# Another Look at NPIs in Definite Descriptions

## An experimental approach

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### Abstract

This paper addresses the issue of negative polarity items in the restrictor of definite descriptions. This matter has received little attention in the literature and the discussion of data has been contradictory. The goal of this paper is to review existing approaches to licensing and to offer additional data points to the debate. This paper reports two experiments. The first is a pen and paper judgment survey conducted in a large undergraduate course. The experiment explored subjects' fine intuitions about NPIs in the restrictors of definite descriptions, as opposed to other environments. The second experiment was conducted online through the Amazon Mechanical Turk website. This experiment simultaneously investigated the influence of grammatical number and genericity/habituality on judgments concerning NPIs in the restrictors of definite descriptions.

### 1. Introduction

Negative polarity items (NPIs) are expressions that need to occur in an environment that is somehow negative. The theoretical linguistics literature has invested much time and effort into attempting to precisely specify what counts as somehow negative and what counts as an environment for licensing of NPIs by this negativity. We will discuss some well-known theories of licensing below. It will suffice to introduce this paper to discuss some patterns of licensing. The

object of inquiry in this paper is the status of NPIs when they occur in the restrictor of definite descriptions, essentially noun phrases that are headed by the definite article *the*. To begin to understand the issue it will be useful to notice that some determiners license the occurrence of negative polarity items, such as *any* and *ever*, in their restrictors, and others do not.

1) a. No student who has any beer is sharing it.
   b. Few students who have any beer are sharing it.
   c. ?Most students who have any beer are sharing it.
   d. *Many students who have any beer are sharing it.
   e. *Some students who have any beer are sharing it.

Determiners that are somehow negative like *no* and *few* allow NPIs in (relative clauses contained in) their restrictors. Positive determiners, like *some* and *many*, do not allow NPIs. And some determiners like *most* seem to fall somewhere in the middle.[1]

It has been a matter of controversy if and when definite descriptions allow NPIs in their restrictors. There is perhaps a consensus that under normal circumstances, NPIs are barred from the restrictors of singular definite descriptions as in 2)a below.

2) a. *The student who has any beer is sharing it.
   b. ?The students who have any beer are sharing it.

There is much less agreement, however, over whether NPIs are allowed in the restrictor of plural definite descriptions. The '?' in 2)b indicates not only the judgments that some speakers have, but also the uncertainty that surrounds judgments about these cases.

The goal of this paper is to add some data points to the discussion and make some suggestions for how these new data affect the possible analyses. The new data come from two experiments. In the first experiment, the students in a large undergraduate course gave judgments on a 5-point Likert scale for sentences in which NPIs occur in the restrictors of noun phrases with a variety of de-

[1] See Jackson (1995) and Gajewski (2011) for ideas about the status of NPIs in the restrictor of *most*.

terminers, including the definite article. In the second experiment, judgments on a 5-point Likert scale were collected through Amazon Mechanical Turk for sentences in which NPIs occur in definite descriptions that are singular or plural and play a role in an episodic or generic sentence.

In the remainder of this introductory section of the paper, we review the literature on the factors that have been identified as potentially affecting the licensing of NPIs in definite descriptions. These are number (section 1.1) and genericity/existence presuppositions (section 1.2).

### *1.1 Singular vs. Plural*

A common position in the literature holds that plural definite descriptions license NPIs while singular definite descriptions do not. Prominent proponents of this idea are Lahiri (1998) and Guerzoni and Sharvit (2007). The following data are reproduced from Guerzoni and Sharvit's discussion. Lahiri 1998 primarily discusses the issue in relation to NPIs in singular and plural correlative constructions in Hindi.

3) a. The students who have any books on NPIs are selling them.
b. *The student who has any books on NPIs is selling them.
(Guerzoni and Sharvit 2007)

Other scholars, most prominently Hoeksema (2008), have questioned the notion that number plays a significant role in licensing in definite descriptions. Hoeksema's investigation of the internet and a NPI database (of Dutch) led him to conclude that singular descriptions can license NPIs as well as plural. Consider the examples below from Hoeksema's (2008) work.

4) a. The student who has ever grasped this theorem knows how hard it is.
b. The students who have ever grasped this theorem know

how hard it is.

(Hoeksema 2008)

### *1.2 Existence presuppositions*

Another factor that is commonly identified as a playing a role in the licensing of NPIs in definite descriptions is the existence presupposition of the determiner. In criticizing von Fintel's (1999) Strawson approach to NPI licensing, Giannakidou (2002) suggests that the difference in licensing between the sentences below has to do with whether or not a presupposition of existence is present. In particular, Giannakidou suggests that the universal determiner *every* and the definite article *the* do not carry the same kind of existence presupposition that the determiner *both* carries.

5) a. Every student/the students who saw anything should report it to the police
b.*Both students should report it to the police.

Hoeksema (2008) holds a similar position, observing that the existence presupposition – present in examples like 6) – is somehow lifted in 6).

6) The students know how hard the theorem is.

As will be discussed below, Hoeksema proposes that it is because 6) expresses a generalization that the existence presupposition is suspended.

## 2. Analyses

In this section, I sketch the theoretical assumptions that I will make about the semantics of the definite article and grammatical number.

