

Plurality and cross-linguistic variation: An experimental investigation of the Turkish plural*

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Abstract

In English and many other languages, the interpretation of the plural is associated with the inclusive reading in positive sentences and exclusive reading in negative sentences. Different approaches to the meaning contribution of the English plural vary in how they account for this apparent alternation across the polarities, but converge on assuming that (at least one of) the denotation(s) of the plural should include atomic individuals. Turkish, on the other hand, is often cited as one of the few known languages in which the plural only receives an exclusive interpretation (Bale & Khanjian 2014, Görgülü 2012). It remains controversial whether the Turkish plural should in fact be analysed more like the English plural (Kan 2010, Sağ 2017) or whether indeed it should only be assigned an exclusive denotation. We report two experiments investigating Turkish-speaking adults' and preschool-aged children's interpretation of positive and negative sentences containing plural nouns. The results provide clear evidence for *inclusive* interpretations of the plural in Turkish, supporting accounts that treat the Turkish and English plurals alike.

1 Introduction

As is well known, the plural in English (and many other languages) is associated with more than one possible interpretation. For example, a plural noun like “trees” in a sentence such as (1) suggests that Tiger planted multiple trees. At the same time, however, when the same noun appears in a negative sentence like (2), it doesn't merely convey that Tiger didn't plant multiple trees, but rather that he didn't plant

* TO BE ADDED

any tree (Krifka 1989, Sauerland et al. 2005, among others). The first reading is generally referred to as an *exclusive* reading, and the latter an *inclusive* reading.

- (1) Tiger planted trees.
 ~ *Tiger planted multiple trees* EXCLUSIVE READING
- (2) Tiger didn't plant trees.
 ✧ *Tiger didn't plant multiple trees*
 ~ *Tiger didn't plant any trees* INCLUSIVE READING

The main approaches to the semantics of the English plural differ in how they account for this apparent alternation across the polarities, but they all converge on the assumption that (at least one of) the denotation(s) of the plural should include atomic individuals (Sauerland et al. 2005, Spector 2007, Mayr 2015, Ivlieva 2013, Zweig 2009, Martí 2017, Grimm 2013, Farkas & de Swart 2010, Križ 2017).

By contrast, Turkish (together with a few other languages, such as Western Armenian and Korean) is cited as one of the few known languages in which the plural only receives an exclusive interpretation (Bale & Khanjian 2014, Görgülü 2012), suggesting that the denotation of the plural can never include atomic individuals. Recent accounts, however, have argued against this claim and have proposed instead that the plural in Turkish be analysed more like the plural in English, giving rise to the same alternation of readings (Kan 2010, Sağ 2017). It remains controversial whether the plural in Turkish should be assigned an exclusive denotation or whether an inclusive denotation is also possible.

In this paper, we report on two experiments designed to investigate this question. We tested Turkish-speaking adults' and preschool-aged children's interpretation of plurals in positive and negative sentences. The results provide clear evidence for *inclusive* interpretations of the plural in Turkish, supporting accounts that claim that it should be analysed like the plural in English (Kan 2010, Sağ 2017).¹ We also briefly discuss, building on recent proposals by Sağ (2017) and Martí (2017), how an inclusive meaning of the Turkish plural can be integrated within a theory of the Turkish number system in general, which includes the well-known idiosyncratic properties of the singular and the agreement between number and numerals.

This debate is important beyond understanding the properties of the Turkish plural, as it can shed light on the different meanings that the plural can obtain across languages, thereby constraining cross-linguistically adequate theories of the semantics of number marking. In particular, the main question in the background of our study is whether there is any language which only allows an exclusive interpretation of the plural. Our results suggest that Turkish is not such a language. We hope our study will pave the way for further experimental investigation of

¹ For a similar investigation and conclusion for the plural in Buryat, see Bylinina & Podobryaev (2017).

interpretation to re-emerge as a dispreferred option as in (6).

There are three main approaches to the English plural in the literature: the implicature approach (e.g., Sauerland et al. 2005, Spector 2007, Zweig 2009, Ivlieva 2013, Mayr 2015), the ambiguity approach (Farkas & de Swart 2010, Grimm 2013, Martí 2017), and the homogeneity approach (Križ 2017). While different, all of these approaches have in common the assumption that (at least one of) the denotation(s) of the plural should include atomic individuals.² That is, in a context in which the relevant trees are *a*, *b*, and *c*, the literal meaning of the plural noun “trees” would include the atomic individual trees and the sets thereof, as in (7) (cf. Schwarzschild 1996)

$$(7) \quad \llbracket \text{trees} \rrbracket = \{a, b, c, \{a, b\}, \{a, c\}, \{b, c\}, \{a, b, c\}\} \quad \text{INCLUSIVE MEANING}$$

The meaning in (7), combined with the rest of the sentence in (4), gives rise then to an inclusive reading, which we could paraphrase as in (8).

