

Remarks: Another look at the acceptability of bare singular NPs in episodic sentences in Brazilian Portuguese

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Abstract: Bare (determiner-less) singular NPs in Brazilian Portuguese have been variously analyzed as indefinite terms, as kind terms, or as ambiguous between the two. It has furthermore been noted (Schmitt and Munn 1999, and subsequent literature) that bare singulars, unlike bare plurals, are degraded in the preverbal subject position of episodic sentences, but that their acceptability is improved when they are embedded inside a list. We conducted an experimental study examining the effect of NP type, syntactic position and list context on the acceptability of bare NPs in Brazilian Portuguese. Our results indicate that the low acceptability of bare singulars in subject position of episodic sentences results from the additive effects of three separate factors, rather than from a constraint against bare singulars in subject position. Implications of these findings for theories of bare NP interpretation in Brazilian Portuguese are discussed.

Keywords: bare plurals, bare singulars, Brazilian Portuguese, existential interpretation, kind-

*Acknowledgements: We gratefully acknowledge the financial support of the University of Illinois Lemann Institute for Brazilian Studies for the collaborative research reported here. We would like to thank Ra ssa Silva Santana, the second author's research assistant, for help with the test materials and participant testing. We are very grateful to Joe Roy and Marissa Barlaz for statistical consulting, and to two anonymous reviewers for their helpful comments and suggestions. All remaining errors are our own.

reference

1 Introduction

Brazilian Portuguese (BrP) is quite unique among Romance languages in that it allows count NPs in argument position to occur in the bare singular form, with no article or other determiner. This phenomenon has been explored by, among others, Schmitt and Munn (1999, 2002); Munn and Schmitt (2001, 2005); Müller (2002, 2003); Müller and Oliveira (2004); Dobrovie-Sorin and Pires de Oliveira (2008); Dobrovie-Sorin (2010); Pires de Oliveira and Rothstein (2011, 2013); and Pires de Oliveira (2012); as well as the experimental work of Pires de Oliveira, Coelho da Silva and Silveira (2010) and Ionin, Montrul and Santos (2011). Much of this literature investigates whether bare singulars are allowed to have kind-reference, a point on which there is some disagreement, as will be discussed in more detail below.

It has also been observed in the literature that bare singulars are degraded in the subject position of episodic sentences in BrP. While this basic fact is uncontroversial, the reasons behind the relative unacceptability of bare singular subjects are not fully understood, as will be discussed below. The goal of this paper is to use experimental methodology to tease apart different factors that may contribute to the (un)acceptability of bare singulars in episodic sentences. We ask whether there is a constraint specifically against bare singulars in subject position, or whether the relative unacceptability of bare singular subjects results from a combination of other factors. Our findings point toward the latter conclusion; based on our data, we argue that the low acceptability of bare singular subjects of episodic sentences stems from several pragmatic / information-structure constraints operating independently. Our findings are quite compatible with the main approaches to bare singulars in BrP, including work by Schmitt and Munn (1999, 2002, and subsequent

literature) and by Pires de Oliveira and Rothstein (2011, 2013), and do not allow us to tease apart these different competing theories. Instead, our findings, by providing evidence that there is no grammatical constraint against bare singulars in subject position, lay the groundwork for further investigation into the status of bare singulars.

2 Background: the distribution of bare singular NPs in Brazilian Portuguese

2.1 Bare singulars with generic and kind readings

Much prior literature on BrP bare singulars has focused on whether or not they have kind readings available to them. As discussed by Krifka et al. (1995), indefinite NPs can receive generic readings via binding by a generic operator, in a generic or characterizing sentence such as *Cats like milk / A lion is a dangerous animal*. Additionally, some NP/DP types can refer to kinds at the level of the NP/DP, as evidenced by compatibility with a kind predicate (e.g., *Dodo birds are extinct*).

In the case of BrP, the ability of bare singulars (and bare plurals) to occur in generic sentences is fairly uncontroversial; some examples are given in (1).

- (1) a. Criança lê revistinha.
child read.3SG comic book
'Children read comic books.' [Schmitt & Munn 2002 :186]
- b. Crianças lêem revistinhas.
child.PL read.3PL comic book.PL
'Children read comic books.' [Schmitt & Munn 2002 :186]
- c. Cachorro é bom companheiro.
dog be.SG good companion
'Dogs are good companions' [Müller 2003 :78]

However, there is disagreement on whether bare NPs in BrP have kind readings available to them. According to Schmitt and Munn, both bare singulars (2a) and bare plurals (2b) are compatible with kind predicates (this judgment is also shared by Dobrovie-Sorin and Pires de

Oliveira [2008], as well as Rothstein and Pires de Oliveira [2011]). Müller (2002, 2003) disagrees with these judgments, arguing that both bare singulars (2c) and bare plurals (2d) are *not* compatible with kind predicates. Schmitt and Munn (2004) point out that in examples such as (2c-d), the fact that the predicate *be extinct* contains *estar* means that it is a stage-level, episodic predicate; they explain (2c-d) by the fact that bare singulars are degraded in subject positions of episodic predicates (see the next section), rather than by their incompatibility with kind readings.

- (2) a. No ano 2030, gavião-real vai estar extinto.
 in-the year 2030 hawk-royal go.3SG be.INF extinct.SG
 ‘In the year 2030, royal hawks will be extinct.’ [Schmitt & Munn 2002 :187]
- b. No ano 2030, gaviões-reais vão estar extintos.
 in-the year 2030 hawk-royal.PL go.3PL be.INF extinct.PL
 ‘In the year 2030, royal hawks will be extinct.’ [Schmitt & Munn 2002 :187]
- c. *Panda logo estará extinto.
 panda soon be.FUT.SG extinct.SG [Müller 2002 : 285]
- d. *Pandas logo estarão extintos.
 panda.PL soon be.FUT.PL extinct.PL [Müller 2002 : 285]

Ionin et al. (2011) conducted an experimental study to determine whether bare singulars and bare plurals in BrP have generic and kind readings available to them. They found that bare plurals were fully compatible with kind predicates, as well as able to occur in generic sentences; bare singulars were generally accepted to a lower extent than bare plurals, and received lower ratings with kind-reference than in generic sentences. In contrast, Pires de Oliveira (2010) presented findings from both corpus data and an experimental study suggesting that BrP bare singulars *are* compatible with kind-reference.