It is important to the discussion that we assume a unified account of the definite article across singular and plural cases. Sharvy (1980) famously provided such a unified meaning. Specifically, Sharvy proposes that the definite article denotes a functions that picks out the maximal element in a set. The idea was also developed in Link (1983) within a general theory of the semantics of plurality. In Link's view, the plural morpheme closes a noun extension under the i-part relation ($\leq_i$)

7) a. $[\![ \text{ the } ]\!](P)$ is defined only if $\sqcup_i P \in P$
In that case, $[\![ \text{ the } ]\!](P) = \sqcup_i P$
b. $[\![ \text{ PL } ]\!](P) = \{x : \exists X \subseteq P[\ x = \sqcup_i X\ ]\ \}$
c. For any set S, $\sqcup_i S$ = the smallest x s.t. for all $y \in S$, $y \leq_i x$

The lexical entry of the definite article in 7)a works in the following way. It carries the presupposition that the i-sum of the individuals in the extension of P is a member of P. The i-sum of a set is the smallest individual that has all the members of the set as an i-part. This will be met by all non-empty pluralized predicates. The presupposition will only be met by a predicate of atoms if there is exactly one atom in the extension. A consequence of this analysis is that singular (count) definite descriptions carry an existence and uniqueness presupposition, while plural definite descriptions carry only an existence presupposition. If the presupposition is met, the definite article maps its input predicate P to the i-sum of all individuals in P.

### *2.1 Modified DE-based approach*

A very common approach to the licensing of NPIs is to say that they must occur in the c-command domain of a downward entailing operator.

8) **Fauconnier/Ladusaw Hypothesis**
An NPI must occur in the scope (c-command domain) of a downward entailing operator.

9) A function F of type $<\sigma,\tau>$ is *downward entailing* iff for all A, B of type $\sigma$ such that $B \vDash A$, $F(A) \vDash F(B)$.

For this definition to apply to a function F, both the input and output domains for the function F must support some notion of entailment ($\vDash$). For a method for generalizing the notion of entailments to all domains of types in ending in t, see von Fintel 1999, among many others.

An alternative version of the Fauconnier/Ladusaw Hypothesis does not make reference to a c-commanding licensor, but rather uses an environment based approach to licensing.

10) a. An NPI must occur in a downward entailing environment.
b. An NPI $\alpha$ must be contained in a constituent $\beta$ such that the function $\lambda x.[\![ \beta[\alpha\backslash v_1] ]\!]^{[1 \rightarrow x]}$ is downward entailing.

The two approaches are closely related. Typically the c-command domain of a DE operator is a DE environment. This is not always the case, however. If another operator of a particular kind occurs between an NPI and the c-commanding DE operator, that operator can disrupt the DE character of the environment. See Zwarts 1996 for a detailed discussion of what kinds of operators disrupt DE environments.

No matter which perspective is adopted, the restrictor of a definite description is predicted to be a place in which NPIs are not licensed. This applies equally to singular and plural definite descriptions. Consider first the case of the c-command condition. The first question is what could be the licenser. In other cases, the determiner – such as *no* – may count as the licenser. The definite article, however, is not qualified. Being of type $<<e,t>,e>$, its input domain is order by entailment, but its output domain, the domain of individuals $D_e$, is not ordered by entailment. Consequently, this theory can only be applied if we liberalize the notion of entailment beyond the proposition, type t-based notion of entailment.

The environment-based approach 10)b has a better chance of succeeding. The NPI occurs within the restrictor which is of type $<e,t>$, which we know to support entailment. And the constituent $\beta$ that is required for the definition in 10)b can be identified with the

proposition constituent containing the description and the predicate that applies to it.

11) The student arrived.
∴ The French student arrived. INVALID

12) The students arrived.
∴ The French students arrived. INVALID

Nevertheless, even under this approach, both singular and plural definite descriptions fail to be downward entailing. We cannot infer from the unique salient student arriving that the French student arrived. Just knowing that a unique student arrived does not tell us anything about his/her nationality. The same argument applies in the plural.

The obvious culprit here is the existence presupposition of definite descriptions. The conclusion in the arguments above presupposes that there are French students. This is precisely what cannot be inferred from the premise. There is, however, an alternative version of the DE theory that produces different results. This involves redefining the notion of entailment used in assessing DE-ness that removes the interference of presuppositions.

This approach is named the Strawson Downward Entailing view by von Fintel (1999). Such an approach was suggested in Ladusaw (1979), a similar view (weak DE) in Hoeksema (1986) and most recently by von Fintel (1999). In the version put forward by von Fintel (1999), the presuppositions of all premises and conclusions in the inference in question are taken for granted as premises. Thus, when assessing an inference in which the conclusion contains a definite description, the presupposition of the definite description (existence and/or uniqueness) must be added to inference as a premise. Viewed in this way, both singular and plural definite descriptions are Strawson DE in their restrictors. Consider the argument in 13).

13) The student has arrived.
There is a unique salient French student.
∴ The French student arrived.

If we know that the unique student arrived and we know that there is a unique salient French student, then it must be that the student that arrived is the French student. Similar reasoning applies in the plural case.

14) The students arrived.
There are salient French students.
∴ The French students arrived.

If we know that the maximal set of students arrived and that there are salient French students, then the French students must be included in the maximal set of salient students and arrived as a part of that set.

This predicts that both singular and definite descriptions license NPIs. This prediction contradicts the most common judgment that singular definite descriptions do not license NPIs. However, as observed by Lahiri 1998 and Cable 2002, this view also predicts that singular, but not plural, definite descriptions are Strawson upward entailing. If the French student arrived and there is a single salient student, then the unique salient student, i.e. the French one, arrived.