(8) Tiger planted one or more trees.

As is easy to see, positing the inclusive meaning of the plural in (7) makes the right prediction for cases like (5), which can simply be analysed as the negation of (8), conveying that Tiger didn’t plant any tree.

(9) Tiger didn’t plant one or more trees.

What remains to be explained, of course, is how the exclusive meaning arises in cases like (4). The three main approaches differ in how they derive this interpretation and we will not go into the details here. We note, instead, that they all share the following properties:

- i. They all assume that the plural can have an inclusive meaning as in (7).
- ii. They all predict the alternation between inclusive and exclusive readings discussed above, albeit in different ways.
- iii. They all allow for the exclusive reading to emerge as a marked option for cases like (5).

To summarise, the plural in English (and many other languages) gives rise to inclusive and exclusive readings in different contexts. All theoretical approaches in the literature agree on the assumption that the plural can have an inclusive meaning, and all derive the exclusive reading in different ways. In the next subsection, we turn

² This denotation is sometimes also referred to as *number-neutral* or *semantically unmarked*. We will use the more neutral *inclusive* and *exclusive* terminology throughout the paper.

to discuss the case of Turkish, which has been argued to work quite differently from English in this respect. In particular, it has been argued to be a language in which the plural can only be interpreted exclusively.

2.2 The case of Turkish

Turkish plural nouns also give rise to exclusive readings. That is, as in English, a sentence like (10) with a non-case-marked plural noun in object position³ conveys the meaning that Chicken planted more than one tulip with blue leaves:

- (10) Tavuk mavi yaprak-lı lale-ler dik-ti.
chicken blue leaf-with tulip-PL plant-PAST
'Chicken planted tulips with blue leaves.'
→ *Chicken planted more than one tulip with blue leaves*

EXCLUSIVE READING

What is more controversial is the question of whether inclusive readings are possible in Turkish. Bale & Khanjian (2014) and Bale et al. (2010) argue that the plural in Turkish can never be interpreted inclusively. Bale & Khanjian (2014) provide data from Western Armenian which suggest that the plural in this language is interpreted exhaustively both in upward and downward entailing contexts, such as the restrictor of the universal quantifier, and point that the similar pattern can be found in Turkish:^{4,5}

³ Accusative-marked nouns in object position convey a specific/definite interpretation and for this reason we concentrate on unmarked bare plurals throughout the paper. We also consider cases in which the bare plural is modified, as this improves the felicity of the sentence for most speakers.

⁴ Bale & Khanjian (2014) note that the Armenian native speakers prefer the singular noun in (12) but if they are forced to interpret (12), they interpret the plural exclusively.

⁵ Bale & Khanjian (2009) suggest that negation is an unreliable downward-entailing context to test the interpretation of the plural. Their argument is that in Western Armenian negation patterns differently from other downward-entailing contexts, such as the restrictor of the universal quantifier and the antecedent of conditionals. They argue that in all of these environments bare plurals only have an exclusive reading, but in negated sentences, an inclusive reading seems to re-emerge. By contrast, Sağ (2017) gives examples of bare plurals in Turkish in questions and other downward-entailing contexts besides negation in which the Turkish plural does appear to have an inclusive reading. Crucially, all Western Armenian examples that have exclusive denotations contain the predicate *uni* 'have'. This is one place where bare singulars have an inclusive denotation (although when they appear in argument positions with the definite article they receive a singular interpretation, see Sigler 1996). This behavior reveals the similarity with the case of Turkish. The availability of the inclusive reading of bare singulars with the 'have' predicate might be the reason for the seemingly exclusive reading of bare plurals. Therefore, we suggest that Western Armenian bare plurals should be tested with other predicates. Nonetheless, we also acknowledge that further study is required to investigate whether there is really a distinction between negation and other downward-entailing environments in Turkish.

- (11) Dəgha-ner vase-ts-in.
 boy-PL run-PST-3PL
 ‘Two or more boys ran.’ (Bale & Khanjian 2014: p.4)
- (12) ?Amen mart vor bədig-ner uner vodk-i gajne-tsav.
 all person that child-PL had foot-DAT stand.up-PST
 ‘Everyone that had two or more children stood up.’
 (Bale & Khanjian 2014: p.4)

In fact, Turkish is often cited as one of the few known languages in which the plural can only be interpreted exclusively. On the other hand, more recent work by Kan (2010) and Sağ (2017) has argued that the Turkish plural does give rise to the same exclusive vs. inclusive alternation as in English. More concretely, the former approach assumes that the plural in Turkish can only have the meaning in (13), while the latter assumes that it can also have the meaning in (14), as in English, with the exclusive reading arising in one of the ways sketched above.

