preverbal bare NPs are topical. Geist (2010) notices some cases where this is not so. The case relevant for us involves so called thetic statements, understood by Geist (2010) as statements with no topic–comment division (Sasse 1987). In a thetic statement, typically involving an intransitive predicate, a bare NP argument is free to stand pre- or postverbally. In both positions, it is the prosodically most prominent element of the sentence—it carries so called SENTENCE STRESS (marked by smallcaps)—and can be interpreted indeterminately, see (20) (from Geist 2010:204).

(20) a. METEORIT upal.
meteorite came.down
'A meteorite came down.'

b. Upal METEORIT.
came.down meteorite
'A meteorite came down.'

In sum, Geist (2010) proposes that Russian bare NPs can be indeterminate or determinate. If indeterminate, a bare NP is necessarily non-specific and as such cannot be the topic of a sentence. Topicality is correlated with word order and prosody—topics are preverbal (or possibly clause-initial) and do not carry sentence stress.[19]

3.4 Summary

We presented three types of accounts of the interpretation of bare NPs in articleless languages, paying special attention to Russian. Heim's (2011) idea is that bare NPs in articleless languages are always indeterminate, but due to the lack anti-uniqueness implicatures, nothing prevents them from being used in situations where a definite description would be appropriate. In contrast, Dayal (2004, 2011) proposed that bare NPs are never genuinely existential. Bare singulars are always determinate and presuppose uniqueness (unless embedded under negation or other operators). Any "indefiniteness intuition" reported by speakers

[18] It is largely an open question which factor exactly is responsible for the interaction: it could be related to information structure (within that to topichood or givenness), syntax (within that to a dedicated topic- or subject-position, or possibly to clause partitioning, cf. Diesing 1992 or Kučerová 2007), or some other principle (Titov 2017). See Šimík & Burianová (to appear) for an overview and corpus-based evidence favoring clause-initiality (as opposed to preverbal position or subjecthood) as the source of bare NP definiteness.

[19] Geist (2010) devotes a whole section to indeterminate topics (see Endriss 2009 for in-depth discussion), showing that indeterminate topics are possible, but they must be either modified by the specificity marker *odin* 'one' or at least involve another (post)modifier; see also footnote 16.

		Heim (2011)	Dayal (2004)	Geist (2010)
SG	PREVERBAL UNSTRESSED	✗	✓	✓
	POSTVERBAL STRESSED	✗	✓	✗
	PREVERBAL STRESSED	✗	✓	✗
PL	PREVERBAL UNSTRESSED	✗	✗	✓
	POSTVERBAL STRESSED	✗	✗	✗
	PREVERBAL STRESSED	✗	✗	✗

Table 2: Bare NPs

✓ = uniqueness/maximality predicted, ✗ = uniqueness/maximality not predicted

			Standard account
DEF	SG	UNSTRESSED	✓
		STRESSED	✓
	PL	UNSTRESSED	✓
		STRESSED	✓
INDEF	SG	UNSTRESSED	✗
		STRESSED	✗
	PL	UNSTRESSED	✗
		STRESSED	✗

Table 3: Definites vs. indefinites

✓ = uniqueness/maximality predicted, ✗ = uniqueness/maximality not predicted

or reflected in translations is due to the fact that bare NPs do not presuppose the familiarity of their referent. Bare plurals can receive quasi-existential narrow-scoping readings via derived kind predication (Chierchia 1998), which boils down to existential quantification over the instances of the kind denoted by the bare plural. Finally, we discussed the proposal of Geist (2010), which brings into discussion the traditional generalization that preverbal (clause-initial) bare NPs cannot correspond to indefinites. We showed that Geist (2010) derives this generalization by relying on two main premises: that preverbal bare NPs are topics (unless stressed, as in thetic statements) and that topics must be specific. Since indeterminate bare NPs are always non-specific, they are ruled out from the preverbal position / topical function.

For clarity, and in anticipation of our experiments, we represent the predictions in Table 2, where the individual rows correspond to the properties of the grammatical subject in our target utterances and, at the same time, to the individual experimental conditions. The prediction profile is as follows: Heim (2011) does not predict any uniqueness/maximality implications in bare NPs (null hypothesis); Dayal (2004) predicts uniqueness in singulars, but not maximality in plurals (tested by experiment NUM); Geist (2010) predicts uniqueness/maximality in preverbal unstressed bare NPs, but not in stressed (pre- or postverbal) bare NPs (tested by experiments WO and PROS).[20] Note that even though the prediction profile is different for each theory (and our experimental results can therefore non-trivially support Dayal's theory without supporting Geist's theory, and vice versa), the individual predictions are not necessarily *in conflict* with one another. It might well be the case that both predictions get borne out by the results if, for instance, uniqueness/maximality interacts both with grammatical number and with word order and/or prosody. That, in turn, would suggest that the eventual theory of definiteness correlates must be multifactorial.

[20]There is no theory that distinguishes between the conditions POSTVERBAL STRESSED and PREVERBAL STRESSED. Including both conditions allows us to make explorative inferences about the potentially different contribution of the word order vs. prosodic factor.

For completeness, Table 3 captures the prediction of the standard uniqueness/maximality-based account of definite descriptions (experiment DEF). The prediction is rather trivial and only concerns the definiteness factor, but it is not ruled out that grammatical number or prosody affect the uniqueness/maximality implications in various ways.[21] Moreover, the inclusion of these factors achieves a better parallelism between the Russian and the German experimental design.

4 Overall experimental design

We devised an experiment where definiteness (correlates) and uniqueness/maximality are treated as independent variables (linguistically and visually presented, respectively), expected to interact in their effect on the dependent variable—the choice of visual vs. covered picture. More particularly, we tested (i) the interaction between definiteness and uniqueness/maximality in German and (ii) the interaction between definiteness correlates (grammatical number, word order, and prosody) and uniqueness/maximality in Russian. The existence of the latter interaction, esp. if it is comparably strong as the former interaction, would lend support to the commonly entertained hypothesis that bare NPs in articleles languages can convey the same meaning as definite descriptions in languages with articles, provided certain conditions are met (i.e., if definiteness correlates are "activated"). We concentrate on uniqueness and maximality as the most agreed-upon semantic notions behind definite descriptions and corresponding bare NPs, singular and plural respectively. The core experiments are supplemented by a number of filler experiments, testing other kinds of presuppositions and implicatures. The fillers give us some confidence that the overall design worked well and at the same time provide grounds for various explorative comparisons, which could in turn feed further hypothesis formulation and experimentation.[22]

4.1 Overall experimental setup and participant task

Experiment batches and number of items The whole experimental setup has two languages mutations—German and Russian. The overall design for these two languages is the same, although some factors could only be manipulated in a single language, namely definiteness in German and position in the clause in Russian; these two factors correspond to one another on the hypothesis that word order is a definiteness correlate (Geist 2010). The items were constructed for German first and subsequently translated to Russian.

The overall experimental setup consists of 7 experiment batches and a few additional fillers, totaling at 72 items, distributed as indicated in Table 4. The main batch (MAIN) tested the interaction between uniqueness/maximality and definiteness (in German) and definiteness correlates (in Russian). EXH tested how pragmatic exhaustification depends on various factors such as word order, number, and definiteness; SCAL tested the scalar implicature of 'some' (as compared to 'all'); BOTH tested the cardinality inferences of 'both' as opposed to 'two'; FOC tested the exhaustification brought about by "free" (non-associated) focus; ONLY tested the exhaustivity assertion brought about by focus associated with 'only'; finally, ALSO tested the additive presupposition of 'also'.

The individual batches functioned as fillers for each other. This means that the items from the MAIN batch were accompanied by twice as many (48) filler items. The role of the fillers was (i) to distract the participants' attention from the manipulations in MAIN, (ii) to balance the overall proportion between the two values of the output variable (selection of visible vs. covered picture; see below), and (iii) to provide additional data from which one can draw post-hoc comparisons with the core experimental results.

[21] It is well-known, for instance, that in some contexts, maximality in plural definite descriptions can be easily violated; see Malamud (2012) or Križ (2016) for discussion.

[22] The experiment (the MAIN batch) was preregistered in January 2018 at the *Open Science Framework;* see https://osf.io/t7crf. All experimental materials, software, results, and analyses are avilable at https://osf.io/b6dsh/?view_only=a0629414701243b080dbb0ec45b24069. The experiment was preceded by a pilot on German, Czech and, with a modified design, on Polish (all in Summer 2017). The core results of these pilot experiments are consistent with the German and Russian ones reported here, lending independent empirical support to the present conclusions.

	Experiment batch	Number of items	ID numbers
1	MAIN	24	1–24
2	EXH	16	25–40
3	SCAL	8	41–48
4	BOTH	6	49–54
5	FOC	6	55–60
6	ONLY	4	61–64
7	ALSO	4	65–68
8	REST	4	69–72
	total	72	

Table 4: Overview of experiment batches

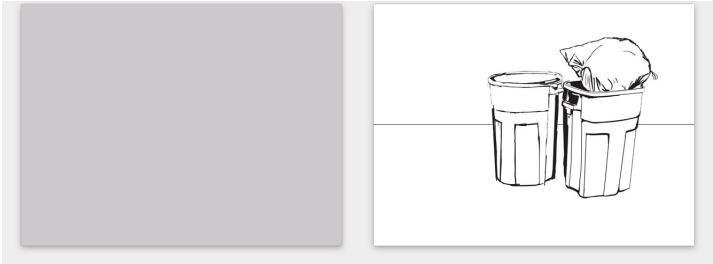
The overall number of items in the design (72) corresponds to the number of items that every participant saw (24 from MAIN plus 48 from the other batches). The conditions (see Tables 6 and 7 for conditions involved in MAIN) were distributed across lists using Latin Square design and the order of presentation of individual batches and conditions within them were pseudo-randomized in such a way that (i) two items from MAIN were interrupted by at least one item from another batch and (ii) the same condition (from any batch) was never presented twice in a row (even if interrupted by an item from another batch; e.g., the order $c_5^{\text{MAIN}} > c_3^{\text{EXH}} > c_5^{\text{MAIN}}$, where c_n is a specific condition, never came up). Every participant saw every item exactly once, i.e., no item was presented in two different conditions to one and the same participant.

Procedure and task The experiment is based on the so called covered box paradigm (Huang et al. 2013), which has been used in two ways: (i) to detect *less preferred* or only *latently present* interpretations and (ii) to detect *less salient* aspects of meaning such as presuppositions. An example of the former approach is Zehr et al. (2017), who tested the availability of local presupposition accommodation of *again,* which is clearly dispreferred to the default global accommodation. An example of the latter approach is Zehr et al. (2016), who tested for the presence of various presuppositions projected across negation by comparing true but presupposition-violating conditions with a plainly true condition. Our use of the paradigm lines up with the latter approach. In all our experimental items, the visible picture is a truthful depiction of what the target sentence *asserts,* but, in the critical conditions, the picture is in contradiction with what the target *presupposes* (by hypothesis). By presenting the picture in combination with an additional covered picture and by instructing the participants to be wary of slight mismatches, we hoped to encourage them to concentrate not just on the target's assertion, but on its less salient meaning components. More particularly, we expected a higher proportion of covered picture choices in cases where the visible picture contradicted the target's presupposition as compared to those where the presupposition matched the visible depiction.

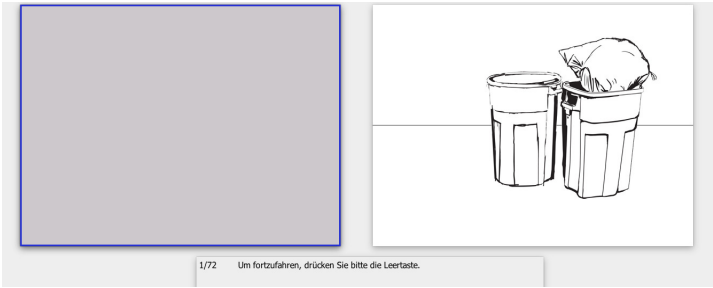
In the present use of the paradigm,

1. the participant is presented with two "covered" pictures—one on the left, the other on the right side of a computer screen (the participant is instructed that these pictures are turned face down and hence are not visible).
2. While these pictures are covered, the participant listens (over headphones) to the audio stimulus—a short narrative uttered by a single speaker, which consists of two to three sentences, whereby the initial sentence(s) provide(s) a context in which the last (target) sentence is supposed to be interpreted (below: 'We threw away a lot of things during the cleaning up of our cellar. **The other/second trashbin is now full, too.**' – an item from ALSO, item ID 67, target sentence boldfaced).

3. After the audio stimulus, one of the pictures turns, as if randomly, face up and the participant is asked to judge whether the visible picture is the correct depiction of the last sentence; the participant has been instructed that exactly one of the two pictures is the correct depiction, the other one being an imperfect match.[23]



4. The participant proceeds by pressing the left or right arrow, depending on which picture she believes to be the correct one—the visible one or the one that remained covered (below: participant pressed left arrow). The chosen picture is framed so as to confirm the choice. If the covered one is chosen, it does *not* get disclosed.



5. The participant is asked to proceed by pressing spacebar. After it is pressed, the whole procedure is repeated, starting with point 1.

The task was explained prior to the experiment using two examples: one in which the visible picture was "correct" (selection of visible) and another one where it was "incorrect" (selection of covered). The main dependent variable was PICTURE CHOICE (covered vs. visible). The left- vs. right-sided picture disclosure was pseudorandomized, varied within items/conditions/subjects, and was balanced in frequency for each single participant. Another variable we measured was REACTION TIME but we did not include it in the predictions of our hypotheses. The judgment was not speeded. The pace was individual and the whole experiment took between 15 and 30 minutes.