15) The French student arrived.
There is a unique salient student.
∴ The student arrived.

In the plural case, this reasoning does not apply. If we know the French students arrived and that there are salient students, we cannot infer that the maximal set of student arrived – we still only know that the French ones arrived.[2]

16) The French students arrived.
There are salient students.
∴ The students arrived. INVALID

[2] A reviewer rightly points out that this conclusion may have to be reconsidered if plural definite descriptions carry an 'excluded middle' or all-or-nothing presupposition, as proposed for example in Löbner (2000).

We may thus alter the theory of NPI licensing to predict different licensing abilities for singular and plural:

17) An NPI is licensed in an environment that is Strawson DE, but not Strawson UE.

### *2.2 Existence presupposition*

As noted above, Giannakidou 2002, Hoeksema 2008 suggests that it is the presence or absence of the existence presupposition that determines whether licensing occurs. This is compatible with DE, Veridicality and other approaches to NPIs. Homer 2010 concurs with this view, claiming explicitly that referential uses of definites do not license NPIs, though he endorses a DE-view.[3]

18) Context: A number of students present at the party wanted to leave as soon as possible.

a. A: What happened, why is the party deserted?
b. B: *I forgot their names now, but the students who had any desire to leave the party left.
c. B': *The students who had any desire to leave the party, namely Sarah, Byron, and Michael left.

(Homer 2010)

Homer claims that when the presupposition is lifted the null object is allowed in the domain of the description. In that case, the null object may satisfy the existence presupposition even though there is no ordinary object in the extension. This permits the description to be

[3] A reviewer observes that the badness of 18)b,c derives more from the speaker having particular individuals in mind, rather than the existence presupposition itself. The reviewer finds the following conclusion to 18) greatly improved, though it still carries the existence presupposition:

(i) B: No doubt the students who had any desire to leave the party left.

strictly DE. The null object must be barred from introduction into the extension of singular description.

## 3. Some observations concerning these analyses

In this section, I make some observation that call into question the simple picture painted by the literature cited above. None of this literature pays attention to the topics sketched below: the nature of the predicate that applies to the definite description that contains the NPI, and the relationship of the issue of grammatical number to the count/mass distinction in noun phrases.

### *3.1 Distributive vs. collective predicates*

One issue that has not garnered much attention in this domain is the role of the predicate. One must realize, for example, that Strawsonian inferences like those in 13) only work because the main predicate of the sentence is distributive. A predicate P is distributive just in case P applies truly to an plural individual x just in case it applies to all contextually relevant parts of x.[4] When the predicate is genuinely collective, the inference does not go through. A genuinely collective predicate applies to plural individuals as wholes, rather than on the basis of the properties of their parts.[5]

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[4] For our purposes, we will discuss cases in which distribution is down to the atomic parts of an individual. In intermediate distributivity, there may be distribution to sub-pluralities.

[5] A reviewer observes that similar problems could arise with more distributive predicates. For example, we can say (i) truthfully even if a small subset of the linguists are not tall. Suppose the subset is the set of semanticists. Then we could not conclude that the semanticists are a tall bunch.

(i) The linguists are a tall bunch.

I leave the effect of definites' tolerance of exceptions on licensing for further research.

19) The linguistics students are a large group.
There are semantics students.
#∴The semantics students are a large group.
[The conclusion does not follow]

If we assume environment-based notion of NPI licensing, then to assess the licensing of an NPI in the restrictor of a definite description we must include the predicate that applies to the individual-denoting description as part of the environment. Thus, we seem to predict that whether or not a plural definite description licenses an NPI should depend on its environment: licensing will be successful when the definite is the argument of a distributive predicate, and unsuccessful when the argument of a collective predicate. The only question to be resolved is what the judgments are. Consider, for example, the following sentences with collective predicates.

20) a. The students with any knowledge of French are a good team.
b. The students with any knowledge of French surrounded the admin building.

At this point, I am not confident enough to pronounce on the appropriate judgments in these cases. The few informal intuitions that I have gathered suggest that these sentences are not significantly better or worse than the typical cases of 'licensing' in plural definite descriptions.

### *3.2 Entailment between individuals*

Recall that the scope-based notion of NPI licensing was excluded because the definite article does not denote the kind of function that can serve as the c-commanding licenser of the NPI. The output domain of the function, the domain of individuals, does not support a propositional notion of entailment. Similarly, a distributive predicate cannot serve as the c-commanding licenser because its input domain, the domain of individuals, does not support this notion ei-

ther. A possible response to this complaint is to allow NPIs in such environments to be licensed by a notion of entailment that extends to 'entailment' at the individual (type e) level.

There are potentially two ways to resolve entailment at the individual level. Consider entailment between predicates of type <e,t>. Talking loosely in terms of sets, one predicate P entails another Q just in case the extension of P is a subset of the extension of Q. We might similarly think to say that an individual a entails another b if a is an individual part of b – after all the in such a case the set of i-parts of a are a subset of the set of i-parts of b. Alternatively, we might observe that it is a typical property of entailment that an expression A *and* B entails both of its conjuncts, A and B. This would suggest, in contrast, that the plural individual John⊕Bill should entail John and entail Bill. Which of these two notions is correct?