2.2 Bare singulars with existential readings

Bare singulars in BrP can also occur in episodic sentences, where they receive an existential interpretation (3); bare plurals can also be used in this environment (4). As shown in (3a), bare

singulars trigger singular agreement on the verb, yet they are compatible with plural as well as singular interpretations of the NP, as indicated by their compatibility with both singular and plural pronouns in (3c).

- (3) a. Chegou criança.
 arrive.PAST.PERF.3SG child
 ‘A child/children arrived.’ [Schmitt & Munn 2002 :187]
- b. Ele comprou computador.
 he buy.PAST.PERF.3SG computer.
 ‘He bought a computer/computers.’ [Schmitt & Munn 2002 :187]
- c. Eu vi criança na sala. E ela estava/ elas estavam ouvindo.
 I saw child in-the room. and she be.SG / they be.PL listening
 ‘I saw a child/children in the room. And she was/they were listening.’
 [Schmitt & Munn 2002 :187]
- (4) a. Chegaram crianças.
 arrive.PAST.PERF.3PL child.PL
 ‘Children arrived.’ [Schmitt & Munn 2002 :187]
- b. Ele comprou computadores.
 he buy.PAST.PERF.3SG computer.PL
 ‘He bought computers.’ [Schmitt & Munn 2002 :187]

As noted by Schmitt and Munn (1999, 2002), bare singulars are somewhat degraded in the preverbal subject position of episodic sentences. Episodic sentences include the *estar* copular construction (see (2c-d)), as well as sentences with a past perfective verb, as in (5a) (compare to (5b), with a bare plural). In contrast, bare singulars are quite well-formed in postverbal subject and object positions of episodic sentences (3b-c), and they are also fine as subjects of imperfective verbs (where the reading is habitual rather than episodic). Schmitt and Munn (1999, 2002) further note that acceptability of bare singulars in the subject position of episodic sentences improves when the bare singular is embedded in a ‘list’ context, as in (5c), or occurs with elements that are associated with focus. Schmitt (1996) notes that in contexts of specific reference to individuals,

the bare singular is also degraded in object position, and that focus and negation improve acceptability in such contexts as well, while there is no corresponding effect for bare plurals.

- (5) a. ?Mulher discutiu as eleições.
 woman discuss.PAST. PERF.3SG the election.PL
 [Schmitt & Munn 2002 :187]
- b. Mulheres discutiram as eleições.
 woman.PL discuss.PAST. PERF.3PL the election.PL
 ‘Women discussed the elections.’ [Schmitt & Munn 2002 :187]
- c. Mulher discutiu as eleições, homem
 woman discuss.PAST. PERF.3SG the election.PL man
 discutiu futebol...
 discuss.PAST. PERF.3SG soccer
 ‘Women discussed the elections, men discussed soccer...’
 [Schmitt & Munn 2002 :187]

2.3 Analyses of BrP Bare Singulars

There are several distinct types of analyses of BrP bare singulars. Müller (2002, 2003), assuming kind readings to be unavailable to bare NPs in BrP (see (2c-d)) analyzes them as indefinite terms. Schmitt and Munn (1999, 2002) analyze bare singulars as DPs with an empty D position and no Num projection (hence the number-less nature of bare singulars); for them, bare singulars (like bare plurals) are names of kinds, and receive existential readings by means of type-shifting (see Chierchia 1998). Schmitt and Munn (1999, 2002) suggest that the relative unacceptability of bare singulars in subject position of episodic sentences (5a), and the improvement via list and focus (5c-d), are due to information structure and the intonational contour of the clause. They conclude that bare singulars, like bare plurals, are freely available with kind, generic and existential readings in BrP (unlike in other Romance languages), and do not address the question of exactly how information structure accounts for the facts in (5). Finally, Pires de Oliveira and Rothstein (2011, 2013) analyze bare singulars as kind-denoting atomic mass nouns, which cannot be type-shifted

and cannot have a true existential interpretation; they analyze bare plurals as plural predicates, which can be type-shifted to either kind or existential readings. Pires de Oliveira and Rothstein (2011) agree with Schmitt and Munn (1999, 2002) that list and focus (as in (5c-d)) have a facilitating effect on bare singulars in subject position; for Pires de Oliveira and Rothstein, this facilitating effect is due to list and focus facilitating the kind reading of bare singulars. Pires de Oliveira and Rothstein (2013) furthermore point out that embedding in a list improves the acceptability of bare singulars not just in subject position, but in object position as well (an observation also made by Schmitt [1996], as noted above).¹

To sum up, the literature agrees that bare singulars are degraded in subject position, and sometimes in object position as well. For Schmitt and Munn (1999, 2002), bare singulars become quite acceptable as long as the right information-structure context is provided. For Pires de Oliveira (2012), the behavior of bare singulars points to their status as kind terms rather than indefinites. Both accounts assume bare plurals to be fully acceptable in subject as well as object positions of episodic sentences, with no special context (list or focus) required.

Further complicating matters is the fact that bare plurals and bare singulars tend to belong in different registers. Müller (2002) suggests that bare plurals belong to the written register, while bare singulars are common in the oral register. Munn and Schmitt (2005, footnote 3) also point to this stylistic difference, while noting that neither form is restricted to one register or the other. Ionin et al. (2011) found that bare singulars were rated lower than bare plurals even in generic

¹ We do not consider the proposal of Pires de Oliveira and Rothstein in detail, given that it relies on very subtle judgments concerning when bare singulars are grammatical, judgments with which other native speakers of BrP (including the second and third authors of this paper, as well as an anonymous reviewer) have disagreed.

sentences, where they are assumed to be perfectly fine by the literature; Ionin et al. attribute the somewhat lowered ratings of bare singulars to the written, formal nature of the test in their study.

3 Research goals

This study was motivated by the question of exactly what makes bare singulars unacceptable or degraded in episodic sentences. Pilot testing revealed that bare singulars were rated quite high in generic sentences (both subject and object position), consistent with the claims in the literature, but that they were rated low (relative to bare plurals) in both subject and object positions of episodic sentences with perfective verbs, again consistent with the claims in the literature. In our experimental study, we sought to tease apart the relative contributions of three different factors to the status of bare NPs in BrP (NP type, syntactic position, and embedding in a list context). Before proceeding to a discussion of our study, we first spell out our assumptions about what an Acceptability Judgment Task (the instrument used in our study) can in principle tell us about grammaticality.

3.1 Grammaticality vs. acceptability

As discussed above, the literature on Brazilian Portuguese agrees that bare singulars in subject position are degraded, i.e., unacceptable. What is far from clear, however, is whether they are actually ungrammatical, vs. unacceptable due to a combination of non-grammatical factors, such as register and information structure (as indeed Schmitt and Munn suggest). We argue that our experimental design can address this question.