- (13) $[[\text{ağaç-lar}]] = \{\{a,b\}, \{a,c\}, \{b,c\}, \{a,b,c\}\}$ EXCLUSIVE MEANING
- (14) $[[\text{ağaç-lar}]] = \{a,b,c, \{a,b\}, \{a,c\}, \{b,c\}, \{a,b,c\}\}$ INCLUSIVE MEANING

We will refer to the latter approach as the TWO-READINGS APPROACH and the former as the ONE-READING APPROACH.

How can we distinguish between these two approaches? They make the same predictions for positive sentences. Crucially, however, the predictions of the two approaches diverge for cases like (15). In such a case, the TWO-READINGS APPROACH, unlike the ONE-READING APPROACH, predicts an inclusive reading, i.e. *Chicken didn’t plant any tulips with blue leaves*. We turn to this in the next subsection.

- (15) Tavuk mavi yaprak-lı lale-ler dik-me-di.
 chicken blue leaf-with tulip-PL plant-NEG-PAST
 ‘Chicken didn’t plant tulips with blue leaves.’

Before moving to the predictions, however, let us first mention another way in which the Turkish number system is argued to be different from the English one and which is important to understand our experimental design. Namely, the singular in Turkish, at least in certain contexts, can obtain an inclusive interpretation compatible with plural individuals (Bliss 2004, Görgülü 2012, Sağ 2017).⁶ That is, while (16) in English suggests that Chicken planted just one tulip, the corresponding sentence in

⁶ Another difference between the Turkish and English number system is the observation that while in English numerals other than “one” require plural nouns, in Turkish numerals can only combine with the singular (Ionin & Matushansky 2006, Bale et al. 2010, Sağ 2017).

- (i) Chicken planted two tulip*(s).

Turkish is compatible with Chicken planting more than one tulip.⁷

(16) Chicken planted a tulip.

(17) Tavuk lale dik-ti.
chicken tulip plant-PAST
'Chicken planted a tulip.'

In sum, whatever one proposes about the plural in Turkish must be compatible with a more general theory of the number system as well as with the possible interpretations of the singular and the agreement pattern with numerals.

3 Predictions

In this section, we outline the main predictions of the ONE-READING and TWO-READINGS approach in a more systematic way as well as an additional prediction made by one of the accounts within the TWO-READINGS camp. In Section 4 we will turn to our study, which tested these predictions.

3.1 Main predictions: positive versus negative contexts

As already mentioned, both the ONE-READING and the TWO-READINGS approach predict an exclusive reading of the plural in positive cases like (18). This reading simply corresponds to the literal meaning of the plural on the ONE-READING APPROACH, while on the TWO-READINGS APPROACH it arises in one of the ways discussed above (i.e. as an implicature, due to ambiguity or homogeneity). Either way, both approaches predict that the sentence in (18) will not be compatible with a context in which Chicken planted only one tulip with blue leaves, as depicted in Figure 1.

(18) Tavuk mavi yaprak-lı lale-ler dik-ti.
chicken blue leaf-with tulip-PL plant-PAST
'Chicken planted tulips with blue leaves.'

(ii) Tavuk iki lale(*ler) dik-ti.
chicken two tulip-PL plant-PAST
'Chicken planted two tulip(*s).'

⁷ Another way to express the meaning that Chicken planted a tulip is with the use of the indefinite *bir*:

(i) Tavuk bir lale dik-ti.
chicken INDF tulip plant-PAST
'Chicken planted a tulip.'

↪ *Chicken planted more than one tulip with blue leaves*

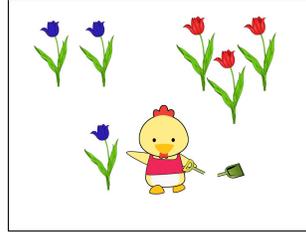


Figure 1 Context for the sentences in (18) and (19) in which Chicken planted only one tulip with blue leaves.

The two approaches, however, make divergent predictions for plural nouns in negative contexts like (19):

- (19) Tavuk mavi yaprak-lı lale-ler dik-me-di.
chicken blue leaf-with tulip-PL plant-NEG-PAST
'Chicken didn't plant tulips with blue leaves.'

The ONE-READING APPROACH only allows for exclusive readings of the plural; the only predicted reading of (19), then, is one according to which *Chicken didn't plant more than one tulip with blue leaves*. The ONE-READING APPROACH therefore straightforwardly predicts (19) to be true in the context depicted in Figure 1. By contrast, the TWO-READINGS APPROACH makes more nuanced predictions for (19). First, as we discussed, the most prominent reading predicted for (19) is an inclusive reading paraphraseable as *Chicken did not plant any tulips with blue leaves*, which is not compatible with the context depicted in Figure 1. In addition, however, the TWO-READINGS approach also allows for a marked reading that corresponds to the negation of the exclusive reading (the same reading as predicted by the ONE-READING APPROACH), which is compatible with the context depicted in Figure 1.