I do not know which is correct (if either is), but it is clear which would be required if it were to predict any licensing. Since predicate entailment holds between A and B, respectively, when the extension of A is a subset of the extension of B, if the definite article is to reverse entailment, then ⊔B must entail ⊔A. In other words, the notion of entailment that preserves the connection between entailment and conjunction wins out.

21) a. ⟦ student ⟧ = {a,b,c}; ⟦ french student ⟧ = {a,b}
b. ⟦ french student(s) ⟧ ⊨ ⟦ student(s) ⟧
c. ⟦ the students ⟧ ⊨ ⟦ the french students ⟧, i.e.,
⊔{a,b,c} ⊨ ⊔{a,b}

If we adopted such a perspective, then licensing would be determined solely by the determiner and not affected at all by the choice of predicate. If we combined this individual-entailment perspective with the environment based approach, either the article or the predicate could be responsible for licensing.

We must bear this alternative perspective in mind when we consider the new data produced in sections 4 and 5 below.

*3.3 Mass and singular generics*

Finally, we turn to the compatibility of Hoeksema's (2008) observations about licensing singular definite descriptions with the theories of licensing we have discussed. Recall that Hoeksema produces examples of singular definite generics that appear to successfully license NPIs. To address these cases, it will be useful to discuss another category of data that have received little attention in this literature, specifically: the status of NPIs in singular mass definite descriptions.

Given the tight connection between mass and plural count domains (cf. The classic work of Link 1983) we should expect singular mass definite descriptions to behave similarly to plural count definite descriptions with respect to NPI licensing. Consider examples like the sentence below.

22) The gravel that had ever been used at superfund site was buried.[6]

The informal judgments that I have collected suggest that such sentences are relatively acceptable, again no better or worse than the best cases of licensing by plural definite descriptions.

In itself this is an interesting observation and worth further exploration; mass domains are similar to plural ones, but not identical. It may be useful to know that what differentiates the two does not affect licensing. I have another agenda, however, for bringing up such examples. The acceptability of such examples may have consequences for the analysis of the recalicitrant case of NPIs in singular definite generics that Hoeksema has emphasized. The proper analysis of singular definite generics is notoriously difficult. Nevertheless, Chierchia 1998 offers an account of singular generic definites that involves a shift to a mass term.

23) a. The tiger roars.
b. $\text{Gen}_{x,s}$ [member-of(x, $\underline{g(\iota\, \text{MASS(tiger)})}$ ) $\wedge$ C(x,s)]
[roar(x,s)]

[6] A superfund site in the United States is one that has been contaminated by radioactivity. One can easily imagine gravel being used in such a site, contaminated and then removed to another site. This facilitates the use of the NPI adverb *ever*. A reviewer finds this example ungrammatical.

Many features of this analysis require comment. Chierchia assumes that there is a shift operation that is available when required by context that converts a count noun denotation into a mass noun denotation. A precedent for this is Lewis's universal grinder (p.c. to Pelletier 1975). Chierchia uses a different operation, however, that fits his theory of mass/count. The operation MASS neutralizes the singular/plural distinction by taking the union of the atoms with the pluralities formed from them. The iota (a supremum operator) applies to this denotation yielding a plurality. Chierchia argues though that a singular noun phrase should not denote a plurality. So, he applies the group-forming operator g (similar to Landman's 1989 $\uparrow$) to the description yielding a group, which is an atomic individual. In Chierchia's theory $g \circ \iota$ is in fact the normal interpretation for the definite article with mass nouns. Then, the group is available to serve as the restrictor for a generic operator GEN. In order to do so, it is shifted to a predicate with the operator 'member of.'

I suggest that the presence of the operator MASS in Chierchia's analysis may be responsible for the apparently anomalous licensing of NPIs in singular generic definite descriptions. Note that the presence of MASS does not necessarily remove the existence presupposition of the definite description. Rather the part-whole structure introduced causes the description to behave similarly to plurals. The presence of the generic operator, however, does intensionalize the sentence and may cause the existence presupposition to be satisfied by non-actual situations. This may lend the construction the air of lacking an existence presupposition. In any event, at this point, this is just a suggestion for how one might maintain that in general singular (count) definite descriptions do not license NPIs in the face of apparent counterexamples like Hoeksema's (2008) example 4)b above.

### *3.4 Conclusion*

In this section, we have discussed some new data and ideas that bear on the issue of NPIs in definite descriptions. These data and ideas raise questions for the way that the phenomenon has been discussed in the literature. First, we have questioned whether we know for certain what the licenser is in these sentences, the definite article or the predicate. The choice has consequences for predictions about the distribution of NPIs in definite descriptions. Second, we have discussed an extension of the notion of entailment to types ending in e that affects what theoretical options are available for analysis and what they predict. With such a notion of entailment, scope-based theories of NPI licensers may after all apply to NPIs in definite descriptions. Finally, we have offered an analysis of licensing in singular generic definite descriptions that casts doubt on Hoeksema's criticisms of Strawson DE-based theories.

In the next sections, I discuss two judgments surveys that were conducted to shed light on the correct analysis of NPIs in definite descriptions. The first experiment deals with the judgments of NPIs in definite descriptions in comparison to NPIs in quantifiers of different monotonicities. The second experiments deals more directly with the issue of interactions between licensing of NPIs in definite descriptions with (i) grammatical number, i.e., singular and plural marking and (ii) the generic or episodic nature of the statement containing the description.