Software, participants, and administration The experimental software was developed by Christoph Demian, using Java. The experiments were carried out in university-based computer pools in Berlin (German) and in Moscow (Russian), mostly in January 2018, some remaining participants took part (in their homes) between February and July 2018. Each participant received a compensation of 5EUR (Berlin) or 300RUB (Moscow). The participants were native speakers of the respective languages and were mostly university students (of a variety of study programs). We did not control for age or gender, as these were not

[23]The pictures were made by Christoph Demian.

	Factor	Levels	Manipulation	Comments
1	LANGUAGE	German Russian	within items / between subjects	
2	WORD ORDER	S PRED PRED S	within items / within subjects	only within Russian
3	DEFINITENESS	definite indefinite	within items / within subjects	only within German
4	PROSODY	final stress initial stress	within items / within subjects	no crossing with WORD ORDER
5	NUMBER	singular plural	within items / within subjects	
6	PICTURE	+unique/maximal −unique/maximal	within items / within subjects	

Table 5: MAIN: Fixed factors and their levels

expected to play any role. Data from 48 participants per language entered the analysis. Participants were controlled for response quality: we only included those who performed in the expected way in at least 6 out of 8 selected (filler) items (= 75% success threshold).[24] For Russian, only 2 participants did not pass; for German, 3 did not pass. The excluded participants were replaced by new ones, so as to arrive at the total of 48 participants per language and thereby to achieve the same number of data-points for each individual condition per experiment batch per language.

4.2 Design of MAIN

The MAIN experiment batch consisted of 24 items, which were manipulated in various ways, so as to test for the interaction between uniqueness/maximality and definiteness (German) or definiteness correlates (Russian). This batch provides data substrate for five different subexperiments, each cutting the dataset in a slightly different way and thereby addressing a different hypothesis. The hypotheses correspond to the predictions summarized in section 3.4: (i) definite descriptions convey uniqueness/maximality (in German); (ii) grammatical number of bare NPs affects the implications of uniqueness vs. maximality (in Russian), (iii) word order in utterances with bare NPs affects uniqueness/maximality implications (in Russian), (iv) prosody in utterances with bare NPs affects uniqueness/maximality implications (in Russian). Finally, (v) we intended to compare the strength of the expected interactions in languages with and without articles.

4.2.1 Manipulated factors and their levels

Table 5 provides the complete overview of the manipulated factors (typeset in smallcaps) and their levels (typeset in sans serif). The WORD ORDER factor, or the combined WORD ORDER × PROSODY factor (manipulated in Russian), stands in a correspondence relation to the DEFINITENESS factor (manipulated in German) on one of the hypotheses (Geist 2010). For German, there are a total of 16 unique conditions (2^4); for Russian, due to the fact that WORD ORDER and PROSODY do not cross (condition PRED S & initial stress is not used because of its infelicity in the kind of context used in the design), there are 12 unique conditions (3×2^2). Since there were 24 items of MAIN, a Russian participant saw each unique condition two times ($24 = 2 \times 12$). The situation was more complex for German, where a participant saw each unique condition at least once and half of the conditions twice ($24 = 16 + 8$). Consequently, two German participants were needed in order to arrive at the same number of datapoints for each unique condition (2 participants yielded 3 datapoints

[24]The items used for this selection were all 4 items from ONLY and 4 items (in selected conditions) from SCAL. These items/conditions were selected because they represent very clear contradictions (→ selection of covered) or very clear verifications (→ selection of visible).

per condition). In total, we collected 96 datapoints per condition in Russian and 72 datapoints per condition for German. Finally, we would like to point out that not every factor (and hence not all conditions) entered the analysis in each of the subexperiments, as will become evident in section 5. Each individual subexperiment involved a 2×2 design, with one factor being constant across subexperiments—PICTURE—and the other differing with the subexperiment—DEFINITENESS (experiment DEF), NUMBER (experiment NUM), WORD ORDER (experiment WO), and PROSODY (experiment PROS).[25]

4.2.2 Sample token set and the core properties of MAIN items

One of the 24 MAIN items (item ID 9) in all the conditions resulting from manipulating linguistic factors is shown in Table 6 for German and Table 7 for Russian. Glossed examples in one of the conditions are provided in (21). The context is the same for all conditions and is constructed in such a way that it raises no expectations about the cardinality of the referents of the subject NP in the target sentence. In our example item, for instance, the context provides no cue as to whether there is one or more carriages or in fact whether there are any at all. This is important because the expected uniqueness/maximality inference must arise from the form of the target NP in German (definite vs. indefinite) or from the form of the whole sentence in Russian (e.g. S PRED vs. PRED S). This also means that uniqueness or maximality—if they are present—are always accommodated, as there is no indication in the prior context that they are satisfied. A related aspect of the design is that all parts of the target sentence are "new" (in the technical sense of the word, i.e., "non-given"; for discussions of givenness, see Schwarzschild 1999; Wagner 2012; Rochemont 2016; a.o.) and that the whole target sentence represents the focus (assuming standard notions of information structure; see Krifka 2008).[26] The reason for this is twofold. First, we wanted to avoid any potential interactions between definiteness and givenness or focusing (backgrounding). Second, it was a crucial part of the design that the target sentence in some of the conditions (namely 1, 3, 4, and 6 in Russian) was thetic (lacking the topic–comment division) and thetic sentences happen to be all new and broad focus.[27,28]

(21) a. Die Lokomotive musste anhalten. Der Waggon hat sich abgekoppelt.
the locomotive had.to stop.INF the carriage has REFL disconnected
b. Lokomotiv dolžen byl ostanovit'sja. Otcepilsja vagon.
locomotive necessary was stop.INF.REFL disconnected.REFL carriage.NOM
'The locomotive had to stop. The/A carriage got disconnected.'

[25] From this perspective, there were fewer unique conditions per subexperiment ($4 = 2 \times 2$) and a correspondingly larger number of datapoints per condition, particularly 288 ($= (24/4) * 48$) for DEF and NUM and 192 ($= (16/4) * 48$) for WO, PROS. The lower number for WO and PROS is caused by the exclusion of the PROSODY factor in WO (only the level final stress entered the analysis) and the factor WORD ORDER in PROS (only the level S PRED entered the analysis).

[26] An anonymous reviewer suggests that the target NP ('carriage') is in fact "given" due to its part-whole bridging relation to the NP introduced in the context ('locomotive'). What is important for our purposes is that bridging only gives rise to givenness (as defined e.g. in Schwarzschild 1999) if it goes from a part to its whole, but not conversely (Allerton 1978). In our items, the bridging went from the whole to its (not necessarily unique) part.

[27] An anonymous reviewer remarks: "The whole link between definiteness and position/lack of stress really seems to me to be about information structure and not definiteness as such. Yet everything in the experiments was new information." We agree that word order and prosodic manipulations inuitively correlate with information structure more than with "definiteness" (and these correlations have been successfully captured experimentally; see e.g. Šimík & Wierzba 2017). But this is precisely the reason why prominent information structure manipulations, esp. the manipulation of focus and givenness, must be avoided: focus/givenness would most likely override any uniqueness/maximality implications (as the reviewer him/herself remarks). See also Titov (2017) for relevant discussion.

[28] An anonymous reviewer notes that s/he finds the target sentence in condition 2 in Russian "rather infelicitous in the context provided [...] because *vagon* was never previously mentioned." But the reduced acceptability of the S PRED & final stress condition holds independently of the PICTURE factor, i.e., "even when this sentence is presented with the picture where [...] uniqueness is satisfied", so it is unlikely that it would affect the expected interaction. Concerning the reported intuition, we could replicate it with some speakers but not others. What is also worth mentioning is that we ran a pilot experiment on Polish, similar to the present one, but with the dependent measure being acceptability, and there, the pertinent condition did not come out as less acceptable.

Context: Die Lokomotive musste anhalten.

	Target	Definiteness	Pros. prom.	Number
1	Der Waggon hat sich ABGEKOPPELT.	def	final stress	sg
2	Ein Waggon hat sich ABGEKOPPELT.	indef	final stress	sg
3	Der WAGGON hat sich abgekoppelt.	def	initial stress	sg
4	Ein WAGGON hat sich abgekoppelt.	indef	initial stress	sg
5	Die Waggons haben sich ABGEKOPPELT.	def	final stress	pl
6	Waggons haben sich ABGEKOPPELT.	indef	final stress	pl
7	Die WAGGONS haben sich abgekoppelt.	def	initial stress	pl
8	WAGGONS haben sich abgekoppelt.	indef	initial stress	pl

Table 6: A German item (ID 9) in all its unique linguistic conditions

Context: Lokomotiv dolžen byl ostanovit'sja.

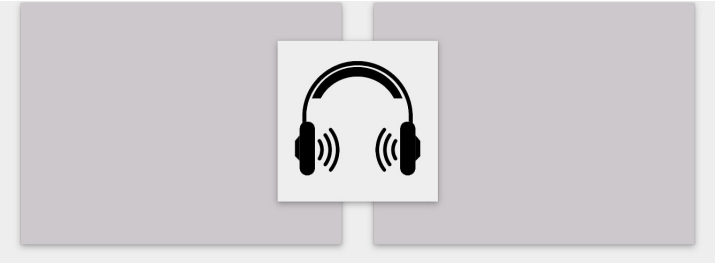
	Target	Word order	Pros. prom.	Number
1	Otcepilsja VAGON.	PRED S	final stress	sg
2	Vagon OTCEPILSJA.	S PRED	final stress	sg
3	VAGON otcepilsja.	S PRED	initial stress	sg
4	Otcepilis' VAGONY.	PRED S	final stress	pl
5	Vagony OTCEPILIS'.	S PRED	final stress	pl
6	VAGONY otcepilis'.	S PRED	initial stress	pl

Table 7: A Russian item (ID 9) in all its unique linguistic conditions

Each of the conditions is further combined with one of two possible pictures (two levels of the PICTURE factor): either +unique/maximal or −unique/maximal. In the former picture, all the depicted potential referents of the subject satisfy the predicate (all carriages in the picture are disconnected; in sg, this happens to be a single carriage); in the latter picture, not all the depicted potential referents of the subjects satisfy the predicate (not all carriages in the picture are disconnected); see Figure 2.

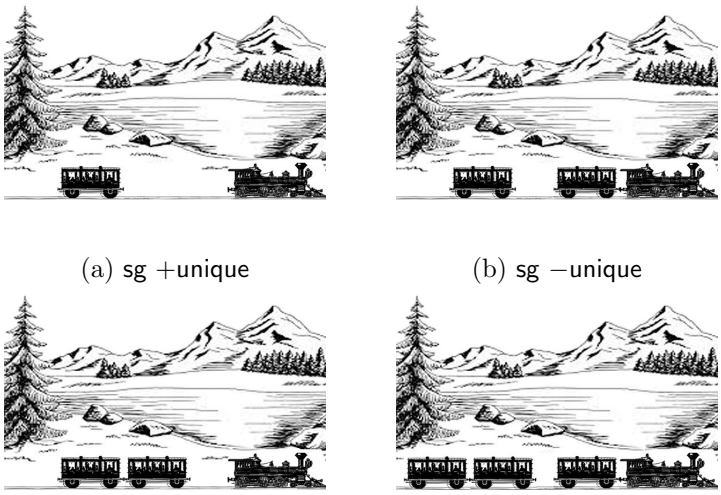
Let us now go through a step-by-step example of how the experimental item was presented during the experiment (in a particular condition) and how the participant might have reacted and why (see also the general procedure above).

1. The participant is presented with two "covered" pictures and at the same time listens to the stimulus in (22), corresponding to condition definite & final stress & plural:



(22) Die Lokomotive musste anhalten. Die Waggons haben sich ABGEKOPPELT.
the locomotive had.to stop.INF the carriages have REFL disconnected
'The locomotive had to stop. The carriages got disconnected.'

2. After the stimulus is presented, one of the pictures gets disclosed, as depicted below.



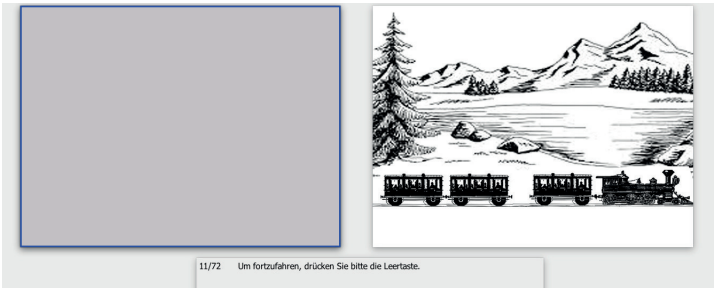
(a) sg +unique (b) sg −unique

(c) pl +maximal (d) pl −maximal

Figure 2: An item (ID 9) in both PICTURE conditions (relative to NUMBER)

In this picture, there are three carriages, two of which got disconnected and one remained connected, corresponding to condition −maximal (= it does not hold that *all* the carriages satisfy the predicate).[29]

3. At this point, it is up to the participant to decide which of the two pictures she believes to contain the correct depiction of the target sentence (*Die Waggons haben sich abgekoppelt.*) Our hypothetical participant decides that the visible picture is not appropriate and selects the covered picture by pressing the left arrow. The selected picture gets framed, in confirmation of the participant's choice, but does not get disclosed. (The participant now proceeds to the next item by pressing spacebar.)