As discussed by Cowart (1997), an experiment can never directly measure (un)grammaticality, which is an abstract concept: every sentence is either grammatical or ungrammatical in a given speaker's mental grammar. Instead, experiments can measure (un)acceptability, by addressing

whether sentence type A is more or less or equally acceptable relative to sentence type B. There can be many reasons for a contrast of acceptability: grammaticality is one such reason (e.g., sentence A is grammatical and sentence B is not), but there are also other possible reasons, traceable to non-grammatical factors such as processing, information structure, or stylistic preferences, among others. A factorial design allows researchers to address the reasons for why some sentence types are less acceptable than others, by carefully manipulating two (or more) factors. For example, Sprouse, Wagers and Phillips (2012) used a factorial design to examine whether island effects are due solely to difficulty with processing, or whether they result from a grammatical constraint. Specifically, Sprouse et al. started with the assumption that there are two distinct processing costs involved in processing a sentence with a *whether*-island: the cost of a long-distance *wh*-dependency, and the cost of processing *whether*-clauses. One possibility is that these two processing costs have a linearly additive effect: native speakers judge *whether*-islands as unacceptable because of the combined effects of two distinct processing difficulties. An alternative possibility is that *whether*-islands involve a grammatical violation, in which case they should exhibit a super-additive effect: the unacceptability of *whether*-islands is greater than what would result from the combined cost of processing a *wh*-dependency and that of processing a *whether*-clause. This second possibility – a super-additive rather than a linearly additive effect – was supported by the data. We apply the same logic to the status of bare singulars in BrP, except that instead of processing costs, we suggest that considerations of register and information structure may be responsible for lowered acceptability.

3.2 Additive or super-additive effects with bare singulars in BrP

Our main goal is to determine whether NP type and NP position have a linearly additive effect, or a super-additive one. Let us consider first the possibility of linearly additive effects. On this possibility, there is nothing special about bare singulars in subject position, but rather, we have two separate factors working together: bare singulars are generally dispreferred to bare plurals (e.g., for stylistic or register reasons); and bare NPs are generally dispreferred in subject position relative to object position (perhaps due to information structure considerations). These two factors, each one operating independently, conspire to make bare singulars in subject position the least acceptable. Figure 1 depicts a possible pattern of results predicted under linearly additive effects.

[INSERT FIGURE 1 ABOUT HERE]

Alternatively, it is possible that we are dealing instead with a super-additive effect: it is possible that only bare singulars, and not bare plurals, are worse in subject position than in object position; it is possible that bare plurals are perfectly fine in both positions. Such a result would suggest that there is some kind of a constraint, possibly a grammatical one, against bare singulars in subject position.² One possible pattern of super-additive effects is represented in Figure 2.

[INSERT FIGURE 2 ABOUT HERE]

² As pointed out by an anonymous reviewer, a super-additive effect does not necessarily mean that there is grammatical constraint (the super-additivity could be due to a different source). However, super-additivity is a necessary condition for the existence of a grammatical constraint; given that our study fails to find super-additivity, as discussed below, we can reasonably conclude that there is no grammatical constraint present for the phenomena that we are investigating.

In addition to the role of position and NP type, there is also the question of whether embedding in a list context improves the acceptability of only bare singulars, or of bare plurals as well, and of whether list ameliorates NPs in both subject and object position. It is possible, in principle, that we would obtain a super-additive effect in the absence of a list context, but a linearly additive effect in the presence of a list context: this is expected if the constraint against bare singulars in subject position operates only in the absence of a list context.

To sum up, our goal in this paper is not to tease apart the predictions of competing theories, but instead to tease apart the different factors that potentially contribute to the lowered acceptability of bare singulars in BrP. By doing so, we hope to answer the question of whether BrP bare singulars in subject position are ungrammatical (in which case we should obtain a super-additive effect, as in Figure 2), or whether they are unacceptable due to several extra-grammatical factors (in which case we should obtain a linearly additive effect, as in Figure 1).

4 Methods

4.1 Test instrument

The test instrument was a contextualized Acceptability Judgment Task (AJT), in which each item consisted of a very brief story followed by the target sentence. Participants were asked to rate the acceptability of the sentence in the context of the story on a scale from 1 (unacceptable) to 4 (acceptable). The AJT had a 2X3X3 design, crossing the factors of NP number (2 levels: single-NP vs. list-NP), syntactic position (3 levels: preverbal subject vs. postverbal object vs. postverbal inside the *there*-construction), and NP type (3 levels: bare singulars vs. bare plurals vs. *some*-plurals). NP number was a between-subjects factor, while position and NP type were within-subjects factors.

In the single-NP version of the AJT, the target NP consisted of just one lexical NP, while in the list-NP version, the target NP consisted of a conjunction of two or three NPs that formed a ‘list’.³ The three syntactic positions corresponded to preverbal subject (6), postverbal object (7), and postverbal position inside the *there*-construction (8). The three NP types that were tested corresponded to bare plurals, bare singulars, and plurals containing the determiner *alguns/algumas* ‘some.PL’ (henceforth *some*-plurals), as shown in (6b-c), (7b), and (8b) for the single-NP version, and in (6d), (7c), and (8c) for the list-NP version. The *some*-plurals were a control condition, to ensure that a normal, non-bare indefinite was fully acceptable in our test contexts.

(6) Subject position:

- a. *context*: Hoje de manhã voltei da viagem de formatura que fiz com a minha escola. Foi muito divertido! Pena que algumas pessoas acabaram pegando uma virose.
 ‘This morning I came back from the graduation trip I took with my school. It was so much fun! Sadly, some people ended up catching a virus.’

Target sentences, Single-NP version:

- b. Aluno ficou muito doente.
 Student get.PAST.PERF.3SG very sick
 ‘Students got very sick.’
- c. Alunos / Alguns alunos ficaram muito doentes.
 student.PL / some.PL student.PL get. PAST.PERF.3PL very sick.3PL
 ‘Students / some students got very sick.’
- d. *Target sentences, List-NP version:*
 Aluno, professor e funcionário / Alunos, professores e funcionários /
 student professor and staff student.PL professor.PL and staff.PL

³ The list contexts discussed in the literature (e.g., (5c)) involve a conjunction of two VPs. However, in the judgments of the second and third authors of this paper (native speakers of BrP), a ‘list’ resulting from the conjunction of two or more NPs also has a facilitating effect on the acceptability of bare singulars. We therefore opted for NP-conjunction rather than VP-conjunction, in order to keep the target sentences shorter and more manageable. We note that the facilitative effect of NP-conjunction on acceptability of bare singular forms has been observed for languages other than BrP, including English, Spanish and French (see, e.g., Heycock and Zamparelli [2003]; Camacho [2003]; Roodenburg [2004]; Le Bruyn and de Swart [2014]).