## 4. Experiment one: Comparing determiners

The first experiment addresses the acceptability of NPIs in definite descriptions relative to their acceptability in quantificational noun phrases that are headed by left upward or left downward monotone quantificational determiners.[7] The former are prototypical environment in which NPIs should not be licensed and the latter are proto-

[7] A reviewer wonders why definites are being compared to quantificational determiners, since these are likely of different types. I compare them assuming that they share similar syntactic structures and that it is possible that the definite determiner like the quantifiers may be a licenser. But see section 6 below.

typical licensing environments.[8] Judgments were elicited on a gradient scale to determine if the acceptability of NPIs in definite descriptions might have an intermediate status.

### *4.1 Participants*

This experiments was conducted in the spring of 2013 on a population of undergraduate students obtained from a class of LING 1010 Language and Mind taught by Prof. Harry van der Hulst at the University of Connecticut. Language and Mind is an introduction to the innateness hypothesis for language, its challenges and successes. The class is not a general introduction to linguistics, but students are exposed to the idea of a native speaker intuition. The students were not exposed in the class to the concept of a negative polarity item. The enrollment of the class was 684. The study was advertised to the entire class, but participation was not required. Instead, students were offered extra-credit for participation in the amount of half a regular homework assignment. Typically, approximately ten percent of the students in this course are non-native speakers of English. Non-native speakers were not discouraged to participate. Instead, students were asked to indicate on the survey whether or not they were native speakers. Students learned what it means to be a native speaker in class. 341 students elected to participate; all received extra-credit. 24 students were excluded from the study for identifying as non-native speakers or for failing to complete the survey. So the total number of subjects included in the study for analysis was 317.

[8] It should be noted that sometimes environments that 'should not' license NPIs – according to the Fauconnier/Ladusaw Hypothesis – actually do. See von Fintel (1999) for discussion of *only* and others. The controls in the experiments are rather uncontroversial, however.

### *4.2 Data Sets*

This experiment compared the ratings of three determiners as licensers of NPIs. The NPI used in all test items was *ever*. There were several reasons for using *ever*. The first is that it is a prototypical weak NPI. That is, among the different kinds of NPIs, *ever* has a very liberal distribution appearing in merely downward entailing environments that do not meet the conditions of stronger kinds of negation, cf. Zwarts 1998, Gajewski 2011. The second reason for using *ever* is that, unlike *any* – the other prototypical weak NPI, *ever* does not permit free choice readings outside of negative environments.[9] So, we can be confident that if an occurrence of *ever* is acceptable it is because it occurs in a suitably negative environment.

The three determiners compared were *no*, a prototypical left downward monotone NPI licenser; *some*, a prototypical left upward monotone non-licenser and *the*, the determiner of interest. All items were presented in a context meant to satisfy the existence presupposition of the definite. There were 18 separate data items with 6 different conditions each. The data sets included sentences without NPIs as controls.

24) **Sample Data Set**

a. Context: Researchers conducted a study of the economic effect of hosting the Olympics.
b. Control items:
   i. **Some** nations that have hosted the Olympics are experiencing growth.
   ii. **The** nations that have hosted the Olympics are experiencing growth.
   iii. **No** nations that have hosted the Olympics are experiencing growth.
c. Test items:

[9] *Ever* does, however, have certain very limited and often archaic-sounding uses outside NPI-licensing environments, e.g., *it was ever thus*, *ever so tired*, *ever the optimist*.

i. **Some** nations that have ever hosted the Olympics are experiencing growth.
ii. **The** nations that have ever hosted the Olympics are experiencing growth.
iii. **No** nations that have ever hosted the Olympics are experiencing growth.

Complete experimental materials are available by request to the author.

### *4.3 Surveys*

The items were presented to the participants in scripts that were fully counterbalanced in a Latin Square design. Participants saw sentences from three different items for each experimental condition. Participants only saw one sentence from each item to prevent them from developing strategies by directly comparing sentences. The test items were mixed with filler items; there were twice as many fillers as test items. The filler items included test items from a different experiment. Test items and fillers were presented to subjects in pseudo-randomized order, e.g., there were no test items in the first five sentences presented. There were 24 different scripts assigned randomly to the participants.

The surveys were conducted offline. Participants were given a sheet with instructions and the experimental data, as well as a bubble sheet on which they entered their judgments. Students were allowed to take the survey home, complete it in their own time and return it to class the following week. Ratings were given on a Likert scale of 1 to 5, 1 being described as "sounding completely natural" and 5 being described as "sounding completely unnatural".

### *4.4 Results and Analysis*

Below find Table 13.1 summarizing the means and modes for the control items, i.e., the sentences containing NPs headed by

*no*, *the* and *some*, but no NPIs. The participants' judgments of the sentences with *some* (mean = 1.85) and *the* (mean = 1.86) were indistinguishable. The sentences with negative determiners, however, received lower ratings. This was surprising, but does not affect the results that were obtained with the test items below.

| **Determiner** | **Mean** | **Mode** |
|---|---|---|
| No | 2.50 | 2 |
| The | 1.86 | 1 |
| Some | 1.85 | 1 |

**Table 13.1 Summary of means and modes for control items**

Table 13.2 below summarizes the means and modes for the test items, i.e., the sentences containing NPIs in the restrictors of noun phrases head by *no*, *the* and *some*. Here we see a new order induced in the items by determiner. Sentences with *no* are the best-rated (mean = 2.85), sentences with *the* are the second-best (mean = 3.02) and sentences with *some* are the worst (mean = 3.32).

| **Determiner** | **Mean** | **Mode** |
|---|---|---|
| No | 2.85 | 2 |
| The | 3.05 | 3 |
| Some | 3.32 | 4 |

**Table 13.2 Summary of means and modes for test items**

Figure 13.1 below provides additional information displaying distributions of judgments for each of the three experimental conditions in the test items.