We expect the picture choice to be influenced by the interaction between a linguistic factor (here: DEFINITENESS) and the visual factor (PICTURE). In the case at hand, the choice of

[29]In this particular case, the predication is collective, which makes item 9 stand out. All the other 23 items involved distributive predication (pigs running away, light bulbs bursting, etc.). We did not intend to manipulate collectivity/distributivity and only realized the special status of item 9 post-hoc. Given the highly homogeneous nature of the items (23 out of 24 were distributive), we decided to keep the data-points from item 9 in the dataset. Any effect of collectivity would be negligible anyway.

the covered picture is assumed to be motivated by the dissatisfaction with having a definite description (*die Waggons*) refer to a non-maximal referent (two out of three carriages).

5 MAIN experiments

The MAIN experiment batch was designed to test the interaction between uniqueness/maximality and various linguistic factors and to compare the strength of that interaction in a language with and a language without articles. The MAIN experiment batch provides data for five related experiments. Each of these experiments concentrates on a different linguistic factor by either ignoring or excluding the manipulation of other factors. For instance, if we are interested in testing the interaction between PICTURE and DEFINITENESS, we can disregard PROSODY by aggregating over the two conditions within the prosodic manipulation (final vs. initial stress). Or, if we are interested in testing the interaction between PICTURE and PROSODY, without the interference of WORD ORDER, we only consider the prosodic manipulation (final vs. initial stress) within the relevant WORD ORDER level (namely S PRED), excluding the irrelevant level (PRED S) from the dataset.

5.1 DEF: Definiteness and uniqueness/maximality

The DEF experiment tests the following hypothesis:

> Definite descriptions in German (a language with articles) convey uniqueness (singular) or maximality (plural).

Note that the hypothesis concerns uniqueness/maximality, but not their (not-)at-issue nature, which motivates the neutral term "convey". Indeed, even though we subscribe to the presuppositional analysis of definite descriptions, our experiment is not designed to distinguish it from other types of accounts.

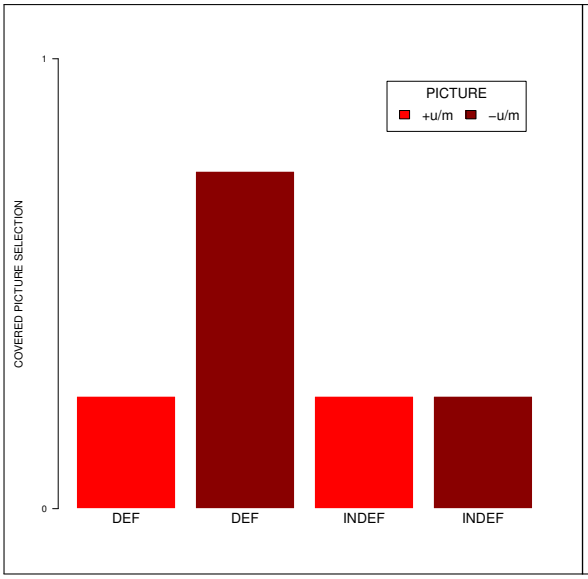


Figure 3: DEF prediction

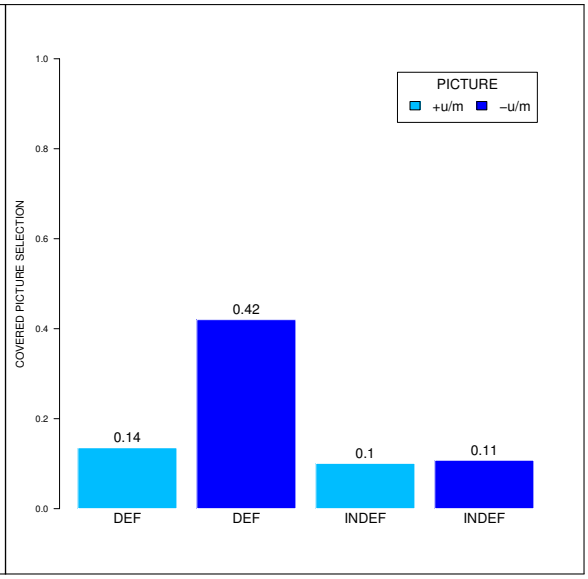


Figure 4: DEF result

Prediction and result

If definite descriptions convey uniqueness (if singular) or maximality (if plural), we expect to see an interaction between the factors DEFINITENESS and PICTURE. More particularly, we expect a higher proportion of covered picture choice in condition definite & −unique/maximal, as compared to condition definite & +unique/maximal; no such contrast is expected for condition indefinite. Less formally, participants should prefer the covered picture if they are

exposed to a definite description followed by a picture that contradicts the uniqueness or maximality which the definite description—by hypothesis—conveys. No such preference is expected for indefinites.[30] This prediction is represented in Figure 3 and the corresponding result in Figure 4. The colored columns indicate the proportion of covered picture selection.[31] What is relevant in the prediction is the *difference* between definite & +unique/maximal and the other conditions, *not* the absolute proportion. The result confirms the expected pattern: the definite & −unique/maximal condition is singled out among the others in that the covered picture was selected significantly more often. More technically, we see a significant interaction between PICTURE and DEFINITENESS ($z = 4.858$, $p < .0001$).[32] Thus, our hypothesis is supported by the results:

> Definite descriptions in German convey uniqueness/maximality.

It is good to point out that the data the result is based on involve aggregation over different levels of factors not directly relevant to the present subexperiment, esp. over both singulars and plurals and over stressed and unstressed subjects. Figures 5 and 6 demonstrate that the crucial interaction is found in all the relevant data subsets, which means that definite description convey uniqueness/maximality irrespective of grammatical number and irrespective of the prosodic pattern.[33]

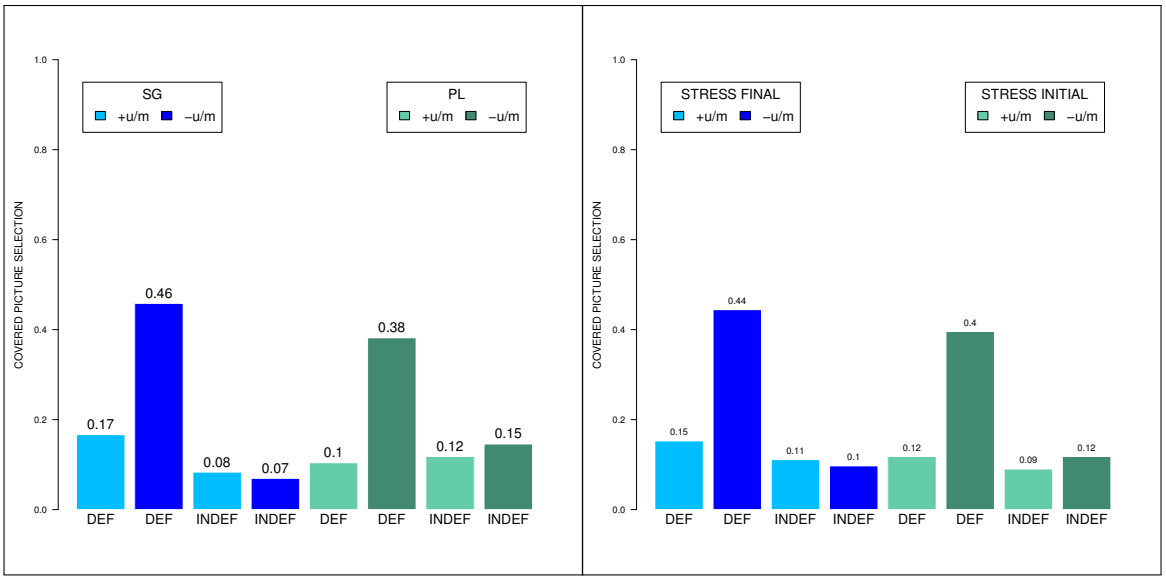


Figure 5: DEF result divided by NUMBER

Figure 6: DEF result divided by PROSODY

Discussion

The result of DEF is in line with the common hypothesis that definite descriptions convey uniqueness or maximality and it is robust across the different levels of NUMBER (sg vs. pl) and PROSODY (final vs. initial stress). What seems and later proves to be striking—anticipating the results of filler experiments (section 6) and the general discussion (section 7)—is that the

[30] In fact, if the anti-uniqueness implication is activated (see section 3.1), one would expect an effect of PICTURE within the indefinite condition: the covered picture should be selected more in the +unique/maximal condition than in the −unique/maximal condition. No such effect is observed in the results.

[31] Predictions are visualized in red and results in blue or green. The prediction plot illustrates the expected pattern (interaction), absolute values are not part of the prediction.

[32] All statistical analyses were performed using the Generalized linear mixed model by maximum likelihood (Laplace Approximation), using the binomial setting and random intercepts for subjects and items (unless explicitly stated otherwise). We used the lme4 package (Bates et al. 2015) of R (R Core Team 2017).

[33] We provide no statistics for post-hoc comparisons, relying only on the visual patterns, which are, however, quite telling.

interaction between definiteness and uniqueness/maximality is relatively weak: in the majority of the critical cases (58%), participants showed satisfaction with definite descriptions used in situations where uniqueness or maximality were violated. One could hypothesize that the weakness of the interaction is caused by the not-at-issue nature of the uniqueness/maximality inference conveyed by definite descriptions. We will come back to this point in the general discussion.

The result further clearly indicates that indefinite NPs in our design do not trigger the anti-uniqueness implicature (Heim 1991, 2011; Sauerland 2008). More particularly, the participants showed no dissatisfaction with encountering an indefinite NP followed by a picture in which uniqueness/maximality is satisfied. We hypothesize that this is because the indefinite functions as an introducer of a referent in the +unique/maximal condition and therefore does not give rise to the anti-uniqueness implication. In other words, the indefinite fulfills Heim's (1982) novelty function (remember that the target referents are always discourse-new in our design), thereby overriding any uniqueness/maximality inferences. Related experimental evidence with a similar conclusion was recently offered by Bade & Schwarz (2018).[34]

5.2 NUM: Grammatical number and uniqueness/maximality

The NUM experiment tests the following hypothesis:

> Singular bare NPs in Russian (an articleless language) convey uniqueness, as opposed to plural bare NPs, which do not necessarily convey maximality (Dayal 2004, 2011).

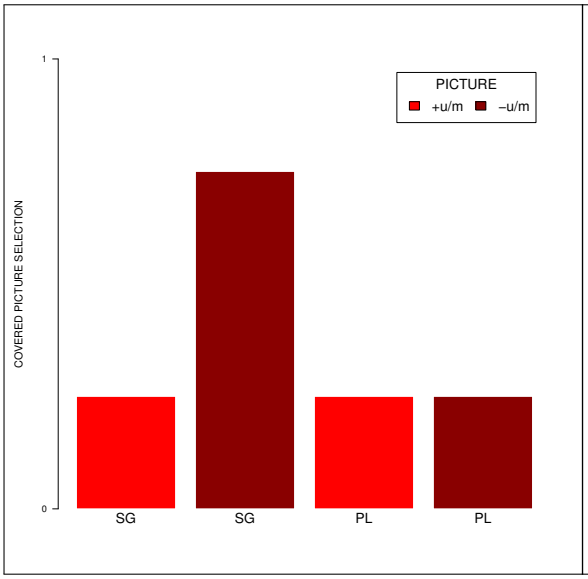


Figure 7: NUM prediction

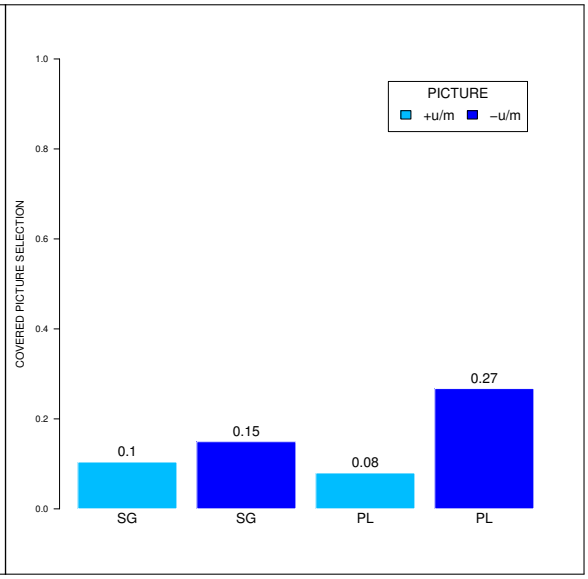


Figure 8: NUM result

If singular bare NPs convey uniqueness, but plural bare NPs do not necessarily convey maximality, we expect to see an interaction between the factors NUMBER and PICTURE. More particularly, we expect a higher proportion of covered picture selection in condition singular & −unique/maximal, as compared to condition singular & +unique/maximal; no such contrast is expected for condition plural. Less formally, participants should prefer the covered picture if they are exposed to a singular bare NP followed by a picture that contradicts the uniqueness which the bare NP conveys (by hypothesis). No such preference is expected for plural bare NPs. This prediction is represented in Figure 7 and the corresponding result in Figure 8. As above, the colored columns indicate the proportion of covered picture selection. The

[34] An anonymous reviewer objects that "[i]f the indefinite is preempted by the definite article, then an anti-uniqueness inference is predicted to arise, regardless of whether the indefinite introduces a novel referent." This statement is certainly true, the problem is that its protasis is apparently not verified in the case at hand—the indefinite is just as felicitous as the definite and hence is clearly not "preempted by the definite".

result does not confirm the prediction. Even though we find the expected kind of interaction (between NUMBER and PICTURE; $z = -3.374$, $p < .001$), it goes in the unexpected direction: it is the plural condition that yields more covered picture selection in the −maximal condition (as opposed to the +maximal condition); the singular & −unique condition does not differ from the +unique baseline. In other words, plural bare NPs exhibit a very slight tendency toward a maximalizing interpretation, but singular bare NPs exhibit no tendency toward expressing uniqueness. In sum:

> We found no evidence for the hypothesis that singular bare NPs in Russian convey uniqueness. Unexpectedly, we found that plural bare NPs convey maximality, albeit very weakly so.