A summary of the predictions of the ONE-READING and TWO-READINGS approaches for positive and negative sentences is outlined in Table 1. These predictions will be the main focus of our experimental study.

context	ONE-READING approach	TWO-READINGS approach
Ch. planted tulips.	×	×
Ch. didn't plant tulips.	✓	×/✓

Table 1 Predictions of the ONE-READING and the TWO-READINGS approaches regarding acceptance of the sentence “Chicken planted tulips”/“Chicken didn't plant tulips”, in a context in which Chicken planted only one tulip. ‘×’ means that the sentence is predicted to be rejected in the given context and ‘✓’ means that the sentence is predicted to be accepted.

3.2 An additional prediction: Relationship with scalar implicatures

Before turning to our studies focusing on the predictions above, we will first outline a further prediction of one of the accounts within the TWO-READINGS approach. While all accounts within this approach make the same predictions in Table 1, the implicature-based account defended in Sauerland et al. (2005), Spector (2007), Zweig (2009), Ivlieva (2013) and Mayr (2015) makes a further specific prediction. This account argues that the exclusive reading of the plural arises as a scalar implicature, and thus predicts a relationship between this reading and other kinds of scalar implicatures, especially in the context of the comparison between adults and young children. More specifically, it has been observed that young children typically compute fewer scalar implicatures than adults (e.g., Chierchia et al. 2001, Noveck 2001, Papafragou & Musolino 2003, among many others). Therefore, everything being equal, if the exclusive reading of the plural is a scalar implicature, we expect that children should access this reading less than adults do. In our study, following previous studies on the interpretation of the plural (Yatsushiro et al. 2017, Tieu et al. 2018, Renans et al. 2018), we will test this further prediction of the implicature account, in addition to testing the main predictions in Table 1.⁸

4 Experiment 1

We tested the predictions of the ONE-READING and the TWO-READINGS approaches discussed above by investigating Turkish speakers' interpretations of plural nouns in positive and negative sentences, and comparing the plural to the scalar implicature of

⁸ The other accounts within the TWO-READINGS APPROACH and the ONE-READING APPROACH, on the other hand, make no predictions regarding the relationship between exclusive readings of the plural and scalar implicatures.

bazi ‘some’. We employed the methodology used in the previous studies on English and Greek reported in Tieu et al. 2018 and Renans et al. 2018.⁹

4.1 Methods

4.1.1 Participants

45 adults and 22 children aged 4–6 year (mean age 5;2), all native speakers of Turkish, participated in the experiment. We excluded from the analysis any participant who answered fewer than six of eight control trials correctly, leaving a total of 42 adults and 21 children.

4.1.2 Procedure

At the very beginning of the experiment, participants were introduced to a puppet with whom they would interact throughout the experiment via webcam (in reality, however, the puppet appeared in pre-recorded videoclips). Subsequently, the participants were presented with a series of short stories in a PowerPoint presentation. After each story, the experimenter asked a question to the puppet and the puppet replied with one of the test sentences. The participants’ task was to judge the puppet’s utterances by rewarding her with one, two, or three strawberries, depending on her performance (Katsos & Bishop 2011, Tieu et al. 2017). Participants were clearly instructed about the meaning of each reward: they were supposed to give the puppet one strawberry if they thought the puppet didn’t answer well, three strawberries if they thought she answered well, and two strawberries if the puppet’s answer was somewhere in the middle – not perfect, but somewhat okay.

4.1.3 Materials

Three factors were manipulated in the experiment: Group (child vs. adult), Sentence Type (Plural sentence vs. Scalar Item sentence), and Polarity within the exclusive reading condition (positive vs. negative). The materials for the Scalar Implicature condition and controls were translated to Turkish from the previous studies in English and Greek (reported in Tieu et al. 2018 and Renans et al. 2018), while the materials for Plural sentence conditions were designed to be similar to these other conditions. The exclusive reading and scalar implicature conditions were presented in blocks with the order counterbalanced across participants. An example of a positive and a

⁹ For an overview of previous experimental work on the meaning of plural nouns, see Tieu & Romoli (To appear).

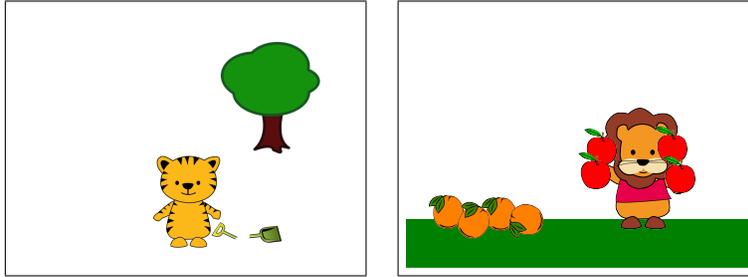


Figure 2 *Left:* image for Plural targets in (20); *Right:* image for the scalar implicature target in (21).

negative exclusive reading target is presented in (20), with the corresponding picture in Figure 2.^{10,11} Here, the context clearly failed to satisfy the exclusive reading.