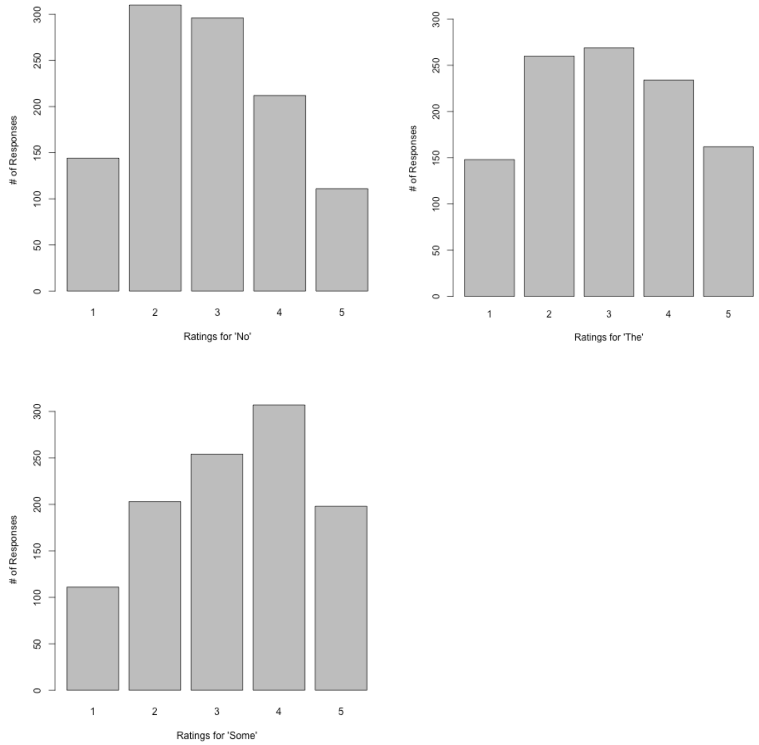


**Fig. 13.1 Bar Charts of Ratings of Test Items by Determiner**

Statistical analysis reveals that these distinctions among the test items are in fact statistically significant. Running a one-way ANOVA on the test items uncovered the following: the difference in mean judgment between the three groups was significant at the p<.001 level. F(2,2859)=35.48, p=6.013e-16. This established that the means of the three groups were not the same.

Additional post-hoc testing is required to confirm that each pair of means are distinct from each other. Tukey post-hoc comparisons of the three groups indicate that sentences with *no* ($M$ = 2.85, 95% CI [2.78, 2.93]) were judged significantly better than sentences with *the* ($M$ = 3.05, 95% CI [2.97, 3.13]), $p$ = .001, which in turn were judged significantly better than sentences with *some* ($M$ = 3.32, 95% CI [3.25, 3.40]), $p$ < .001. The figure below illustrated the means for the test items with their error bars.

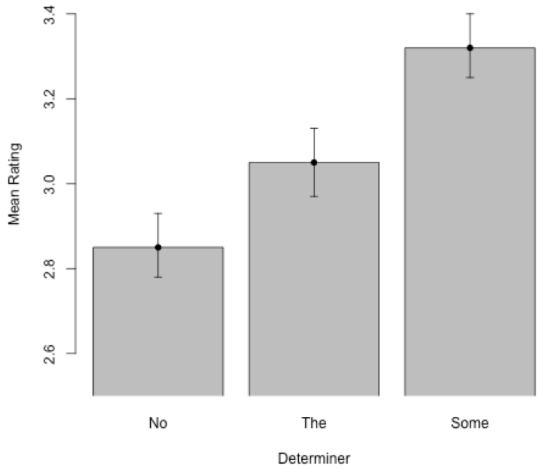


**Fig. 13.2 Means for test items with error bars**

## 5. Experiment Two: Plurality and Genericity

The second experiment addresses the effect of grammatical number and genericity on the licensing of NPIs in definite descriptions. To test for the effect of genericity, the difference between licensing in simple present (typically generic) and present progressive sentences (typically episodic) is tested. The reason to test generics is Hoeksema's 2008 observation about the facilitating role of genericity.

### *5.1 Participants*

The second experiment was conducted on Amazon Mechanical Turk (AMT) in Spring 2013. The participants were AMT workers, who were awarded $0.5 USD for completing the survey. 192 workers' responses were accepted and compensated. Non-native speakers were not excluded from participation and compensation. This less-

ens the chance that workers will lie about their native speaker status. 20 of the approved workers were excluded for identifying as non-native speakers or for completing the survey more than once. The final number of subjects was 172.

### *5.2 Data Sets*

This experiment used a complete factorial 2x2 design. The two factors were number (singular vs. plural) and genericity. I attempted to control for genericity using tense, assuming that simple present favors and present progressive disfavors a generic reading. Again the only polarity item used in the experiment was *ever*. There were 24 separate items with 8 conditions each. Again, the items included control sentences that lack NPIs.