Alguns alunos, alguns professores e alguns funcionários
 some.PL student.PL some.PL professor.PL and some.PL staff.PL
 ficaram muito doentes.
 get.PAST.PERF.3PL very sick.3PL
 ‘Students, teachers and staff / some students, some teachers and some staff got very sick.’

(7) Object position:

- a. *context:* Edith é uma professora muita criativa e sempre leva atividades diferentes para os alunos. Os alunos dela adoraram as atividades da semana passada. ‘Edith is a very creative teacher and always brings different activities for her students. Her students loved last week’s activities.’
- b. *Target sentences, Single-NP version:*
 Ela levou desenho / desenhos / alguns desenhos para a aula.
 She bring.PAST.PERF.3SG picture/ picture.PL / some.PL picture.PL to the class
 ‘She brought pictures / some pictures to class.’
- c. *Target sentences, List-NP version:*
 Ela levou desenho, mapa, e cubo mágico /
 she bring.PAST.PERF.3SG picture map and cube magic
 desenhos, mapas, e cubos mágicos / alguns desenhos,
 picture.PL map.PL and cube.PL magic.PL some.PL picture.PL
 alguns mapas, e alguns cubos mágicos para a aula.
 some.PL map.PL and some.PL cube.PL magic.PL to the class
 ‘She brought pictures, maps and magic cubes / some pictures, some maps and some magic cubes to class.’

(8) *There*-construction:

- a. *context:* Jennifer ouviu um barulho à noite e foi lá fora ver o que era. Ela encontrou lixo pelo quintal, e suas latas de lixo estavam viradas. O motivo era óbvio. ‘Jennifer heard a noise at night, and went out to investigate. She found trash all over her backyard, and her garbage bins were overturned. The reason was obvious.’
- b. *Target sentences, Single-NP version:*
 Tinha rato / ratos / alguns ratos dentro do lixo.
 Have rat rat.PL some.PL rat.PL inside of-the garbage
 ‘There were rats / some rats inside the garbage.’
- c. *Target sentences, List-NP version:*
 Tinha rato e camundongo / ratos e camundongos / alguns ratos
 have rat and mouse rat.PL and mouse.PL some.PL rat.PL
 e alguns camundongos dentro do lixo.

and some.PL mouse.PL inside of-the garbage
'There were rats and mice / some rats and some mice inside the garbage.'

Twelve token sets were created for each condition, and distributed across three test lists for each version, using a Latin-square design. Within each test list, there were four tokens per condition (where *condition* refers to a combination of context and NP type: e.g., subject position with bare plural, subject position with bare singular, and so on). Each test list thus contained a total of 36 target items corresponding to nine different conditions. There were a total of six test lists, three for the single-NP version and three for the list-NP version of the AJT.

In addition to the 36 target items, each test list also contained 24 items testing bare and non-bare NPs in generic and kind-reference contexts (not discussed here, but mentioned briefly in section 6), and 72 distractor items (identical across test lists) testing phenomena related to tense and aspect, for a total of 132 test items.

4.2 *Participants*

The participants in this study were 72 native speakers of Brazilian Portuguese residing in Brazil. Thirty participants were tested on the single-NP version (ten per test list), and 42 were tested on the list-NP version (14 per test list). The participants ranged in age from 18 to 57, with mean age of 22 and median age of 21; only five participants were above the age of 30, and only three – above the age of 40. All participants were tested in São Paulo; they were all educated (most were college students), and hence fully familiar with the standard variety of BrP.

5 **Results**

The results for the entire set of experimental sentences are given in Figure 3. As it shows, both bare plurals and bare singulars received higher ratings in the list-NP version relative to the single-NP

version, while the opposite was the case for *some*- plurals. Furthermore, ratings were particularly low in subject position for both bare NP types, in both test versions.

[INSERT FIGURE 3 ABOUT HERE]

Following the advice of an anonymous reviewer, we restrict our focus in the rest of the paper to bare singulars and bare plurals in object and subject positions, in both single-NP and list-NP variants, given that these are the conditions for which we can make specific predictions.⁴ These results are given in Figure 4 (compare to the predictions in Figures 1 and 2).

[INSERT FIGURE 4 ABOUT HERE]

5.1 Statistical analysis: both test versions

The data for the conditions in Figure 4 were analyzed using a mixed effects model with fixed and random variables. The model was fit in the R software package (R Development Core Team [2014]) using the *lmer()* function of the *lme4* package (Bates, Maechler, Bolker and Walker [2015]), and the *afex* package (Singmann, Bolker, Westfall and Aust [2016]) was used to generate p-values

⁴ As mentioned above, *some*-NPs were a control, ensuring that non-bare NPs would receive high ratings in all contexts; this was indeed the case, as shown in Figure 3 (*some*-NPs received lower ratings in the list-NP than in the single-NP test version, quite possibly because the repetition of the word *some* made the sentences rather long and cumbersome). The *there*-construction conditions were initially included in order to tease apart the factor of syntactic role (object vs. subject) from that of placement relative to the verb. As expected, ratings of NPs in the *there*-construction were similar to those in the object position, given that both are postverbal. In order to keep the statistical analysis more manageable, and given that the literature focuses primarily on the subject vs. object positions, we leave the *there*-construction out of the subsequent analysis, on the advice of an anonymous reviewer. We note that in the single-NP context, bare singulars improved in the *there*-construction, relative to the subject position, to a much greater extent than bare plurals. Numerically, the *there*-construction was the only environment in the single-NP version where the ratings of bare singulars came close to 3.0, indicating relative acceptability. This finding suggests that the *there*-construction is a particularly good environment for bare singulars. We leave the question of why this is the case for further research.