For the moment, it remains unclear if the observed effect of plurals on maximality is to be attributed to some other factor, such as WORD ORDER or PROSODY, because as before, we aggregated over the different levels of these factors. It could be, for instance, that plural bare NPs only trigger maximality if the NP is topical. We will turn to this issue shortly.

Discussion

Dayal's (2004) hypothesis that singular bare NPs in articleless languages presuppose uniqueness clearly does not receive support from the present results. We should point out that even though Dayal admits that in some cases uniqueness might be absent, this is not to be expected in the case of our experiment: all of our items involve episodic statements and the target bare NPs are never embedded under negation or some intensional operator, which could, according to Dayal, lead to a suspension of the uniqueness presupposition. Our experimental result is thus in line with Heim's (2011) null hypothesis that bare NPs are simply indeterminate. The effect of plurarity on maximality will be discussed in the general discussion (section 7).

5.3 WO: Word order and uniqueness/maximality

The WO experiment tests the the following hypothesis:

> Preverbal (≈ topical) bare NPs in Russian convey uniqueness/maximality, as opposed to postverbal (≈ non-topical) bare NPs (Geist 2010, among others).

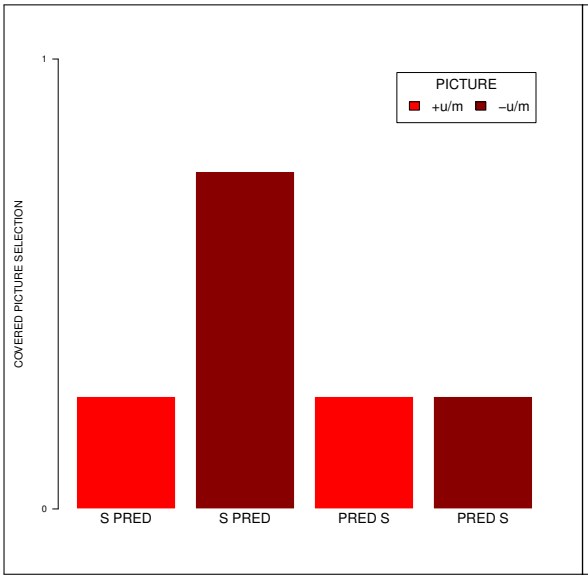


Figure 9: WO prediction

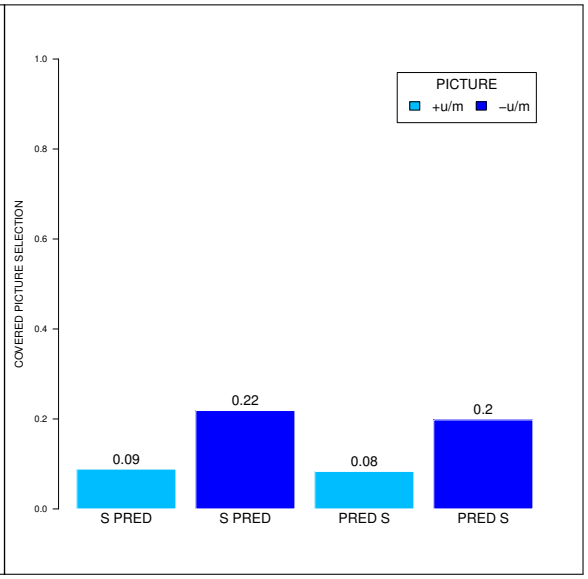


Figure 10: WO result

For the purpose of this subexperiment, we included only a proper subset of the data gained from MAIN, in particular conditions S PRED & final stress and PRED S & final stress. Data from condition S PRED & initial stress did not enter the analysis. In other words, the factor under investigation was WORD ORDER (S PRED vs. PRED S); prosodic prominence remained constant (sentence final = default). If topicality (expressed by word order) conveys uniqueness/maximality, we expect an interaction between the factors WORD ORDER and PICTURE. More particularly, we expect a higher proportion of covered picture selection in condition S PRED & −unique/maximal, as compared to condition S PRED & +unique/maximal; no such contrast is expected for condition PRED S. Less formally, participants should prefer the covered picture if they are exposed to a sentence with a preverbal bare NP followed by a picture that contradicts the uniqueness/maximality brought about by the preverbal position (by hypothesis). No such preference is expected for sentences with postverbal bare NPs because these are hypothesized to be underspecified for (in)determinacy. The prediction is represented in Figure 9 and the corresponding result in Figure 10. The result does not confirm the prediction: there is no significant interaction between WORD ORDER and PICTURE ($z = -.302$, $p = .76$).

> We found no evidence for the hypothesis that preverbal bare NPs in Russian convey uniqueness or maximality.

While the expected interaction is not confirmed, we find a main effect of PICTURE ($z = -3.443$, $p < .001$). In other words, participants exhibited a very slight tendency towards interpreting bare NPs as one would interpret definites (independently of the manipulation of WORD ORDER). A post-hoc analysis, whose results are shown in Figure 11, shows that this effect is to be attributed to plural bare NPs only (i.e., there is an interaction between NUMBER and PICTURE within both S PRED and PRED S), in line with the results of NUM.

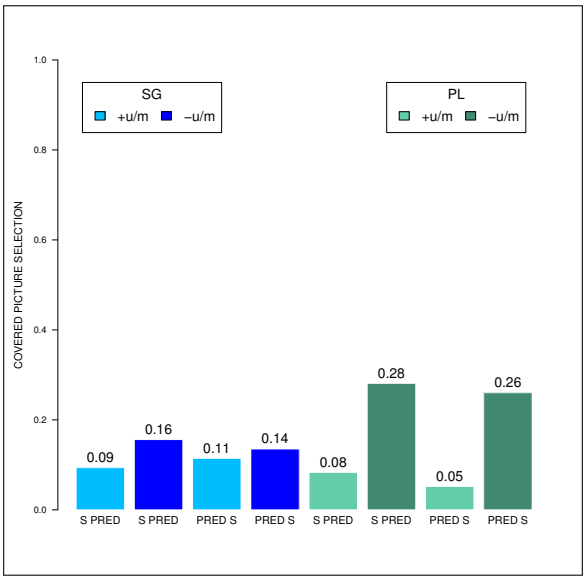


Figure 11: WO result divided by NUMBER

Discussion

The result fails to confirm the expected effect of word order on uniqueness/maximality of bare NPs. There are multiple ways of interpreting this result. The most radical one is that the intuition expressed by so many authors in the past (see section 3.3) is a mere illusion: there simply is no correspondence between word order manipulations in articleless languages and (in)definiteness in languages with articles. We find this conclusion unlikely, not just because we trust other linguists' (and, in fact, our own) native intuitions, but also because the existence of this correspondence recently received support in a corpus study on Czech

(Šimík & Burianová to appear).[35] We can think of a number of reasons why we failed to find the expected interaction.

First, it is possible that the word order manipulation failed to be interpreted by the participants as a manipulation of topicality—the hypothesized factor behind the expected definiteness effect. This could, for instance, be the case if theticity is much more context-dependent than sentence-form-dependent. In our design, the target sentence was all new (it contained no given element) and even though topics can be new (a fact recognized ever since Reinhart 1981), there is a possibility that new topics are less likely to be perceived as topics *per se*. Needless to say, this state of affairs would go counter the common assumption, as well as Geist's (2010) assumption, that preverbal unaccented bare NPs are topical, independently of context.

Second, it is possible that the pertinent word order manipulation do correspond to definiteness manipulations, but uniqueness/maximality remain unaffected by it. This, of course, goes counter to Geist's (2010) but also Dayal's (2004) assumption about how bare NPs are construed. These authors, among many others, assume that uniqueness/maximality *are* involved in the derivation of determinate bare NPs. Setting these approaches aside, there are, of course, quite a few alternative notions that have been proposed to capture the meaning of definiteness, including familiarity (used in both functional and formal tradition and understood in various ways, see e.g. Christophersen 1939; Heim 1982; Roberts 2003), identifiability (e.g. Givón 1984; Lyons 1999), non-ambiguity (e.g. Löbner 1985), or salience (e.g. von Heusinger 1997). These notions, at least in some approaches, can do without uniqueness/maximality: a bare NP can refer to a familiar/identifiable/salient/etc. individual (and thus be interpreted as determinate) without presupposing its uniqueness or maximality. Considering this on the background of our experiment, it seems coherent to assume that after the picture is disclosed, the participant can identify the referent that satisfies the predicate, irrespective of whether uniqueness/maximality is satisfied or not. A different experimental design would be needed to test whether any of the above-mentioned alternative notions is suitable to characterize determinately used bare NPs in articleless languages or, for that matter, definite descriptions in languages with articles. Notice that while we were able to detect uniqueness/maximality as a component of the meaning of German definite descriptions, it is possible that it is not the *only* component.[36]

Third, it is possible that the hypothesized interaction exists, but our experimental design was not sensitive enough to capture it. This is not completely implausible, given that the corresponding interaction found in DEF was present, but relatively weak. As we will see in section 6, however, the design was powerful enough to even capture various conversational implicatures. If uniqueness/maximality is a presupposition, which is considered more salient than an implicature, the hypothesized interaction should be visible.

5.4 PROS: Prosody and uniqueness/maximality

The PROS experiment tests the following hypothesis:

> Unstressed preverbal (≈ topical) bare NPs in Russian convey uniqueness/maximality, as opposed to stressed preverbal (≈ non-topical) bare NPs (Geist 2010, among others).

For the purpose of this experiment, we included data from conditions S PRED & initial stress and S PRED & final stress. Data from condition PRED S were not included. In other words, the factor under investigation was PROSODY (initial stress vs. final stress), word order remained constant—the subject was always preverbal. If topicality (expressed by the placement of prosodic prominence) conveys uniqueness/maximality, we expect an interaction between the factors PROSODY and PICTURE. More particularly, we expect a higher

[35] Notice also that we do not expect there to be a relevant difference between Russian and Czech. As already pointed out in footnote 22, a pilot experiment on Czech—with a very similar design to the present one—yielded analogous results.

[36] We are aware of one experimental study that compares uniqueness and salience in their capacity to stand for definiteness, namely Bosch et al. (2011). These authors conclude that "[s]alience is only a poor substitute for uniqueness".

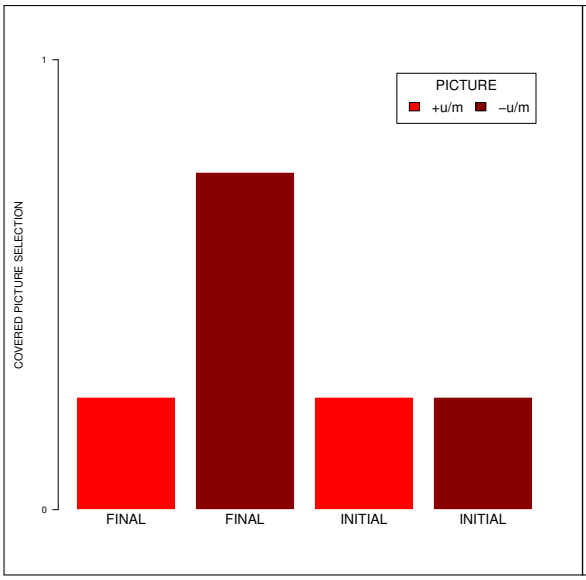


Figure 12: PROS prediction

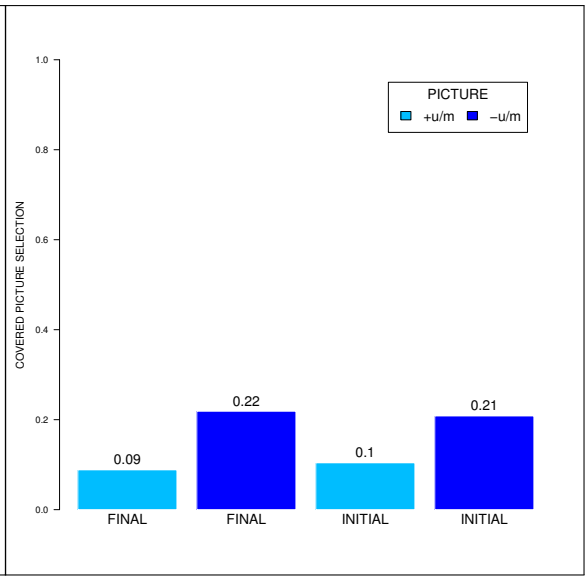


Figure 13: PROS result

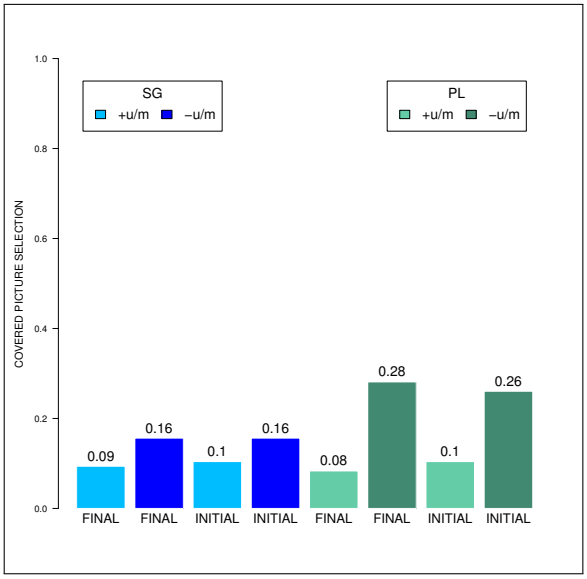


Figure 14: PROS result divided by NUMBER

proportion of covered picture selection in condition final stress & −unique/maximal, as compared to condition final stress & +unique/maximal; no such contrast is expected for condition initial stress. That is, participants should prefer the covered picture if they are exposed to sentence with an unstressed (topical) bare NP followed by a picture that contradicts the uniqueness/maximality brought about by the lack of stress (by hypothesis). No such preference is expected for sentences with stressed bare NPs because such sentences are hypothesized to be thetic, the bare NP in them non-topical, and hence without any impact on uniqueness/maximality inferences. The prediction is represented in Figure 12 and the corresponding result in Figure 13. The result does not confirm the prediction: there is no significant interaction between PROSODY and PICTURE ($z = .131$, $p = .9$).