25) **Sample Data Set**

a. Control items:

i. The student**s** who have taken calculus are selling their books.

ii. The student who has taken calculus is selling her books.

iii. The student**s** who have taken calculus sell their books.

iv. The student who has taken calculus sells her books.

b. Test items:

i. The student**s** who have ever taken calculus are selling their books. [PL, -GN]

ii. The student who has ever taken calculus is selling her books. [SG, -GN]

iii. The student**s** who have ever taken calculus sell their books. [PL, +GN]

iv. The student who has ever taken calculus sells her books. [SG, +GN]

### *5.3 Surveys*

The items were presented to the participants in scripts that were fully counterbalanced in a Latin Square design. Participants saw sentences from three different items for each experimental condition. Participants only saw one sentence from each item. The test items were mixed with filler items; there were twice as many fillers as test items. Test items and fillers were presented in pseudo-randomized order. Each participant saw the items in a unique order. To create these lists, the Python Turkolizer from Edward Gibson's lab at MIT was used (http://tedlab.mit.edu/software/).

The surveys were conducted on the AMT website. Workers were allowed one hour to complete the survey. The average time to completion was 20 minutes. Ratings were on a 5-point scale: 'completely unnatural'(1), 'somewhat unnatural' (2), 'possible'(3), 'somewhat natural'(4), 'completely natural'(5). Note that this is an inversion of the scale in the first experiment.

### *5.4 Results and Analysis*

In Tables 13.3 and 13.4 below find the means and modes for the control items and test items respectively. The modes are not particularly informative since it was 2 for all items. There are differences however in the means.

| Determiner | Mean | Mode |
|---|---|---|
| SG, -GN | 3.11 | 2 |
| PL, -GN | 3.25 | 2 |
| SG, +GN | 3.06 | 2 |
| PL, +GN | 3.12 | 2 |

**Table 13.3 Summary of means and modes for control items, Experiment 2**

| Determiner | Mean | Mode |
|---|---|---|
| SG, -GN | 2.52 | 2 |
| PL, -GN | 2.90 | 2 |
| SG, +GN | 2.62 | 2 |
| PL, +GN | 2.79 | 2 |

**Table 13.3 Summary of means and modes for control items, Experiment 2**

The presence of NPIs in the test items produced an overall lowering in ratings. For more information on the test items, see the distributions for their ratings in Figure 13.3.

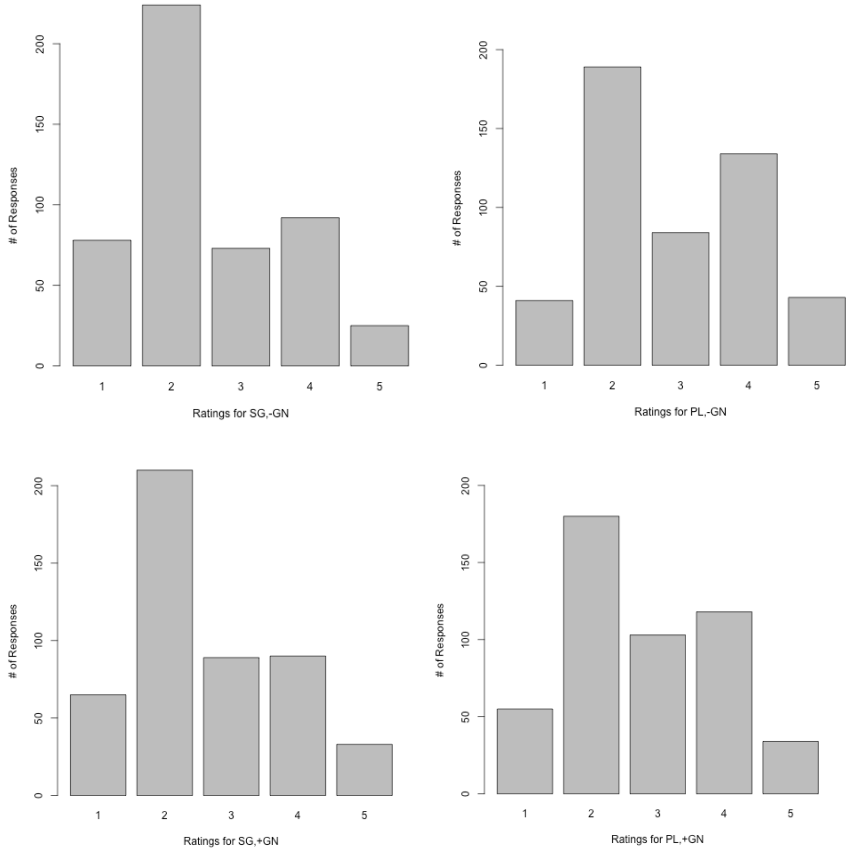


**Fig. 13.3. Bar Charts of Ratings of Test Items by Number and Tense**

Notice that there is a depression in the middle of the distribution of all four test items. Such a trend was found across all items. I hypothesize that participants may not have seen the relation of the description "possible" for rating 3 to the "completely un/natural" descriptions for ratings 1 and 5.

Nevertheless, there are some trends in the data that are worth taking note of. In particular, there was a preference for the plural test items over the singular test items: [SG,-GN] mean = 2.52, [PL,-GN] mean = 2.90; [SG,+GN] mean = 2.62, [PL,+GN] mean = 2.79 While this trend is also present in the control items, it is more pronounced in the test items. On the other hand, there is no apparent preference for the generic items over the episodic items. In Figure 13.4 below find the means of the test items displayed with error bars.