(according to the package documentation, *afex* uses the Kenwood-Roger correction). We introduced the following fixed effects: *NP type* (bare singular vs. bare plural), *position* (subject vs. object), and *NP number* (single-NP vs. list-NP). The following fixed effect combinations were introduced as interaction terms: *NP type * position*, *NP type * NP number*, *position * NP number*, and *NP type * position * NP number*. Participants (N=72) and items (N=24) were introduced as random effects. The reference levels in R were ‘bare plural’ for *NP type*, ‘object’ for *position* and ‘list-NP’ for *NP number*. The output of both *lmer* and *mixed* functions is provided in Table 1.⁵

[INSERT TABLE 1 ABOUT HERE]

As shown in Table 1, NP type, position and NP number all had significant main effects. There was also a significant interaction between all three factors, which was due to the following: (i) improvement by embedding in a list context was greater for bare singulars than for bare plurals, regardless of position; and (ii) the effect of position for bare singulars was greater in the single-NP than in the list-NP version.

Following the advice of an anonymous reviewer, we next conducted separate statistical analyses for the single-NP and list-NP test versions, in order to determine whether each one exhibited linearly additive or super-additive effects.

⁵ The rcode used for the *lmer* function is given in (i), and the rcode for the *mixed* function from the *afex* package, used to generate p-values, is given in (ii). The *scale* function was used to correct for the potential bias of the Likert scale.

(i) `lmerBrP = lmer(scale(rating) ~ NP-type * position * NP-number + (1 | subject) + (1 | item), data=BrP_nouns)`

(ii) `mixed(lmerBrP, BrP_nouns)`

In Table 1, * corresponds to a significant p-value below .05.

5.2 Statistical analysis: single-NP and list-NP test versions

The data for the single-NP test version were analyzed using a mixed effects model with fixed and random variables, and was fit in R using the *lmer()* function, and used the *afex* package to generate p-values. We introduced the fixed effects of *NP type* (bare singular vs. bare plural) and *position* (subject vs. object), as well as an *NP type * position* interaction. Participants (N=30) and items (N=24) were introduced as random effects. The data for the list-NP test version were analyzed in the same way, with the same fixed effects, and participants (N=42) and items (N=24) as random effects.

The *afex* output for the single-NP version was as follows (the full output of the *lmer* function is not provided for reasons of space): there was a significant effect of NP type ($F(1, 425.09)=66.16$, $p<.0001$), a significant effect of NP position ($F(1, 32.35)=9.89$, $p=.004$), and no interaction between the two ($F(1, 425.09)=2.63$, $p=.11$). The *afex* output for the list-NP version was as follows: there was a significant effect of NP type ($F(1, 605.08)=72.77$, $p<.0001$), a significant effect of NP position ($F(1, 34.90)=21.90$, $p<.0001$), and no interaction between the two ($F(1, 605.08)=1.51$, $p=.22$).

The lack of a significant interaction indicates in both the single-NP and the list-NP test versions, we obtain linearly additive effects. As Figure 4 shows, in both test versions, bare singulars are rated below bare plurals, and the subject position receives lower ratings than the object position, for both NP types. The obtained results in both Figure 4a and Figure 4b resembles the predictions in Figure 1 (linear additivity) rather than those in Figure 2 (super-additivity).⁶

⁶ As pointed out by an anonymous reviewer, it is difficult to make conclusions based on null effects. Following the reviewer's suggestions, we addressed this issue by considering the effect size of the non-significant interaction, examining the coefficients from the model as estimates of effect size. According to the output of the *lmer* function, in the single-NP version, the coefficient

5.3 Individual items analysis: subject position

Before concluding our presentation of the results, we note a potential problem with some of the test items in which the bare NP was in the subject position. As discussed earlier, the literature on bare singulars in BrP suggests that they are particularly degraded as subjects in episodic sentences with perfective verbs. Of the 12 test items which had a bare NP in subject position, 10 indeed contained perfective verbs, but two (items #1.5 and 1.10 in the supplementary materials) had verbs in the imperfective; at the same time, these sentences were still episodic rather than habitual in interpretation. Additionally, one more test item (item #1.7), with a perfective verb, was potentially subject to a generic rather than an episodic interpretation. We therefore examined whether performance on these three potentially problematic items differed from that on other items. Figure 5 provides violin plots for all 12 items in the *subject* condition, across both NP forms (bare singular and bare plural) and both test versions (single-NP and list-NP). The three potentially problematic items are each framed by a red rectangle. As Figure 5 shows, these three items did not exhibit substantially different performance from the other nine items. While item #1.5, with an imperfective verb, obtained higher ratings for bare singulars than most of the other items, so did item #1.9, with a perfective verb. On the other hand, item #1.10, which also had an imperfective verb, had particularly low ratings for bare singulars. Thus, it does not look like the behavior of bare singulars and bare plurals was substantially affected by the grammatical aspect of the verb; in future studies, it would be interesting to manipulate grammatical aspect (perfective vs. imperfective) directly, to

of the *NP type X position* interaction was $-.22$; in the list-NP version, the corresponding coefficient of the interaction was $.15$. The relatively low coefficients indicate small effects: thus, even if we were able to obtain a significant interaction (after testing more participants), this interaction would be unlikely to be meaningful, given the small effect sizes.

see whether bare singulars are less acceptable with perfective verbs.

Finally, we note that while there is quite a bit of variability across individual test items, this variability is taken into account by the mixed model used for our statistical analysis.

[INSERT FIGURE 5 ABOUT HERE]

6 Discussion

As discussed earlier, the literature on bare NPs in Brazilian Portuguese has suggested that bare singulars in subject position of episodic sentences are degraded. Our experimental results confirm this intuition: bare singulars in preverbal subject position in the absence of a list context received a mean rating of only 1.71 on a scale from 1 to 4, the lowest mean rating obtained for any NP type in any position. By examining the effects of three separate contributing factors (NP type, syntactic position, and NP number), we are furthermore able to pinpoint the factors responsible for the low acceptability of bare singulars. We find the following: (i) Bare singulars are degraded relative to bare plurals in both subject and object positions of episodic sentences; and (ii) The effect of syntactic position is the same for both bare singulars and bare plurals: both are preferred in object position relative to subject position. Importantly, we find a linearly additive rather than a super-additive effect: bare singulars in subject position are unacceptable because of a combined effect of bare NPs being bad in subject position, and bare plurals being preferred to bare singulars. Additionally, we found that embedding in a list context improves acceptability of bare singulars in both subject and object positions, and improves the acceptability of bare plurals as well, though the effect of list is greater for bare singulars than for bare plurals.

To sum up, our findings suggest that three distinct factors are at work: (i) overall low felicity of bare singulars; (ii) low felicity of bare NPs in preverbal subject position; and (iii) low felicity of bare NPs in the absence of a list context. We will examine each of these in turn.