(20) EXCLUSIVE READING target

Context: Tiger only planted this one tree and no flowers.

EXP: Peki, Ellie, Kaplan çiçek-ler ek-me-di. Peki, ağaç?
 okay Ellie tiger flower-PL plant-NEG-PAST what.about tree
 ‘Okay, Ellie, so Tiger didn’t plant any flowers. What about trees?’

- a. Kaplan ağaç-lar ek-ti. POSITIVE
 tiger tree-PL plant-PAST
 ‘Tiger planted trees.’
- b. Kaplan ağaç-lar ek-me-di. NEGATIVE
 tiger tree-PL plant-NEG-PAST
 ‘Tiger didn’t plant trees.’

Turning to the predictions, both the ONE-READING and TWO-READINGS approaches predict an exclusive reading of the positive targets (i.e. *Tiger planted more than one tree*). Since the exclusive reading was not made true in the context, participants were expected to give the puppet a non-maximal reward, i.e. one or at most two strawberries.

For the negative targets, the ONE-READING approach predicts that participants should invariably access the exclusive plural interpretation of the noun (i.e., *Tiger*

¹⁰ To keep things interesting for the child participants, the characters and objects varied from one item to the next. The stories for the positive and negative conditions also differed.

¹¹ We should flag right away that, as mentioned, most native speakers find non-case-marked unmodified bare plurals in object position infelicitous. We decided nevertheless to use them as a first step for the sake of maintaining uniformity with the previous studies on Greek and English. Using control items, we were able to confirm that participants were nonetheless interpreting the sentences in the expected way. But we acknowledge this potential issue with Experiment 1, and address it in Experiment 2 by moving to sentences with modified bare plurals in object position.

didn't plant more than one tree). Given that this interpretation is compatible with the context, participants were expected to give the puppet the maximal reward, i.e. three strawberries. Under the TWO-READINGS approach, on the other hand, participants were expected to predominantly interpret the sentence inclusively (i.e. *Tiger didn't plant any tree*). Since this interpretation is incompatible with the context, the expected reward was again one or at most two strawberries. In addition, the TWO-READINGS approach allows for a marked reading on which the exclusive reading is computed in the scope of negation (i.e. *Tiger didn't plant more than one tree*). This interpretation is compatible with the context and if participants accessed this reading, they were expected to give the puppet the maximal reward. In other words, the TWO-READINGS approach, but not the ONE-READING approach, allows for variability in participants' responses to the negative targets.

In the scalar implicature condition, the context made it clear that the action of the protagonist involved the whole set of objects depicted in the picture. When the experimenter asked the puppet what had happened in the story, she responded with a sentence containing the scalar term *bazı* 'some', as illustrated in (21) (the corresponding picture is provided in Figure 2):

- (21) SCALAR IMPLICATURE TARGET
Context: Lion took no oranges and all of the apples.
 EXP: Okay, Ellie, so the Lion didn't carry any oranges. What about the apples?
 PUPP: Aslan elma-lar-ın bazı-lar-ı-nı taşı-dı.
 Lion apple-PL-GEN some-PL-POSS.3SG-ACC carry-PAST
 'Lion carried some of the apples.'

If participants interpreted the puppet's utterance with the scalar implicature of *bazı* 'some', i.e. *Lion didn't carry all of the apples*, they were expected to give the puppet one or two strawberries as a reward. By contrast, if they interpreted it literally, then they were expected to give the puppet the maximal reward.

All participants also received eight control trials to ensure that they could give minimal and maximal rewards where appropriate. Four of them corresponded to clearly true plural sentences and were expected to elicit the maximal reward, as in (22) and (23):

- (22) *Context:* Giraffe did not bake any cakes but she baked four cookies.
 EXP:Peki, Ellie, Zürafa kek-ler pişir-me-di. Peki, kurabiye?
 okay Ellie giraffe cake-PL bake-NEG-PAST what.about cookie
 'Okay, Ellie, so Giraffe didn't bake any cakes. What about cookies?'
 PUP:Zürafa kurabiye-ler pişir-di. POSITIVE CONTROL
 Giraffe cookie-PL bake-PAST
 'Giraffe baked cookies.'

- (23) *Context:* Sheep baked four pizzas but no baklavas.
EXP:Peki, Ellie, Koyun pizza-lar pişir-di. Peki, baklava?
okay Ellie sheep pizza-PL bake-PAST what.about baklava
'Okay, Ellie, so Sheep baked pizzas. What about baklavas?'
PUP:Koyun baklava-lar pişir-me-di NEGATIVE CONTROL
Sheep baklava-PL bake-NEG-PAST
'Sheep didn't bake baklavas.'