> We found no evidence for the hypothesis that unstressed preverbal bare NPs in Russian convey uniqueness or maximality.

As in WO, also here we find a main effect of PICTURE ($z = 5.696$, $p < .0001$)—a very slight but general tendency to interpret bare NPs similarly as one would interpret definites

(independently of the manipulation of PROSODY). And also in this case, we see that the effect is to be attributed to plural bare NPs; see Figure 14.

Discussion

The result of this experiment reinforces the result of the WO experiment: we find no evidence for the hypothesis that uniqueness/maximality depend on topicality, whether manipulated by word order (WO) or by prosody (PROS). At the same time, the same interpretational caveats apply. It remains an open question (i) whether we succeeded at manipulating topicality (rather than just prosody), (ii) whether uniqueness/maximality are involved in determinate interpreations of bare NPs, and (iii) whether the experimental design is sensitive enough to capture the intended interaction. For more discussion, we refer the reader to the discussion of the WO results.

5.5 ART: Presence/Absence of articles and uniqueness/maximality

The ART experiment seeks to answer the following question:

> Do definite articles in German interact with uniqueness and/or maximality more strongly than definite correlates in Russian do?

Technically speaking, we expect a three-way interaction between the type of definiteness-marking strategy (articles in German vs. definiteness correlates in Russian), the presence or absence of the relevant marker, and uniqueness/maximality. If German articles encode uniqueness/maximality better than Russian definiteness correlates, we expect a more pronounced increase in covered picture selection in the critical condition (def & +u/m), as compared to the control conditions, than in the relevant corresponding critical conditions in Russian (depending on the definiteness correlate: sg & +u/m, S PRED & +u/m, and final stres & +u/m). In order to perform the statistical tests, we re-coded the data so as to bring the individual definiteness correlate factors in Russian on a par with DEFINITENESS in German, resulting in the following correspondences: (i) NUMBER: sg $\approx$ def, (ii) WORD ORDER: S PRED $\approx$ def, and (iii) PROSODY: s PRED $\approx$ def. The comparisons are visualized in Figures 15, 16, and 17, respectively. For all three tests, the expected interaction came out as significant: (i) $z = 5.353, p < .0001$, (ii) $z = 3.064, p < .003$, (iii) $z = 2.725, p < .007$.[37] We can conclude:

> Definiteness in German interacts with uniqueness/maximality more strongly than any of the definiteness correlates in Russian.

Discussion

The result is not surprising in the light of the previous experiments, where we found an interaction between definiteness and uniqueness/maximality, but not between definiteness correlates and uniqueness/maximality, except in the NUM experiment, where, however, the interaction went in the unexpected direction. Interestingly, upon performing a post-hoc test, based on a re-coding of the NUMBER-related data, such that pl $\approx$ def, we find no significant interaction between the strategy, presence of the marker (here: def and pl), and uniqueness/maximality ($z = 1.336, p = .18$). This means that, as far as our experiment is concerned, definiteness in German behaves on a par with plurality in Russian. More theoretical and empirical work must be done in order to understand this puzzling post-hoc result.

[37] As before, the tests were performed using random intercepts for subjects and items, the exception being test (i), which only used random intercepts for items, due to non-convergence of the more complex model.

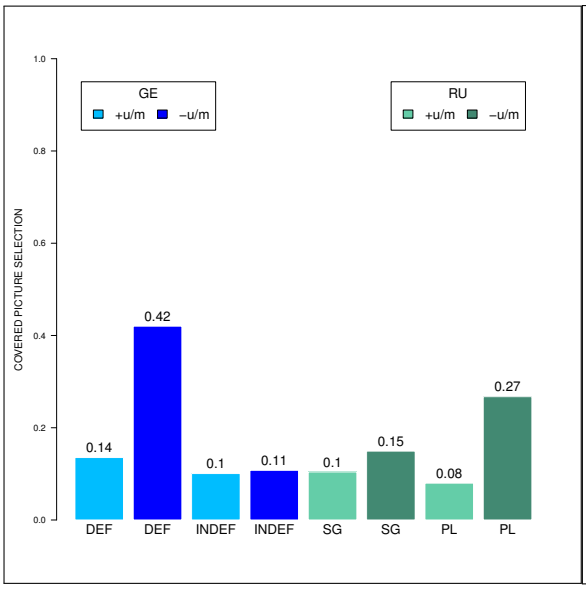


Figure 15: DEF ≈ NUMBER

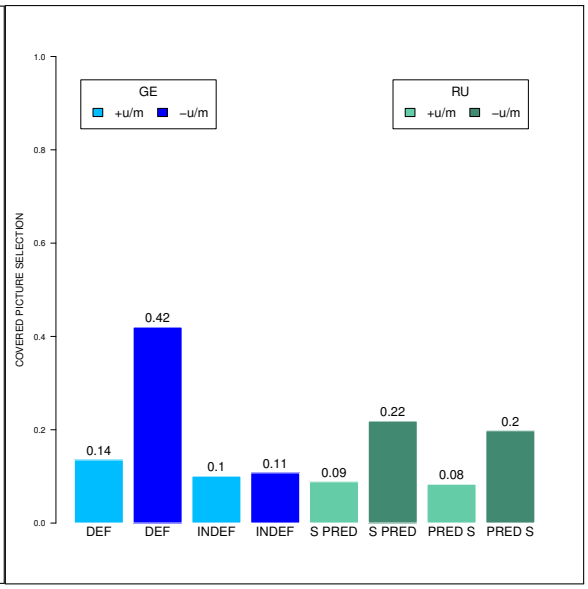


Figure 16: DEF ≈ WORD ORDER

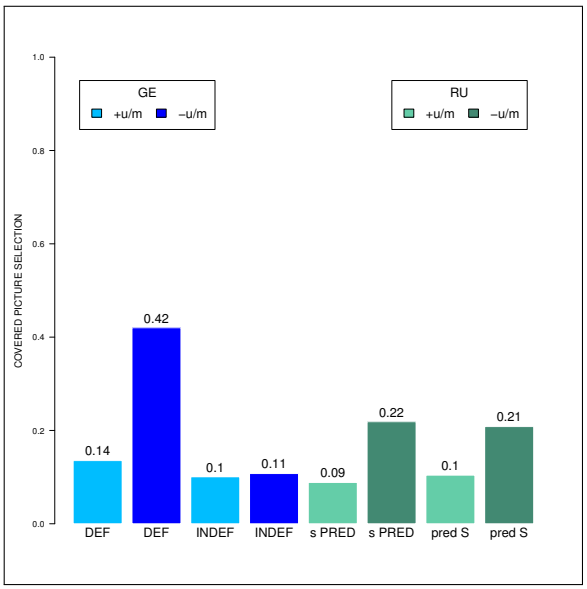


Figure 17: DEF ≈ PROSODY

6 Fillers

The fillers to the MAIN items were distributed among a number of experiment batches, listed above in Table 4, and they tapped into a whole range of inferences: from purely pragmatic or focus-induced exhausitifcation (EXH, FOC), through scalar implicatures (SCAL), determiner- or particle-triggered presuppositions (BOTH, ALSO), to at-issue exhaustive assertions (ONLY). The purpose of including all these inference types was to provide a certain sanity check but also grounds for comparing the size of the effect brought about by uniqueness/maximality violations (MAIN), which are—by hypothesis—contradictions of presuppositions, and the effects brought about by various other types of violations (contradictions of implicatures, presuppositions, or assertions). Below, we provide the results of most of the filler experiments, but no associated predictions or formal analyses of the results. The discussion is informal and explorative, but we consider important for the general discussion and valuable in that it generates new questions, which could feed new experimentation.

6.1 ONLY

The ONLY experiment tested the participants' sensitivity to the contradictions of the exhaustivity assertion introduced by the focus sensitive particle 'only' (*nur* in German, *tol'ko* in Russian) or, more particularly, situations where a sentence of the form 'ONLY x is such that $P(x)$' is accompanied by a picture depicting that $P(x)$, but also that $P(y)$ (where $x \neq y$). The manipulated factor PICTURE had two levels +exhaustive and −exhaustive. In the former case, the picture matched the exhaustivity of the target sentence with 'only'; in the latter case, it did not: there were additional elements in the picture which contradicted the exhaustivity of the target sentence. The factor was manipulated between items; three (of the four) items were −exhaustive and one was +exhaustive.[38] An example item (ID 61) in the −exhaustive condition is provided below—the German and Russian linguistic stimuli are in (23) and the visual stimulus is in Figure 18.[39]

(23) a. Hanna und Nils bekamen die Aufgabe Obst zu malen. Hanna hat nur einen
H. and N. got the task fruit to paint H. has only an
Apfel gemalt.
apple painted
'Hanna and Nils got the task to paint fruit. Hanna only painted an apple.'

b. Anja i Kolja polučili zadanie narisovat' frukty. Anja narisovala tol'ko
A. and K. got task draw.INF fruit A. drew only
jabloko.
apple
'Anja and Kolja got the task to draw fruit. Hanna only drew an apple.'

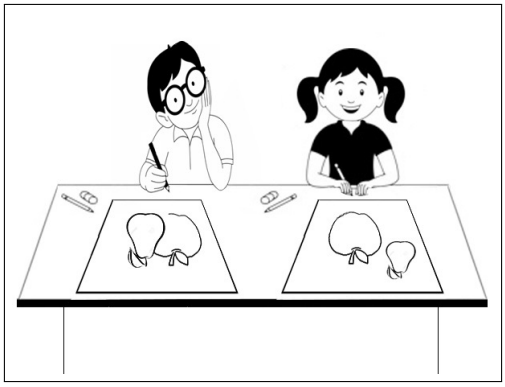


Figure 18: Visual stimulus for item 61 from ONLY (condition −exhaustive)

Figures 19 and 20 show the results of ONLY for both languages. The manipulated variable PICTURE clearly has a strong effect on the outcome variable: the participants selected the covered picture in the −exhaustive condition in 97% of the cases, which is expected, given the fact that a contradiction arises in the assertion.

6.2 ALSO

The ALSO experiment tested the participants' sensitivity to contradictions of the additive presupposition introduced by the focus sensitive particle 'also' (*auch* in German, *tože* in Russian). The manipulated factor PICTURE had two levels +additive and −additive. In the former case, the picture reflected the additivity expressed in the target sentence with 'also'; in the latter case, it did not: the presupposition introduced by 'also' was not verified in the picture. As in ONLY, the factor was manipulated between items, whereby three (of the

[38]The disproportion was motivated by the aim to achieve a rough balance of matching and non-matching visible pictures within the whole experiment. The same disproportion is present in the batches ALSO and REST.

[39]Note that while the assertion is false, in view of the picture, what is sometimes considered the presupposition, namely 'Hanna painted an apple', is true. This tension was present in most of the experimental manipulations within the whole design.