First, our findings show that bare singulars are always rated lower than bare plurals, in all syntactic positions, both with and without a list context. This is consistent with Schmitt's (1996) observation that bare singulars can be degraded in object as well as subject position, relative to bare plurals. This is most likely the result of the stylistic register effect noted in the literature: as discussed before, bare singulars are most commonly used in oral registers (though no corpus study has been done to confirm this), while our study used the written modality. Schmitt and Munn (2002) note that bare singulars are possible in the written modality, and the fact that we obtained ratings of above 3.0 for bare singulars in at least some of our test conditions suggests that bare singulars are indeed grammatical even in the written register in BrP, even if they are not quite as felicitous as bare plurals.

Second, we found that both bare singulars and bare plurals were rated lower in subject position than in object position, both with and without a list context (an effect which was not attested for *some*-plurals). The lowered ratings of both bare NP types in subject position is likely an effect of information structure: old information comes before new information; in an episodic sentence, old information would be expressed by a definite or specific indefinite NP; and bare NPs, in a non-generic environments, generally do not express either definite or specific readings. This effect is not limited to BrP, but has also been attested for bare NPs in other languages, including English. It has been known since Carlson (1977) that bare plurals in English behave quite differently from regular indefinites, and more recently, Kalluli (2006) has argued that bare plural subjects of

episodic predicates in English cannot be topics, and must therefore be focused in order to be felicitous.

Third, we found that both bare singulars and bare plurals were improved in acceptability, in all syntactic positions, through embedding in a list context. Prior literature on BrP has focused on the improvement in the list context for bare singulars and has not discussed whether the effect also exists for bare plurals. Our findings suggest that it does, although the effect is stronger for bare singulars. We believe that the improvement of bare NPs in a list context is likely to be due to pragmatics. Use of a bare NP with no indication of quantity is somewhat infelicitous: when we say that *Students were very sick* or *She brought pictures to class*, it would be more felicitous to specify the number of students or pictures (which is probably why *some*-plurals are better than bare NPs in the single-NP version: we are specifying that *some* – i.e., a few, not many – students or pictures are under discussion). Use of a list context places the focus on the property denoted by the NP, rather than on the cardinality, and this improves the acceptability.

At the same time, we found that improvement upon embedding in a list, while present across the board, was greater for bare singulars than for bare plurals. A possible explanation of why list improves acceptability for bare singulars more than for bare plurals is suggested by the account of Pires de Oliveira and Rothstein (2011, 2013) and Pires de Oliveira (2012), on which bare singulars are obligatorily kind-denoting, and require list contexts (or focus) to make them felicitous with episodic predicates. Support for the analysis of bare singulars as kind-denoting comes from performance on another category in our test, the category of kind-reference, which is exemplified in (9); for this category, we varied the NP form between bare plural, bare singular and definite plural, as shown in (9b-c) (since both bare plurals and definite plurals have kind readings in BrP).

We did not vary NP number for this category, using the same sentence forms (such as (9b-c)) in both versions of our test (not surprisingly, the results from the two versions were nearly identical).

(9) Kind-reference, subject position:

- a. *context*: Pedro começou a faculdade de biologia este ano e estava muito ansioso. Em sua primeira aula, ele aprendeu sobre espécies que já estão extintas.
'Pedro began his degree in biology this year and he was very excited. In his first class, he learned about extinct species.'

Target sentences:

- b. Dinossauro está extinto há milhões de anos.
dinosaur be.SG extinct have millions of years
'Dinosaurs have been extinct for millions of years.'
- c. Dinossauros estão / Os dinossauros estão extintos há milhões de anos.
dinosaur.PL be.PL/ the dinosaur.PL be.PL extinct.PL have millions of years
'Dinosaurs have been extinct for millions of years.'

We included this category in order to address the debate in the literature about whether bare singulars are compatible with true kind readings: Müller (2002) argues that bare singulars, unlike bare plurals, cannot be used with kind predicates such as *be extinct*, while Schmitt and Munn (1999, 2002), and much subsequent literature, argue that they can. Our findings support the latter view: ratings of bare singulars in the condition in (9) were quite high, with a mean rating of 3.16 (std=.74); this was significantly lower than the ratings for bare plurals (mean=3.68, std=.44) and definite plurals (mean=3.64, std=.40), but still much higher than the ratings of bare singulars that we observed in episodic sentences in the absence of a list-context.⁷ The fact that bare singulars

⁷ The test category in (9) was modeled on a similar category in the AJT used by Ionin et al. (2011). Ionin et al. found relatively low ratings of bare singulars with kind-reference: 2.34 on a scale from 1 to 4, compared to 3.80 for bare plurals and 3.88 for definite plurals; this led Ionin et al. to tentatively conclude that bare singulars in BrP do not have kind readings, though they indicated that the written modality and the rather formal nature of the test contexts may have lowered the ratings of bare singulars for stylistic

were rated below bare plurals with kind-reference as well as with episodic readings supports our proposal that this difference is probably due to stylistic or register preferences. The fact that bare singulars were overall rated quite high with kind predicates supports the view of Schmitt and Munn (1999, 2002) as well as Pires de Oliveira and Rothstein (2011, 2013) that bare singulars are kind terms in BrP.⁸

The fact that we obtained high ratings for bare singulars with kind-reference, coupled with the fact that bare singulars in subject and object positions of episodic sentences improved greatly in the presence of a list context, is fully consistent with the proposal of Pires de Oliveira and Rothstein (2011, 2013), as well as Pires de Oliveira (2012), that BrP bare singulars are kind terms that lack

reasons. As noted above, we found much smaller differences in ratings among these NP types, even though we also used the written modality. We believe that the format of the AJT in our study vs. Ionin et al. is responsible: Ionin et al. presented all the sentence variants (with bare singulars, bare plurals, and definite plurals, as well as indefinite singulars and definite singulars) side-by-side following the story context; in contrast, we presented only one sentence after each story. The side-by-side presentation in Ionin et al. may have caused the participants to explicitly compare the different sentence types, and to rate bare singulars relatively low because, compared to bare plurals and definite plurals, they did not appear as good in a formal, written context. The format of the AJT in the current study avoided this problem, and as a result, bare singulars were found to be much more acceptable.