Four other control trials corresponded to clearly true or clearly false negative sentences that contained a definite noun phrase instead of a bare plural. This allowed us to ensure that participants could correctly interpret negation independently of the bare plural. These trials could be associated with either a minimal or a maximal reward target; the experimenter selected the appropriate version of the trial depending on how participants responded to the critical target trials, balancing the overall number of minimal and maximal rewards given across the experiment.

- (24) *Context:* Zebra painted four vases and no bowls. NEGATION CONTROL
EXP:Ellie, can you tell us something about the story?
PUP':Zebra kase-ler-i boya-ma-dı.
Zebra bowl-PL-ACC paint-NEG-PAST
'Zebra didn't paint the bowls.'
PUP'':Zebra vazo-lar-ı boya-ma-dı.
Zebra vase-PL-ACC paint-NEG-PAST
'Zebra didn't paint the vases.'

In sum, each participant received two training items followed by 18 test trials: 6 critical plural targets (3 positive, 3 negative), 4 scalar implicature targets, 4 clearly true positive and negative plural controls, and 4 clearly true or clearly false negation controls. The plural and scalar implicature targets were presented in blocks which were counterbalanced across participants; the test and control trials within the plural block were pseudo-randomized.

4.2 Results

Figure 4 displays the proportion of 1-, 2-, and 3-strawberry responses to the plural positive, plural negative, and scalar implicature targets. At this stage, we group the non-maximal 1- and 2-strawberry responses together, in contrast to the 3-strawberry responses, mapping the reward types to different readings of the target sentences in the following way: for the positive plural targets, 1- and 2-strawberry responses are interpreted as a measure of the exclusive reading, while 3-strawberry responses

correspond to an inclusive reading.¹² For the negative plural targets, the opposite holds: 3-strawberry rewards are interpreted as consistent with the exclusive reading, while 1- and 2-strawberry responses correspond to an inclusive reading. Finally, for the scalar implicature targets, 1- and 2-strawberry responses are interpreted as a measure of the target inference having been computed, whereas 3-strawberry rewards correspond to an implicature-less reading.

Starting with the plural positive targets, we observe that adults mostly rejected the positive sentences in contexts that were incompatible with the exclusive reading. By contrast, children tended to accept such sentences in the same contexts, suggesting they had instead interpreted the sentence under an inclusive reading. On the plural negative targets, on the other hand, adults appeared to split between selecting the maximal and the non-maximal rewards, while children tended to give minimal rewards only, suggesting they generally interpreted the plural inclusively under negation. Finally, in the scalar implicature condition, both groups generally selected non-maximal rewards, indicating they computed the implicature of *bazi* ‘some’.

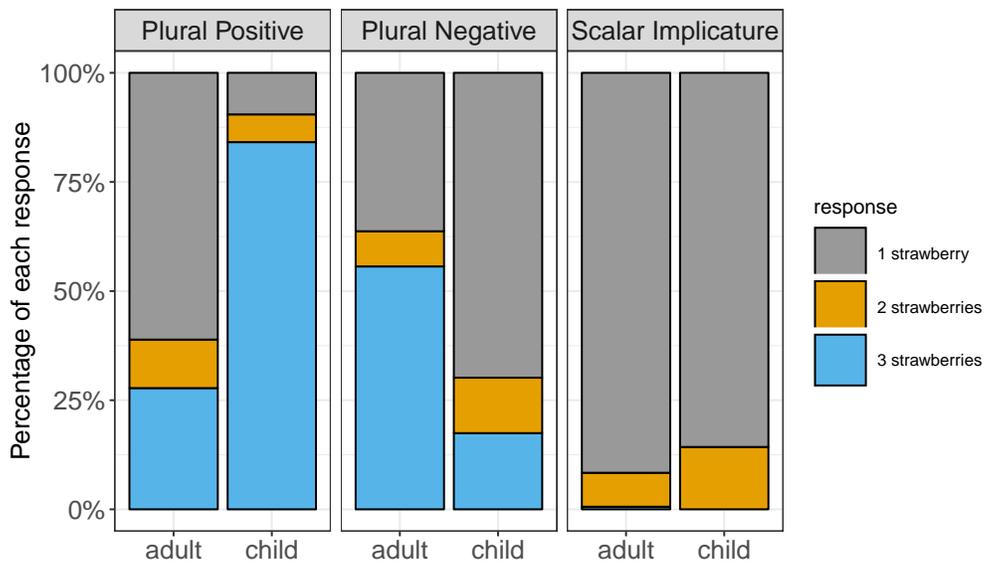


Figure 3 Percentage of 1-, 2-, and 3-strawberry responses to positive, negative, and scalar implicature targets.