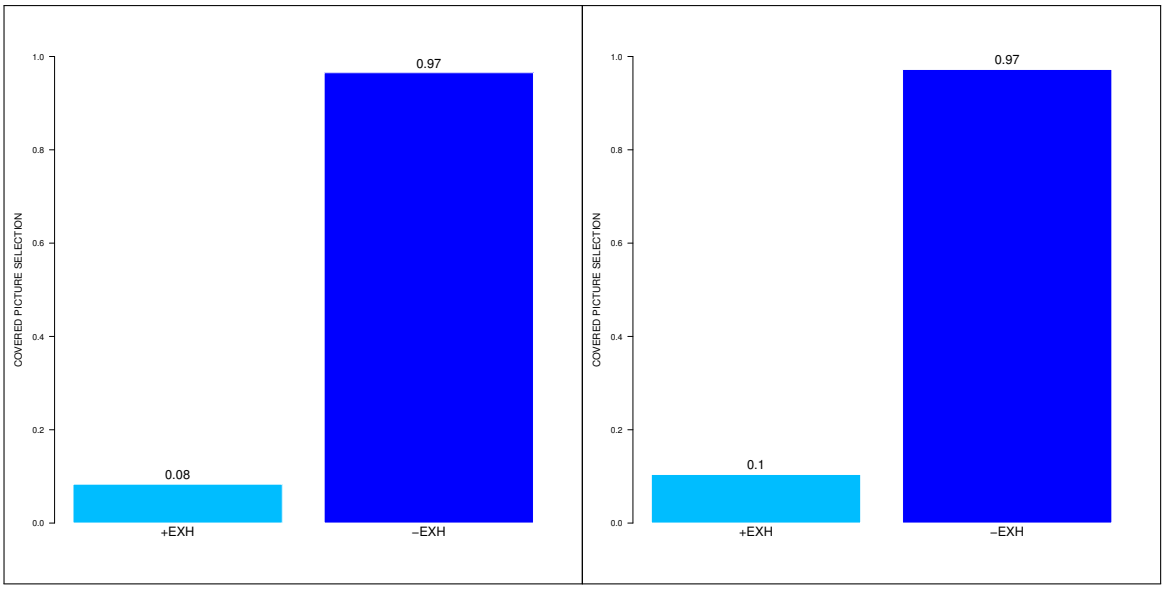


Figure 19: ONLY result German

Figure 20: ONLY result Russian

four) items were −additive and one was +additive. An example item (ID 66) in the −additive condition is provided in (24) and Figure 21.

(24) a. Als Julia und Thomas spazieren gingen, ist es deutlich kälter geworden.
when J. and T. walk.INF went is.AUX it clearly colder become
Thomas hat auch eine Mütze aufgesetzt.
T. has also a cap put.on
'When Julia and Thomas went for a walk, it turned quite cold. Thomas put on a cap, too.'

b. Julja i Saša guljali, kogda stalo xolodnee. Saša tože nadel šapku.
J. and S. walked when became colder S. also put.on cap
'Julja and Saša were walking and it turned cold. Saša put on a cap, too.'

Figures 22 and 23 show the results. The manipulated variable PICTURE has a strong effect on the outcome variable: the participants selected the covered picture in the −additive condition in 96% (German) and 86% (Russian) of the cases. What is striking is that the effect size is comparable to the one observed for ONLY, despite the fact that what is contradicted here is a presupposition (rather than an assertion). It is also worth mentioning that the effect is apparently much stronger than the effect observed for uniqueness/maximality presupposition contradictions in DEF (which led to 42% covered picture selection).

Figure 21: Visual stimulus for item 66 from ALSO (condition −additive)

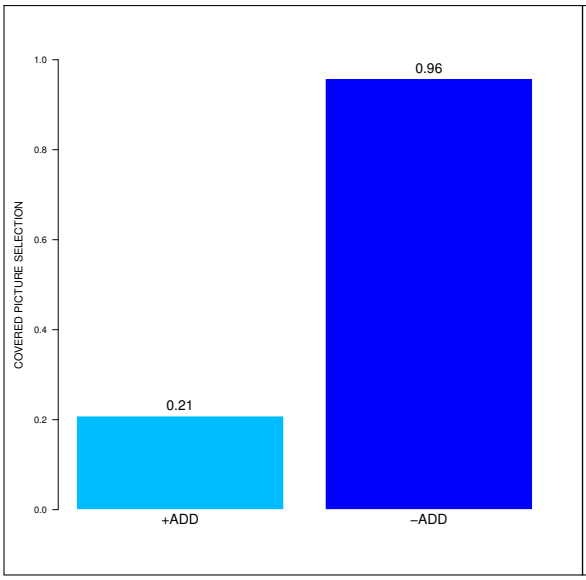


Figure 22: ALSO result German

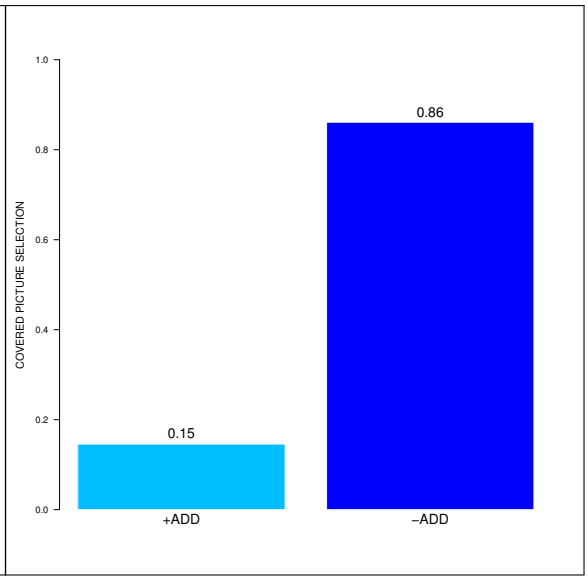


Figure 23: ALSO result Russian

6.3 BOTH

The BOTH experiment tested the participants' sensitivity to contradictions of the cardinality assertion/presupposition/implicature associated with the numerals 'both'/'two' (*beide*/*zwei* in German and *oba*/*dva* in Russian). The two manipulated factors (both within items) were NUMERAL TYPE (both vs. two) and PICTURE (2-pic vs. 2+1-pic vs. 3-pic), giving a total of 6 conditions. One item (ID 49) in all its conditions is exemplified in (25) and Figure 24.

(25) a. Das Weibchen flog zu ihrem Nachwuchs zurück. Beide / Zwei Jungvögel waren
the female flew to its offspring back both two chicks were
im Nest.
in.the nest
'The female bird flew back to its offspring. Both / Two birds were in the nest.'

b. Samka letela nazad k svoemu potomstvu. Oba / Dva ptenca byli v gnezde.
female flew back to its offspring both two chicks were in nest
'The female bird flew back to its offspring. Both / Two birds were in the nest.'

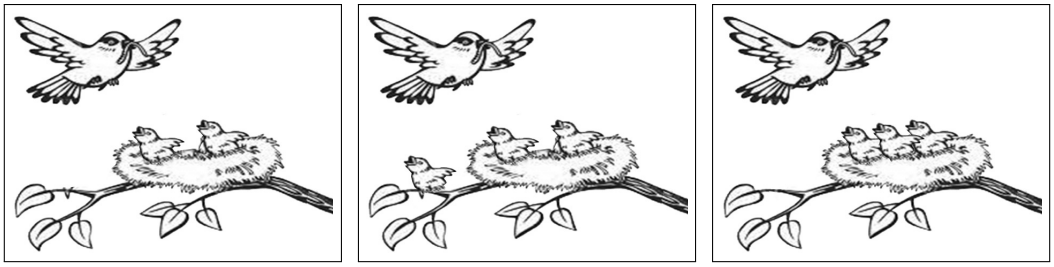


Figure 24: Visual stimuli for item 49 from BOTH (left to right: conditions 2-pic, 2+1-pic, 3-pic)

Figures 25 and 26 show the results. The manipulated variables and their interactions have very clear and very similar effects on picture selection in both languages. Leaving a formal analysis aside, let us just mention a few immediately clear impressions. In both languages, the conditions both & 2-pic, two & 2-pic, and two & 2+1-pic give little excuse to select the covered picture. This is expected because none of these three conditions violates any sensible inference of the associated sentence. Assuming that 'both' is a universal quantifier presupposing a restrictor with cardinality 2 (Schwarzschild 1996), the picture in condition both & 3-pic contradicts the presupposition of the associated sentence (it does not hold that there are two chicks) and the picture in condition both & 2+1-pic contradicts both this presupposition and the assertion (it does not hold that all the chicks are in the nest). As one would expect, both conditions receive a high proportion of covered picture selection.[40] What we find interesting and in some sense surprising is condition two & 3-pic, which exhibits a contradiction of a scalar implicature (the implicature being 'There are not more than two birds in the next'). This contradiction produces an effect as strong as or even stronger than the presupposition and/or assertion contradictions.

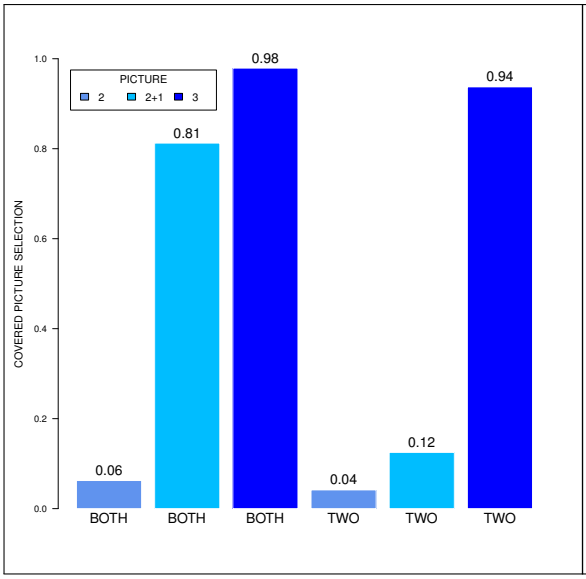


Figure 25: BOTH result German

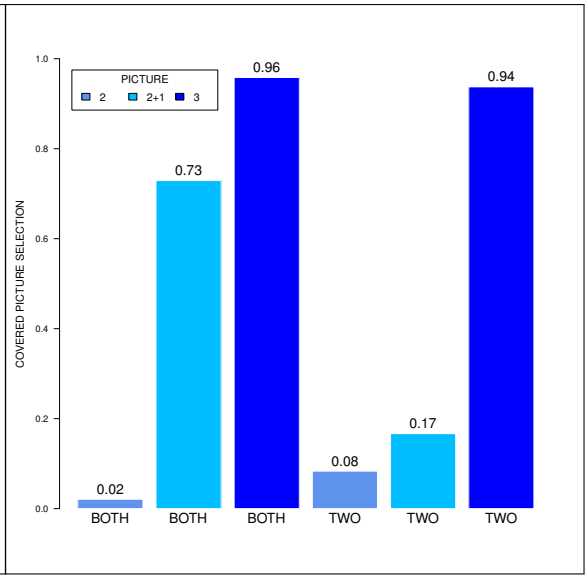


Figure 26: BOTH result Russian

6.4 SCAL

The SCAL experiment tested the participants' sensitivity to contradictions of the implicature triggered by the determiner 'some' (*einige* in German and *nekotorye* in Russian), in comparison to contradictions of the assertion conveyed by the determiner 'all' (*alle* in German and *vse* in Russian). The two manipulated factors (both within items) were DETERMINER (some vs. all) and PICTURE (+all vs. −all), giving a total of 4 conditions. One item (ID 47) in all its conditions is exemplified in (26) and Figure 27.

(26) a. Mit dem schwarzen Auto kamen drei Gangster. Alle / Einige trugen einen
with the black car came three gangsters all some wore a
Hut.
hat
'Three gangsters arrived in the black car. All / Some wore a hat.'

b. Na čërnoj mašine priexali tri gangstera. Vse / Nekotorye byli v šljapax.
in black car came three gangsters all some were in hats
'Three gangsters arrived in the black car. All / Some wore a hat.'

[40] The small but crosslinguistically consistent decrease in covered picture selection in condition both & 2+1-pic as opposed to both & 3-pic might be due to a successful accommodation of the nucleus into the restrictor, resulting in 'Both chicks that are in the nest are in the nest', which, albeit trivial, does not lead to contradictions in either assertion or presupposition.

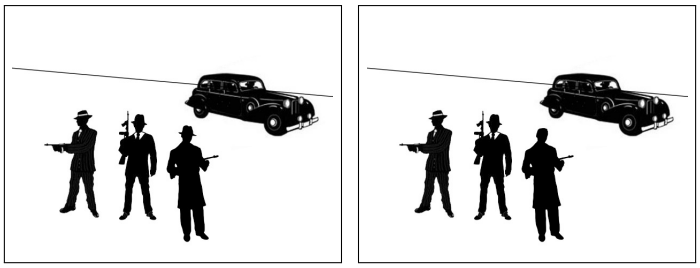


Figure 27: Visual stimuli for item 47 from SCAL (left +all, right −all)

Figures 28 and 29 show the results. There is a very clear interaction between the two manipulated factors. The high proportions of covered picture selection in conditions all & −all and some & +all indicate the participants' sensitivity to the assertion contradiction in the former case and to the scalar implicature assertion in the latter case. The slight difference between the two conditions in German goes in the expected direction: the violation of assertion contradiction is more pronounced than the violation of implicature contradiction, reflecting the fact that drawing a scalar implicature is optional. In Russian, the results for these conditions are virtually indistinguishable, indicating a very high sensitivity to implicature contradiction.