⁸ Our AJT included one more test category, in which the target NP occurred in the object position of a generic sentence (as in *Ele cria galinha*, ‘He raises chickens’). All accounts of BrP bare singulars cited in this paper assume that bare singulars are fine in such generic sentences (which involve quantification by a generic operator). For the single-NP version, we found that bare singulars in this configuration were rated at a mean of 2.94 – slightly higher than bare singulars in episodic sentences, but slightly lower than bare singulars with kind-reference (for comparison, bare plurals in generic sentences were rated at 3.63). Interestingly, list context improved ratings of bare NPs in this generic context, just as in episodic contexts: the ratings went up to 3.46 for bare singulars and 3.81 for bare plurals (but did not rise at all for definite plurals, the third NP type tested in this category). The fact that list context raises ratings for bare NPs in generic as well as episodic sentences suggests that it is a pragmatic effect which is not tied specifically to existential readings.

true existential readings. However, this account, on which bare singulars are kind terms but bare plurals are plural predicates, cannot readily explain the parallel behavior that we found for bare singulars and bare plurals (the fact that both are degraded in subject position, and that both are improved by embedding in a list context). On the other hand, our findings are quite readily compatible with the proposal of Schmitt and Munn (2002, and subsequent literature), on which both bare singulars and bare plurals are kind terms, and on which the relative infelicity of bare singulars is attributed to information structure effects. Our findings suggest that their proposal should be extended, in that information structure considerations affect bare plurals as well as bare singulars. On this view, a possible reason for why embedding in a list affects bare singulars more than bare plurals is ceiling effects, since bare plurals were already rated as more acceptable (close to ceiling) in the single-NP version.

7 Conclusion and directions for further research

In this work, we have used experimental methodology to examine the readings of BrP bare singulars. The observations in the literature that bare singulars in subject position are particularly degraded, and that they are improved by embedding in a list context, are supported by our study. On the basis of our findings, we have proposed that the low acceptability of bare singulars in subject position of episodic sentences results from the additive effects of three separate factors: a stylistic preference for bare plurals over bare singulars, and pragmatic / information-structure effects leading to lowered acceptability of preverbal bare NPs as well as bare NPs without list contexts. Our results are largely compatible with Schmitt and Munn's (2002) proposal that bare singulars in subject position are ruled out by information-structure considerations, but suggests that their analysis should be extended to bare plurals and to the object position as well.

An interesting direction for future research would be an examination of whether placing the NP in focus also improves bare plurals as well as bare singulars, and whether focus affects the subject position more than other syntactic positions. Per the proposals cited above, focus and list contexts should have a similar effect on the acceptability of bare singulars, so it would be fruitful to examine the role of focus using the same methodology that we have used to test list contexts, to see if convergent results obtain. Another interesting direction for further study would be to directly test the predictions of Schmitt and Munn's proposal that the (un)acceptability of bare singulars is related to the intonational contour of the sentence; this could be done by varying the prosody of the target sentence, while keeping other factors constant. It is possible that the improved acceptability of bare singulars inside *there* constructions (see footnote 4) is related to the intonational contour of this sentence type; this topic is in need of further investigation. Finally, it would be fruitful to directly test the effects of grammatical aspect, in order to see whether bare singulars are degraded only with perfective and not with imperfective verbs. The contribution of the present paper has been to isolate the effects of several different factors on the (un)acceptability of bare singulars. We hope that our findings can be used as a springboard for further experimental investigation into the status of bare singulars in BrP.

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Table 1. Summary of main effects and interactions

<i>Effect</i>	output of the <i>lmer</i> function			output of the <i>mixed</i> function of the <i>afex</i> package	
	estimate	std error	t-value	F-statistic (degrees of freedom)	p-value
NP type: bare singular	-.64	.08	-7.92	F(1, 1052.06) = 62.73	< .0001*
Position: subject	-.55	.13	-4.10	F(1, 40.26) = 16.78	.0002*
NP number: single NP	-.34	.12	-2.86	F(1, 197.31) = 8.16	.005*
NP type * Position	.13	.11	1.14	F(1, 1052.06) = 1.30	.25
NP type * NP number	-.19	.12	-1.56	F(1, 1052.06) = 2.43	.12
Position * NP number	0.001	.12	.01	F(1, 1052.06) = 0	.99
NP type * Position * NP number	-.36	.18	-2.07	F(1, 1052.06) = 4.26	.04*

Figure 1: Predicted results if the effects are linearly additive

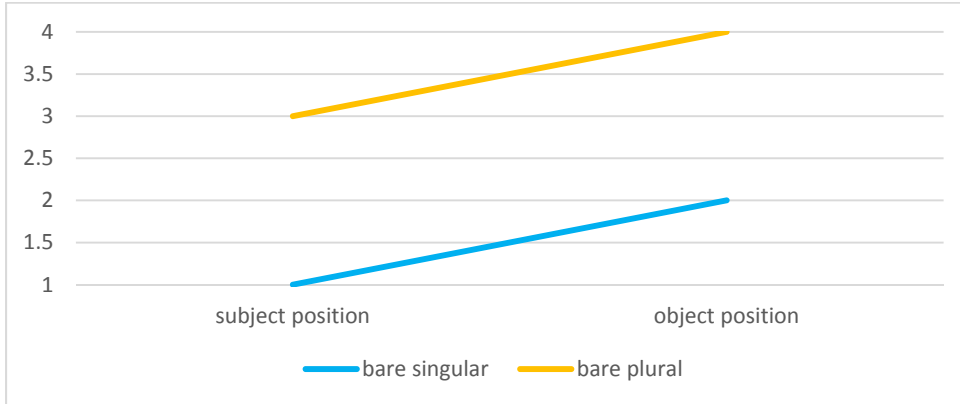


Figure 2: Predicted results (one possible pattern) if the effects are super-additive

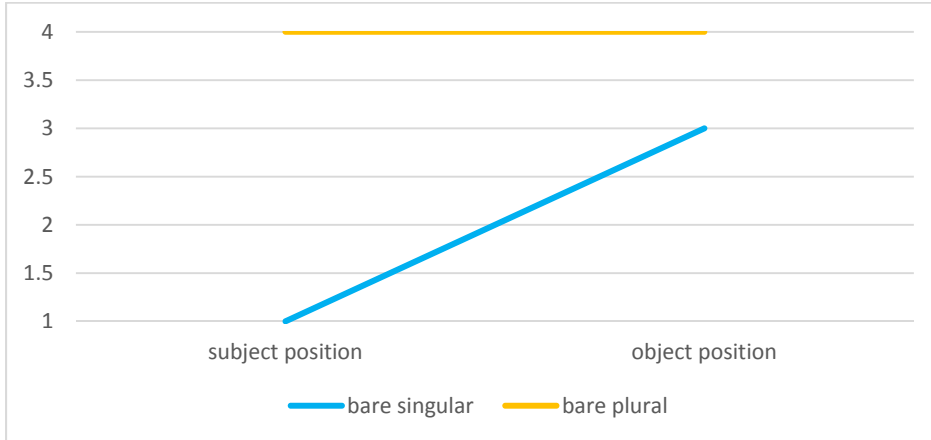


Figure 3. Mean ratings for each NP type in each position, divided by test version (error bars represent standard error)