Figure 4 displays the results for the positive and negative plural targets, with the

¹² We will return in the General discussion section to the potential significance of the distinction between 1- and 2-strawberry responses.

ternary responses recoded in binary terms (1 for exclusive reading, 0 for inclusive reading). Logistic regression models fitted to these recoded plural data revealed a significant effect of Group ($X^2(1) = 29$ $p < .001$), but no effect of Polarity or interaction between Group and Polarity; that is, adults gave more exclusive responses than children did, and this difference between the two groups did not vary across the two polarities.

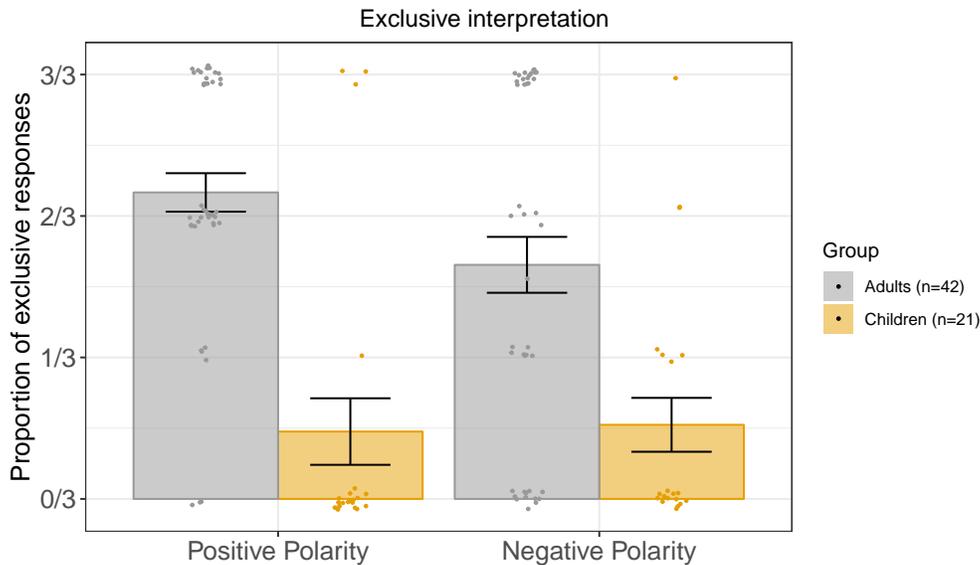


Figure 4 Exclusive interpretations of positive and negative plural targets, after recoding the ternary responses in binary terms (1 for the exclusive reading, 0 for the inclusive reading). Each dot represents an individual participant's mean inference rate for the given target.

4.3 Discussion

Overall the results of Experiment 1 are more in line with the main predictions of the TWO-READINGS approach and the additional prediction of the scalar implicature-based account. In particular, adults gave clear evidence of inclusive interpretations in negative contexts. In addition, children exhibited fewer exclusive readings than adults did in positive contexts, in line with the general trend in the developmental literature on scalar implicatures.

The adult data support a TWO-READINGS approach to the plural in Turkish. The child data in the plural condition are in line with the predictions of the implicature-

based account of the plural; however, the finding that children rejected the scalar implicature targets just as adults did is more puzzling. On the other hand, the finding of a discrepancy between the plural and scalar implicature conditions is reminiscent of experimental data reported in [van Tiel et al. \(2014\)](#), which revealed that rates of implicature computation vary widely across different scales. For instance, the ‘not all’ implicature of *some* was found to be computed much more by adults than the ‘not love’ implicature of *like*. In the present case, it would appear that the *some* implicature is stronger than the exclusive reading of the plural in Turkish.

The results are also comparable to those reported in [Tieu et al. \(2018\)](#) and [Renans et al. \(2018\)](#) for English and Greek. One key difference between the Turkish results and these previous findings, however, lies in the relatively high acceptance rate of the negative targets in the Turkish experiment. Our adult participants accepted the negative sentence “Tiger didn’t plant trees” 55% of the time in a context in which Tiger planted a single tree, whereas in Tieu et al.’s English experiments and Renans et al.’s Greek experiment, the percentage of acceptance was generally lower (42% and 19% in English, and 2% in Greek). Note, however, that this finding is still in line with the TWO-READINGS approach, while it is incompatible with the ONE-READING approach, which unambiguously predicts acceptance in these cases. We can think of two potential sources of this high acceptance rate in the negative condition. First, it could be due to an interpretation in which the plural noun takes scope above negation. Second, it could be that the participants accessed the marked exclusive reading under negation, which is allowed, albeit dispreferred, under the TWO-READINGS approach. We turn next to these two possibilities, before moving on to Experiment 2, designed to tease apart these hypotheses.