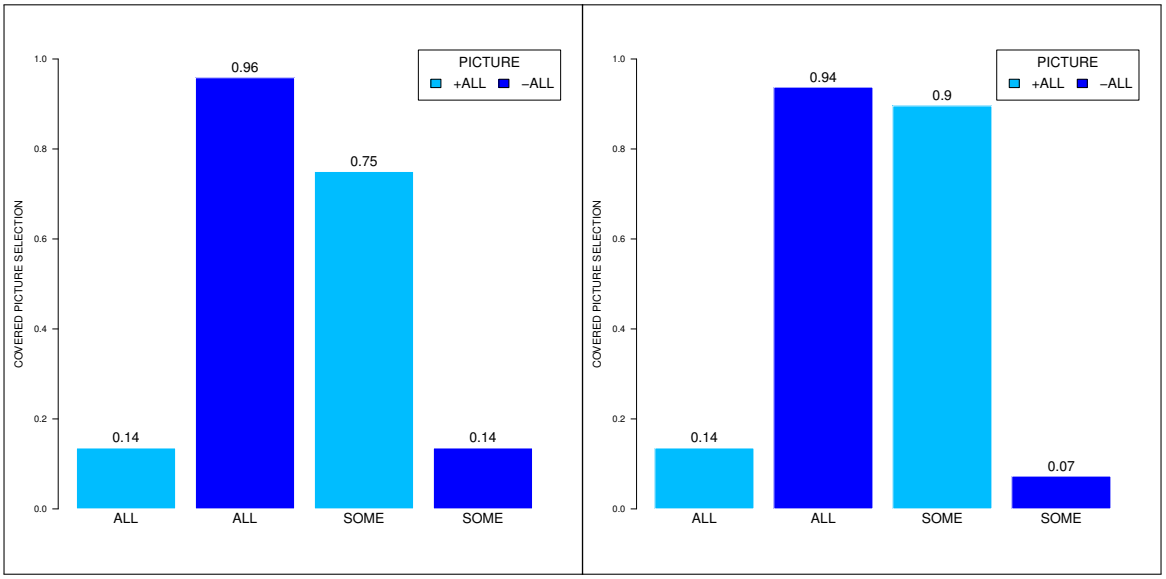


Figure 28: SCAL result German

Figure 29: SCAL result Russian

6.5 EXH

The EXH experiment tested the participants' sensitivity to contradictions of exhaustivity implicatures and their dependency on factors similar to the ones manipulated in MAIN. The aim was to provide material for explorative comparisons between the effects of the relevant factors on uniqueness/maximality, notions that are deemed to be presuppositional, and those on exhaustivity, which is—at least in the case at hand—conversational (based on the relevance implicature). The manipulated factors were NUMBER (sg vs. pl; manipulated between items), WORD ORDER (S PRED vs. PRED S; within items), DEFINITENESS (def vs. indef; within items; manipulated only in German), DETERMINACY (bare vs. determined; within items; manipulated only in Russian and distinguishing between bare NPs and NPs determined by the indefinite determiner *kakoj-to*), and PICTURE (+exhaustive vs. −exhaustive), totalling at 16 unique conditions per language.[41] One item (ID 29) is shown in all its con-

[41]The factor NUMBER corresponds to a loose notion of semantic number in this experiment, such that 'home shoes' (item 25) count as singular (corresponding to 'a pair of shoes'). Yet, most of the items were not problematic

ditions in (27)/(28) and in Figure 30. (All the illustrated conditions are in condition sg, since NUMBER was manipulated between items.) The picture on the left represents the +exh condition because the corresponding linguistic stimulus mentions *all* the items ready for painting (here: the paint roller is all there is). The picture on the right represents the −exh condition because the linguistic stimulus does *not* mention all the items (the bucket is not mentioned, even though it is relevant).

(27) Wir hatten vor zu streichen.
we had before to paint
'We were planning to paint.'

a. Die / Eine Farbrolle lag schon auf dem Boden bereit. S PRED & def/indef
the a paint.roller lay already on the floor ready
'The/A paint roller was ready on the floor.'

b. Auf dem Boden lag schon die / eine Farbrolle bereit. PRED S & def/indef
on the floor lay already the a paint.roller ready
'The/A paint roller was ready on the floor.'

(28) My xoteli pokrasit' steny.
we wanted paint.INF walls
'We wanted to paint the walls.'

a. (Kakij-to) Valik uže ležal na polu. S PRED & bare/det
some paint.roller already lay on floor
'The/A paint roller was ready on the floor.'

b. Na polu uže ležal (kakij-to) valik. PRED S & bare/det
on floor already lay some paint.roller
'The/A paint roller was ready on the floor.'

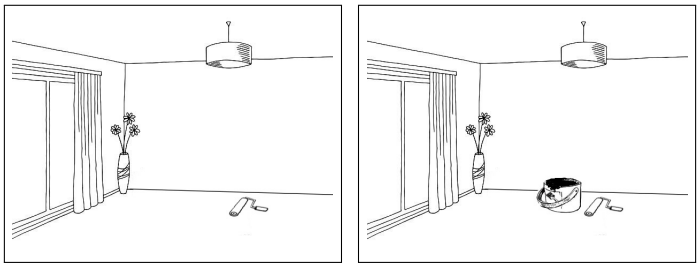


Figure 30: Visual stimuli for item 29 from EXH (left +exh, right −exh)

The results, provided in Figures 31 and 32, show in both languages a consistent effect of PICTURE: condition −exh yields more covered picture choices than +exh. This reflects the tendency to pragmatically strengthen the interpretation from, say, 'the/a paint roller was ready' to the exhaustive '**only** the/a paint roller was ready'. The fact that the effect is present across all individual conditions suggests its default status, but it is also apparent that individual factors can further contribute to drawing this exhaustivity implicature and that this can happen in a cumulative fashion, particularly in German. (The Russian pattern is less clear and consistent, so leave it aside.) The first thing to notice is that exhaustification is consistently more pronounced in PRED S than in S PRED. A possible explanation is optional accommodation of focus on subject in PRED S (allowed by the fact that in this condition, the subject carries sentence stress); narrow focus, in turn, is likely to contribute to its exhaustive interpretation. We further see that plurals are more liable to get exhaustified than singulars and within plurals, indefinites (thus: bare NPs) are more liable to exhaustification than definites.

in this way.

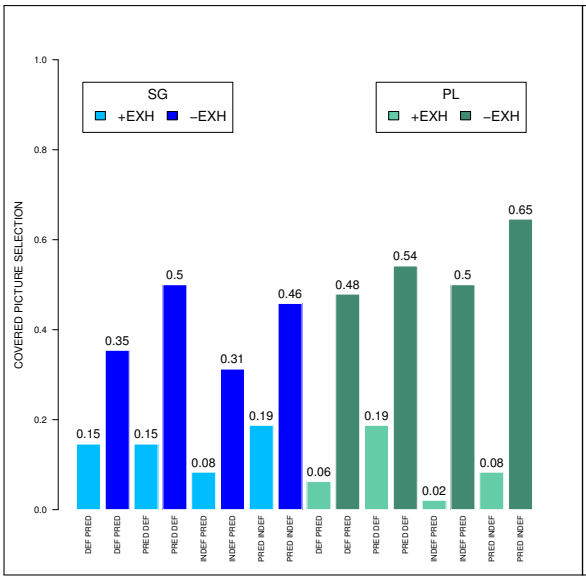


Figure 31: EXH result German

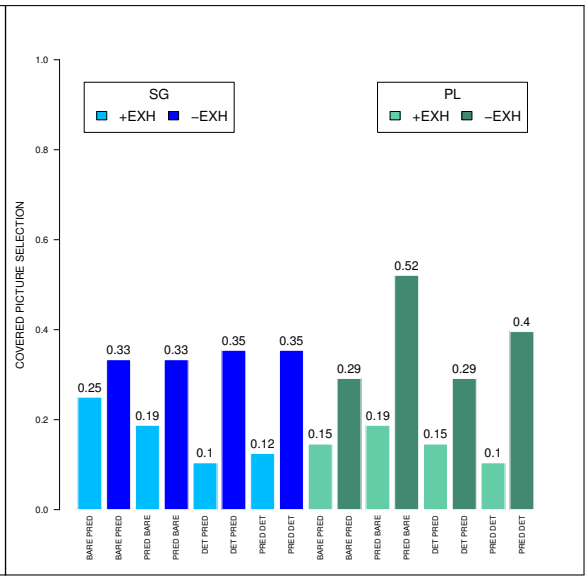


Figure 32: EXH result Russian

7 General discussion

Our experiments bear implications for three areas of linguistic research: the semantics of definite descriptions, the semantics of bare NPs, and cross-linguistic NP semantics. We will discuss these implications in turn.

7.1 The semantics of definite descriptions (DEF)

The basic prediction of the uniqueness/maximality theory of definite descriptions was borne out by the DEF experiment, which exhibits consistent sensitivity to violations of the uniqueness/maximality inference—by hypothesis a presupposition—of definite descriptions. What came as a surprise was the relative weakness of the expected interaction: in only 42% of the critical cases (definite & −unique/maximal) did the violation lead to the expected picture selection (covered); in other words, the participants tolerated the violations in the majority of the critical cases. Our filler experiments confirmed the surprising nature of this result. Other presupposition violations were recognized as such in more than 90% of the cases, whether the presuppositions were triggered by a determiner (BOTH) or by a focus-sensitive particle (ALSO). These violations led to effects comparable to those of assertion contradictions (ONLY). Interestingly, also violations of scalar implicatures (SCAL) induced a much stronger effect than the one observed in DEF. If anything, the strength of the interaction in DEF matches the effect found in EXH, which tested pragmatic exhaustive implicatures. This means that something like *The boat sank* was felt to be similarly (in)appropriate as a description of a picture in which there are two boats, one of which sank (violation of uniqueness), as (in)appropriate it was to use it as a description of a picture where the (single) boat sank, but a/the water-scooter sank, too, which violates the Grice's (1975) maxim of quantity because the sunken water-scooter should also have been mentioned.

We can think of a number of reasons why the interaction in DEF was relatively weak, namely (i) that the design worked differently than intended, (ii) that uniqueness/maximality are not presuppositions but implicatures, (iii) that the discourse structure of the items was such that it backgrounded the relevance uniqueness/maximality inferences significantly, (iv) that some definite NPs were construed as weak definite NPs, and, finally, (v) that the grammatical nature of definiteness renders its semantics less salient. We will discuss these reasons one by one. Notice, by the way, that they are not incompatible with one another, they might in fact act in combination to produce the resulting weak interaction.

According to Coppock & Beaver (2015), definite NPs can have both determinate and indeterminate readings. Only in the former case do they presuppose uniqueness (or maximality). Even though the conditions under which indeterminate readings of definite NPs

arise in their account are quite different from those used in our experimental design, it cannot be ruled out that at least some definites were interpreted indeterminately by some participants. An anonymous reviewer pointed out that this interpretation might in fact be prompted by the covered box design. As stated in section 4.1, the covered box paradigm has not just been used for tapping into presuppositions and implicatures (our intention here), but also into dispreferred interpretations. It is possible that participants selected the visible picture in the critical condition precisely because it matched the dispreferred (indeterminate) interpretation of the target definite NP. We consider this interpretation implausible in the light of the filler results. Consider SCAL, for instance (section 6.4). Indefinite 'some' NPs are in principle compatible with two readings: the logical reading, compatible with a situation where all entities satisfy the nucleus ('some and possibly all'), and the pragmatically enriched reading, amounting to 'some but not all'. It seems clear that the latter reading is preferred and the former dispreferred. If dispreferred readings were prompted by our design, we would expect a relatively high proportion of visible picture choices in the critical some & +all condition. Yet, the visible picture was chosen in only 25% of the cases (cf. the 86% of visible choices in the some & −all condition), suggesting that the participants mostly stuck to the pragmatically enriched meaning, despite being prompted by the visible picture towards the (dispreferred) logical interpretation.

The comparable effect size found in DEF and in EXH could suggest a conversational source of the uniqueness/maximality implication conveyed by definite descriptions, which in turn would be in line with the proposals of Szabó (2000) and Ludlow & Segal (2004). The problem with this reasoning is the striking difference in effect size between DEF and EXH on the one hand and SCAL on the other, at least if scalar implicatures triggered by expressions like 'some' are conversational in nature. One potential way out of this problem would be to assume that so called scalar implicatures can be at-issue, as suggested by Chierchia (2006) and many others since then.

Another reason that comes to mind has to do with the discourse relation between the context and the target in MAIN. It is a notable property of the MAIN items (as opposed to most of the filler items) that the context is incomplete without the target sentence because it raises an implicit and in some cases even explicit question.[42] For instance, in item 1 of MAIN, the participant first learns that something happened at the butcher's (= context), raising the implicit question 'What was it that happened?'. Immediately after that, the participant learns that a/the pig(s) ran away (= target), which answers this question. The question raised by the context would be answered irrespective of how many pigs there are and how many of them ran away. It is the fact that *some pig(s) ran away* (or in fact that *something notable happened*) that seems to matter most. Importantly, this consideration holds of every target sentence and every picture of MAIN, irrespective of the condition. The high proportion of ignored violations of uniqueness/maximality could therefore reflect the fact that some relevant aspect of both the target sentence and the picture (= some pig ran away) jointly and successfully served as an answer to the implicit or explicit question raised by the context. This effect might have been so strong that it backgrounded the importance of the targeted uniqueness/maximality inference. Even if this speculation were on the right track, however, it would still come as a surprise that a pragmatic factor of this kind should affect the uniqueness/maximality inference to such an extent, esp. if this inference is a presupposition.

Manfred Krifka (p.c.) suggested that what could be behind the relative weakness of the targeted interaction is a potential weak-definite nature of the definite descriptions used in our experiment. The hallmark of weak definites (as in *listen to the radio* or *go to the grocery store*) is that they need not satisfy the uniqueness/maximality condition (see Aguilar-Guevara 2014 for in-depth discussion). Manfred Krifka was responding to item 15 of MAIN, in which reception guests are startled (= context) by the burst of a/the light bulb (= target). The implication is that *the light bulb* might be a weak definite description, at least in relation to an ordinary "room situation". We find it relatively plausible that the "weakness" of the definiteness used in the MAIN experiment could have contributed to the weakness of the expected interaction. On the other hand, none of the items we used involved a prototypical

[42] Using two recent approaches, we could also say that the contexts in MAIN had a very salient *inquisitive content* (Ciardelli et al. 2013) or that they introduced a salient *question under discussion* (Roberts 2012; Beaver et al. 2017).

weak definite.