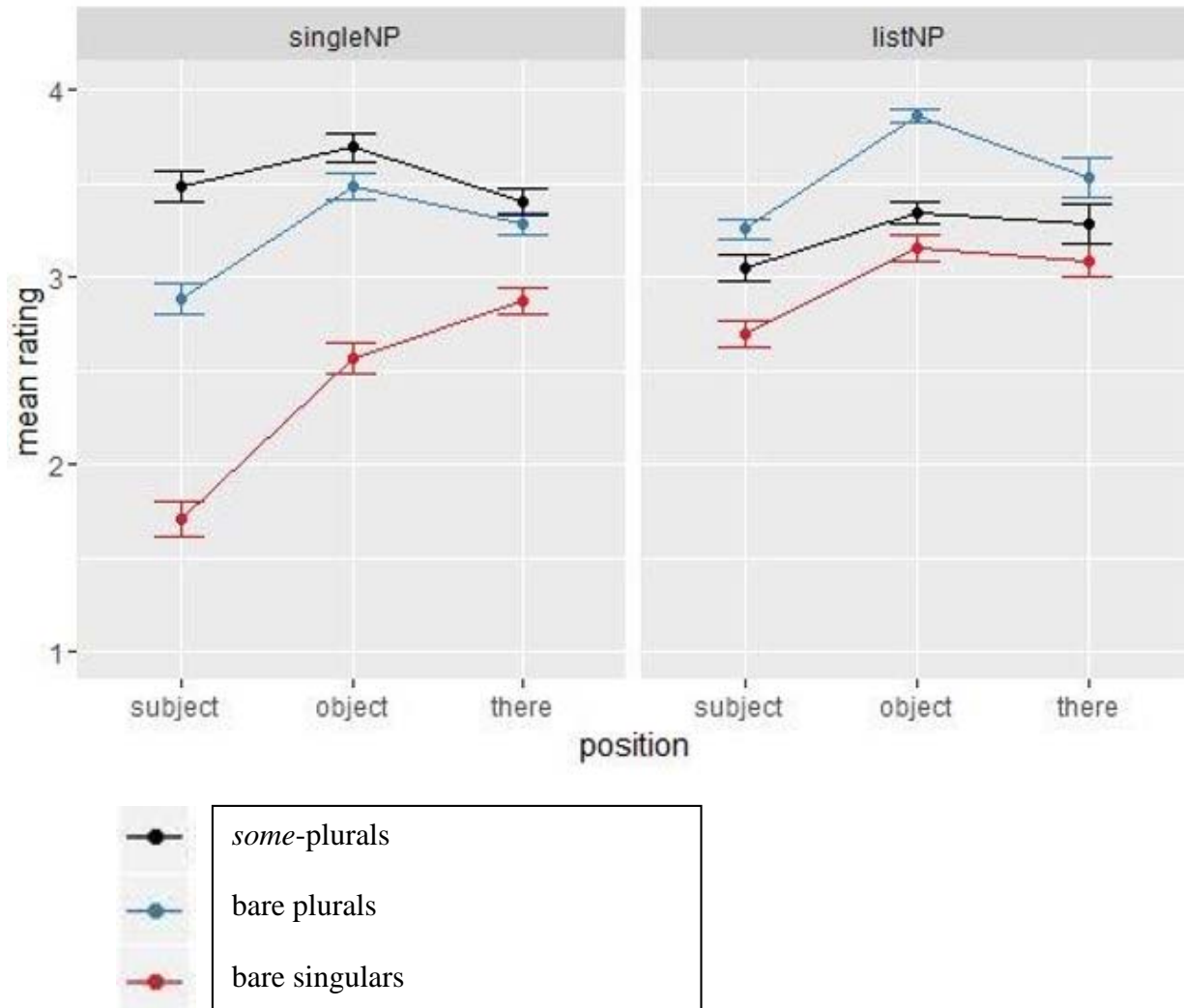


Figure 4: Results for bare NPs in subject and object positions

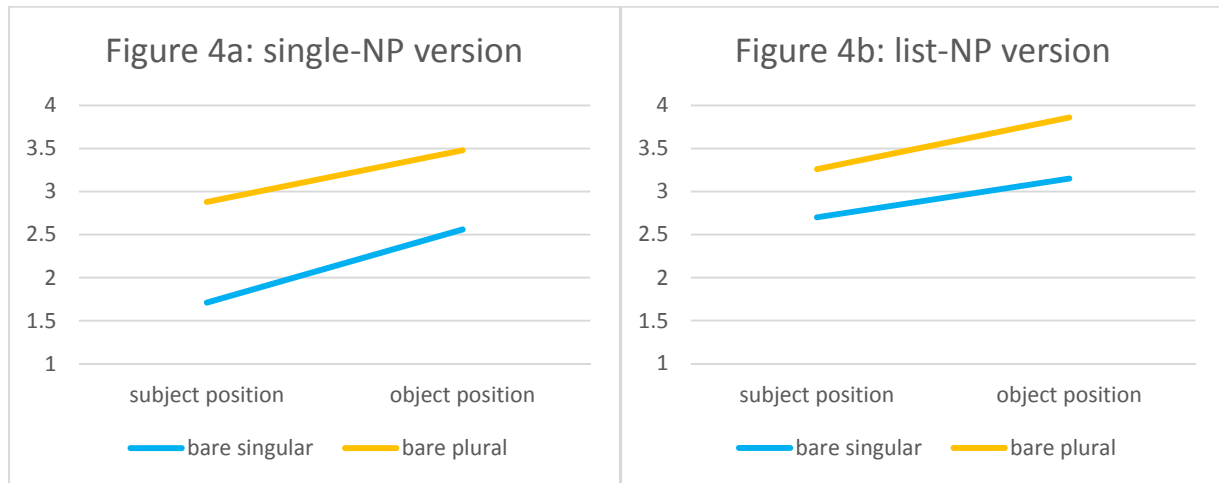


Figure 5: Performance on individual items in the subject conditions; red rectangles around the three potentially problematic items