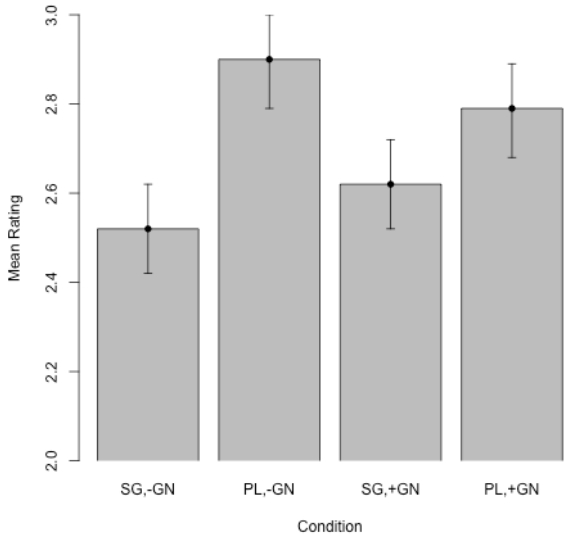


**Fig. 13.4. Means for test items with error bars**

I ran a two-way ANOVA on the test items and found the following: There was a strongly significant main effect of number, showing that plural items were higher rated than singular items at the p<.001 level. F(1,1956) = 28.35, p=1.13e-07. There was no main effect of the main clause tense type, simple present vs. present progressive. There was a marginally significant interaction effect of number and tense at the p<.05 level. F(1,1956) = 4.36

| | Df | Sum Sq | Mean Sq | F-Value | Pr(>F) |
|---|---|---|---|---|---|
| Number | 1 | 36.53 | 36.53 | 28.3452 | 1.132e-07 |
| Genericity | 1 | 0.00 | 0.001 | 0.0007 | 0.97916 |
| Num:Gen | 1 | 5.63 | 5.625 | 4.3646 | 0.03682 |
| Residuals | 1956 | 2520.98 | 1.289 | | |

**Table 13.5 The table for the two way ANOVA with interactions**

I looked at an additional interaction to see if the preference for plurals over singulars showed any interaction with the distinction between control and test items. In particular, I ran a two-way ANOVA with interactions in which number and control/test were used as factors. As expected, there were highly significant main effects of number and of the control/test distinction. Importantly, there was also a significant interaction effect (p=.002) between number and control/test, indicating that the preference for plurals among the test items is greater than that among the control items.

| | Df | Sum Sq | Mean Sq | F-Value | Pr(>F) |
|---|---|---|---|---|---|
| Number | 1 | 25 | 25.0 | 18.89 | 1.42e-05 |
| Test | 1 | 825 | 824.5 | 622.24 | < 2e-16 |
| Num:Test | 1 | 12 | 12.3 | 9.29 | 0.00232 |
| Residuals | 3915 | 5188 | 1.3 | | |

**Table 13.6 The table for the two way ANOVA with interactions**

## 6. Discussion

The result of Experiment 1 suggests that definite determiners fail to license negative polarity items to the same degree as prototypical li-

censers such as the negative determiner *no*.[10] At the same time, they are not as poor as upward monotone determiners as licensers. They appear instead to have an intermediate status as licensers of NPIs. One must be careful not to overstate what conclusions can be drawn from this judgment survey.

There are some conclusions though that seem to suggest themselves. In particular, it seems that we should not seek to make licensing in definite descriptions an example of the normal case. That is, we do not want to change our theory to write a licensing condition that applies equally to typical negative environments and to the restrictors of definite descriptions. On the face of it, this appears to favor theories that treat licensing in definite descriptions, even plural ones, as a special case. For example, this may favor theories that require cancellation of a presupposition for licensing in this case, or make use of a secondary licensing relation. Homer's (2010) theory that requires the exceptional introduction of a null element into a noun extension may be a theory of this kind, although we need to know more about what conditions allow such introductions. On the other hand, the sentences in Experiment 1 were presented in contexts that would satisfy their existential presuppositions. So, if cancellation were necessary, we might expect judgments more like we found or the upward monotone environments.[11]

Conversely, these results may raise questions for theories that use Strawson DE as the condition that licenses NPIs. In such theories licensing in definite descriptions is treated on a par with licensing in other environments. Minimally, such theories make the prediction that licensing in plural definites should be similar to licensing in other environments that carry existence presupposition – this would include most of the environments that motivated Strawsonian theories. In this experiment, other merely Strawson DE licensers like *only* were not included. A possible direction for future

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[10] A reviewer kindly points out that this result converges with corpus studies such as Hoeksema (2012) that show that despite being very frequent, definite determiners are rare licensers of NPIs.

[11] Horn 2013 points to the importance of existence inferences in NPI-licensing definites by comparing *the* to *the only*:

(i) The *(only) man who could ever reach me was the son of a preacher man.

research would be to compare ratings for NPIs in definite descriptions with other such Strawson DE licensers.

Experiment 2 provides support for a differentiation of singular and plural definite descriptions as licensers, especially in episodic environments. At this point, experiment 2 provides no further information concerning the effect that genericity has on licensing in definite descriptions.

### *6.1 Future Experiments*

There are many loose ends and many data points that could benefit from systematic investigation. In particular it would be valuable to conduct judgment surveys concerning (i) the effect of collectivity on licensing in definite descriptions, (ii) the acceptability of NPIs in singular definite mass terms, and (iii) other methods for controlling for generic readings and existence presuppositions and their effect on licensing.

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