The last piece of speculation we can offer stems from a comment by Ellen Brandner (p.c.), who reminded us that articles, whether definite or indefinite, are not merely semantic linguistic "devices", but also—and perhaps very importantly so—grammatical ones. They often represent the minimal pieces of morphology that make noun phrases usable in sentences—without them, many sentences would simply be ill-formed. On top of that, articles are often the main carriers of information about case, number, and gender, German being a paradigmatic example of this. Our surprisingly weak results could therefore point towards the need of a multi-factorial analysis, where the grammatical load of words reduces the salience of the semantic inferences they convey.

Be it as it may, the results of DEF clearly suggest that the hypothesized uniqueness/maximality of definite description is a more fragile phenomenon than one might expect: it can "disappear" or be ignored relatively easily, possibly as a consequence of various pragmatic processes or of their grammatical function. To conclude this part of the discussion, let us mention that our results resonate with those of De Veaugh-Geiss et al. (early access), who also found the uniqueness/maximality of definite descriptions (particularly definite pseudoclefts) to be weaker than expected. De Veaugh-Geiss et al. (early access) resorted to anaphoricity as a potential explanation of the lacking uniqueness/maximality. Our results show the need to consider a broader set of confounding factors, as anaphoricity in the narrow sense was not involved in our experiment and the bridging relation (also called "associative anaphora"; cf. 'carriage'–'locomotive') was present independently of the target definiteness.

7.2 The semantics of bare NPs in an articleless language (NUM, WO, PROS)

The claim that definiteness correlates bring about presuppositional semantics of bare NPs was not borne out by our experiments. We did not find singular bare NPs to convey uniqueness to a greater extent than plural bare NPs convey maximality (Dayal 2004), nor did we find the effect of topicality (conveyed by word order or prosody) on uniqueness or maximality (Geist 2010, among many others).

Potential explanations for the missing effect of **topicality** (WO, PROS) were discussed in quite some detail in the discussion of section 5.3. Apart from the null hypothesis, to which we will turn shortly, they include (i) the possibility that the covered box paradigm did not work as intended, (ii) the possibility that our design failed to manipulate topicality, (iii) the possibility that uniqueness/maximality presupposition are not involved in determinate bare NPs in articleless languages, and (iv) the possibility that our experiment was not sensitive enough to capture the intended interaction.

Option (i), namely that our covered box design prompted participants to choose less preferred (= indeterminate) readings (= visual pictures in the critical conditions), applies equally to definite descriptions and bare NPs (assuming Coppock & Beaver's 2015 analysis), with the difference that in the latter case, the choice of the less preferred reading would completely override the preferred (determinate) one. Also here, it should be mentioned that this view does not line up with what we saw in the fillers. In SCAL, for instance, the less preferred interpretation (the logical one) was chosen only in 10% of the cases. The reader is referred to section 7.1 for more detailed discussion.

Concerning (ii), in the light of our discussion in section 7.1, it is indeed not ruled out that the effect of the discourse relation between the context and target was so strong that it overrode any attempted topicality manipulation and the expected interaction—although potentially there—simply dropped too "low" to be visible (floor effect). On the other hand, the filler results demonstrate very high sensitivity to presuppositional and implicature phenomena, sometimes even more strongly so than for German, which makes the floor explanation hard to swallow.

Explanation (iii) seems more likely: at least some commonly entertained semantic/pragmatic concepts used for modelling definiteness (identifiability, salience, etc.) could probably be adapted for bare NPs and thereby be compatible with the null result. The concept of identifiability is a case in point: the participants were always capable to identify the relevant referent, irrespective of the ±unique/maximal manipulation.

While trying to look for potential explanations for the missing interaction, we should

not forget that the results are compatible with the null hypothesis, which we identified, for purposes of the present work, with Heim's (2011) suggestion that bare NPs in articleless languages are always indeterminate (see section 3.1).[43] While this hypothesis goes counter to the common conjecture that the semantics underlying definite descriptions is universal and expressible, in one way or another, in every language, it is elegant in that it does not need to resort to stipulating covert type-shifting operations. The details of the hypothesis are still to be explored and there could be a need for supplementary assumptions, explaining particular empirical patterns. Examples of this are the scope facts discussed in sections 3.2 and 3.3, particularly the claim that indefinite bare NPs cannot take wide scope. Yet, these facts were contested by Borik (2016) and Borik & Seres (2018). As far as we can tell, many empirical issues remain open.

Regarding the unexpected result of the **grammatical number** manipulation in the NUM experiment, where we found a slight tendency of plural bare NPs to refer to the maximal referent, we can offer the following speculations. There are two potentially relevant ways in which singular NPs differ from plural ones:[44] (i) the ease (or difficulty) with which uniqueness vs. maximality is satisfied and (ii) the option for bare plurals to have maximalizing meanings, even in languages with articles. Let us discuss these in turn.[45]

It is well-known that it is easier to satisfy maximality (for plurals) than it is to satisfy uniqueness (for singulars). The reason is that maximality follows from existence: any non-empty set of plural entities is automatically a set containing an entity that contains all the others—the maximal entity. This is not the case for singulars: a non-empty set of atomic entities is not automatically a set containing exactly one entity. Now, if bare NPs in articleless languages—for some reason—presupposed existence, that presupposition would amount to the presupposition of maximality (with bare plurals), but not to the presupposition of uniqueness (with bare singulars). In other words, bare plurals, unlike bare singulars, would correspond to definite descriptions. The problem with this proposal is obvious: it is unclear why bare NPs in articleless languages should be presuppositional. In the light of the generalizations discussed in sections 3.2 and 3.3 (but cf. Borik 2016), it seems clear that any such proposal would have to be supplemented with the prohibition of presupposition projection across all sorts of scoping operators (something tentatively entertained by Dayal 2004 for the case of bare singular uniqueness presupposition; see section 3.2).

Concerning the other speculation, it has been known, at least since Condoravdi (1992),

[43] An anonymous reviewer points out that some other approaches are also compatible with the results, mentioning Chierchia (1998) and Coppock & Beaver (2015). It is true that these authors do not identify conditions under which indeterminate interpretations are ruled out. At the same time, they keep the option—in the case of Coppock & Beaver (2015) even preferentially so—that bare NPs may have determinate interpretations. These are assumed to be derived using the IOTA-shift, which in turn introduces the relevant uniqueness (or maximality) presupposition. In that sense, Chierchia's (1998) or Coppock & Beaver's (2015) proposals can be seen as providing a certain baseline, to which an account like Geist's (2010) functions as a natural extension in the sense that it attempts to identify the conditions under which determinate interpretations come out as the only possible ones (without implying that Chierchia 1998 or Coppock & Beaver 2015 would subscribe to such an account). In that sense, Heim's (2011) proposal is stronger, as it explicitly removes the presupposition-introducing IOTA-shift from the grammatical system of articleless languages, at least for purposes of bare NP interpretation.

[44] An anonymous reviewer suggests that plural bare NPs do not lend themselves to partitive readings, which in turn might increase the tendency for the maximalizing interpretation. However, plurals do not differ from singulars in this respect because bare singulars also do not readily permit partitive readings.

[45] An anonymous reviewer points out that something like weak definiteness, discussed in section 7.1 German, could also be at play in the case of Russian bare singulars. This suspicion is supported by the fact that weak definites indeed typically correspond to bare singulars in articleless languages. From this perspective, one could hypothesize that the result we see for plurals (namely slight tendency towards maximality) is the "default" and that the lack of uniqueness in singulars is caused by their "weak definite" character. The reviewer further points out that if weak definiteness are understood in terms of pseudo-incorporation (Carlson et al. 2006; Schwarz 2014; a.o.) and if bare singulars in articleless languages pseudo-incorporate particularly easily (cf. Sağ 2018 for Turkish), then bare singulars in our experiment might have been pseudo-incorporated (and hence without any salient uniqueness implications) across conditions. There is no agreement concerning the existence of pseudo-incorporation of bare singulars in Russian; Geist (2010) argues that it does not exist, Mueller-Reichau (2015) argues that it does (albeit with some caveats left open). While acknowledging that pseudo-incorporation (possibly a correspondent of weak definiteness in articleless languages) might have affected our results, we believe that a separate study would be needed to resolve the issue. (One possible experimental manipulation—kindly suggested by the reviewer—would be inserting adverbials to break the adjacency between the subject and the predicate.)

that bare plurals in English can sometimes correspond to definite descriptions (Condoravdi refers to this meaning as "quasi-universal"; see also Condoravdi 1997; Cohen 2005; Solt 2009).[46] In (29), definite descriptions can apparently freely alternate with bare plurals without any notable difference in truth conditions or presuppositions. Note also that these bare plurals are unlikely to be existentials derived by derived kind predication, given the assumptions introduced in Chierchia (1998), because *students [in the campus]* and *trees [in the desert]* do not denote natural or well-established kinds; in Dayal's (2013) terminology, they are "indexical", in the sense that they include a (covert) constituent referring to a particular entity (a particular campus/desert).

(29) a. In 1985 there was a ghost haunting the campus.
(The) Students were aware of the danger. (Condoravdi 1992:19)

b. The desert was barren, with barely enough water to sustain plant life.
(The) Trees were few... (Solt 2009:131)

Whatever the ultimate explanation, it cannot be *a priori* ruled out that a similar effect carries over to articleless languages, causing the tendency to interpret bare plurals as maximalizing. This idea has at least two caveats. First, while in English, the maximalizing interpretation of bare plurals is arguably contextually and otherwise restricted (see the literature cited), this could not be the case in Russian. Second, we would expect to see a comparable effect of NUMBER in German, which we do not: there is no visible tendency of bare plurals (the indefinite & plural condition) towards a maximalizing interpretation.

An anonymous reviewer, leaning on Dayal (2013), suggests another possible view of the tendency towards a maximalizing interpretation in Russian bare plurals. According to Dayal's (2013) updated definition of the NOM-shift, some "indexical" bare plurals—including those in (29)—can be shifted to kinds, after all, and hence can be interpreted existentially via derived kind predication (DKP).[47] The relevant condition introduced by the NOM-shifter is that the cardinality of the extension of the property (weakly) varies with situations. In (29-a), for instance, the number of students in the campus is not constant in all situations. Not all "indexical" bare plurals are like this, however, as illustrated in (30): in order for the car I bought to be considered a "(complete) car", there must always be 4 wheels; *wheels [of the car I bought]* thus cannot be shifted to a kind (and later be input to DKP).

(30) I bought a car. The wheels / *Wheels need to be replaced. (Dayal 2013:57)

The anonymous reviewer is right in that bare plurals in our target utterances are "indexical" because their denotation is restricted by a particular referent introduced in the context. Examples include 'carriages [towed by the locomotive]' (item 9), 'pots [on the stove]' (item 16), or 'cacti [on the window sill]' (item 23). The question then is if the bare plurals we used are more like 'students [on the campus]' (licit input to NOM) or more like 'wheels [of the car]' (illicit input to NOM). If the latter holds, i.e., if the cardinality remains constant across situations, then the existential reading derived by DKP is unavailable and the only remaining possibility is the maximalizing interpretation, correctly capturing the tendency we observed in our results. We do not consider this explanation plausible, however. As mentioned in section 4.2.2, it was an essential property of our design that the context never introduced any expectations concerning the cardinality of the target NP extension. In other words, the cardinality of the extension of the target NP naturally varies with the evaluation situation (note, by the way, that the evaluation situations correspond to the different levels of the PICTURE factor in our experiment), the target NP is thus a licit input to NOM, and consequently lends itself to an indeterminate reading. We conclude that Dayal's (2013) refined version of NOM-shift provides no handle on the unexpected interaction in the results of NOM.

[46] This observation could in fact have a source in the uniqueness vs. maximality asymmetry discussed in the previous paragraph. As far as we know, this hypothesis has not been explored in the literature.

[47] The intuitively maximalizing interpretation arises indirectly (i.e., not via the IOTA-shift), as a consequence of domain widening; see Dayal (2013) for discussion.

7.3 Definiteness crosslinguistically (ART)

Our experiments are as far as we know the first ones to compare the semantics of definite descriptions with what we call here definiteness correlates in articleless languages. We found a difference between the two: while we were able to prove the relevance of uniqueness/maximality for the semantics of definite descriptions (DEF), definiteness correlates apparently do not necessitate such concepts (NUM, WO, PROS). Although many questions remain open, one conclusion can be drawn quite safely: There is no one-to-one relation between definiteness and definiteness correlates. Even if uniqueness/maximality prove to be relevant for articleless languages (something we failed to find support for in this paper), their effect is demonstrably smaller than the one found in languages with articles, as shown by our crosslinguistic tests (ART). This conclusion is backed by the filler experiments, where we saw a striking similarity between German and Russian with regard to various presuppositions and implicatures.

The questions that remain open include the following: Which factors other than grammatical number, word order, or prosody (the latter two standing for topicality) could trigger a bare NP interpretation comparable to the one of definite descriptions? (Candidates include verbal aspect, see Krifka 1989, but also Filip 1993, or nominal case, see e.g. Partee & Borschev 2004.) Which notions other than uniqueness/maximality could lie behind the recurring "definiteness intuitions" in the literature on articleless languages? (Candidates include familiarity or identifiability.) While these and many other questions remain to be tackled in future research, we hope that the present contribution on uniqueness and maximality serves as a good starting point.

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