The scope of the plural Let us first consider the scope possibility. In English, bare plurals are generally regarded as scopally inert (e.g., [Carlson 1977](#)). For example, it is claimed in the literature that the only possible reading of (25) is one in which the plural *doctors* is in the scope of *want*:

- (25) Mary wants to meet doctors. ([Carlson 1977](#))
 ≈ Mary wants to meet some doctors or other (not a specific set of doctors)
 WANT > DOCTORS

By contrast, the plural has been argued not to be scopally inert in Turkish ([Bale & Khanjian 2014](#), [Bliss 2004](#)). For example, (26) has been claimed to allow two interpretations depending on the scopal relation between the bare plural *doktorlar* ‘doctors’ and *istiyor* ‘want’. If *doctors* scopes below *want*, then the predicted reading is the same as in English, i.e. (26-a). But when *doctors* scopes above *want*, then the predicted reading is as in (26-b), that is, Mary wants to see a specific set of doctors.

- (26) Mary doktor-lar bul-mak isti-yor. (from Bliss 2004: p.51)
 Mary doctor-PL meet-INF want-PROG.3
 ‘Mary wants to meet doctors.’
 a. ≈ Mary wants to meet some doctors or other (WANT > PL)
 b. ≈ There are some doctors that Mary wants to meet (PL > WANT)

This suggests that a negative sentence containing a bare plural in Turkish, such as (27), might also in principle give rise to the two interpretations depending on the scopal relation between the plural and negation.

- (27) Kaplan ağaç-lar ek-me-di.
 tiger tree-PL plant-NEG-PAST
 ‘Tiger didn’t plant trees.’
 a. ≈ It’s not true that Tiger planted trees (NEG > PL)
 b. ≈ There are some trees that Tiger didn’t plant (PL > NEG)

If indeed the sentence in (27) was sometimes interpreted as in (27-b), and since our contexts were compatible with this interpretation, this could explain the relatively high proportion of acceptance of the negative targets.

Favouring the marked interpretation through contrastive focus The second possible explanation for the high acceptance rate of the negative sentences in Turkish could be due to some factor facilitating the generally dispreferred exclusive reading under negation; as we have discussed, this reading is always a possibility when forced by the context. In particular, the English and Greek experiments differed from the present Turkish experiment in one potentially important respect: in both the English and Greek experiments, the experimenter asked the puppet a question using a bare plural and then the puppet replied using a bare plural noun as well, as seen in the English example in (28). In the Turkish experiment, however, the experimenter asked the puppet a question using a morphologically singular noun and the puppet replied using a bare plural noun, as in (29):

- (28) Exp: Tiger didn’t plant any flowers. What about **trees**? ENGLISH
 Pupp: Tiger didn’t plant **trees**.
 (29) Exp: Kaplan çiçek-ler ek-me-di. Peki **ağaç**? TURKISH
 lion flower-PL plant-NEG-PAST what.about tree
 ‘Tiger didn’t plant any flowers. What about tree?’
 Pupp: Kaplan **ağaç-lar** ek-me-di.
 lion tree-PL plant-NEG-PAST
 ‘Tiger didn’t plant trees.’

This contrast between the singular noun in the question and the plural noun in the answer could have encouraged a contrastive focus interpretation of the plural and facilitated the otherwise dispreferred exclusive interpretation of the plural under negation. That is, “Tiger didn’t plant trees” would be interpreted as *Tiger didn’t plant more than one tree*. If so, this could account for the higher acceptance of the negative sentences, as this interpretation was compatible with our experimental contexts.

In order to tease apart these different hypotheses, we conducted a follow-up study to Experiment 1, which we present in the next section.

5 Experiment 2

The aim of Experiment 2 was two-fold. First, we wanted to investigate in more detail the finding of greater acceptance of the negative targets in Experiment 1, as discussed in the last section. Second, we wanted to address the potential issue of the acceptability of sentences with unmodified bare plurals and replicate the results with more natural sentences involving modified plurals.

5.1 Methods

5.1.1 Participants

We tested 40 adult native speakers of Turkish. Two participants were excluded from the analysis for failing to correctly answer at least six of the eight control items, leaving a total of 38 participants.

5.1.2 Procedure

The procedure was exactly the same as in Experiment 1.

5.1.3 Materials

The design was different from that of Experiment 1 in three respects. First, we used target sentences involving modified bare plurals, as in (30).

- (30) Tavuk mavi yaprak-lı lale-ler dik-me-di.
chicken blue leaf-with tulip-PL plant-NEG-PAST
‘Chicken didn’t plant tulips with blue leaves.’

Second, we changed the questions that the experimenter asked the puppet so as not to facilitate a contrastive focus interpretation that could lead to the exclusive reading

under negation. The new type of question was as in (31):

- (31) Bize hikaye hakkında birşey-ler söyle-r mi-sin?
us story about something-PL say-AOR QUEST-2SG
'Can you tell us something about the story?'

Third, we manipulated scope such that half of the negative targets made a wide scope interpretation of the plural noun true (*wide-scope-true contexts*) and half made the wide scope interpretation false (*wide-scope-false contexts*). An example of a target sentence in a wide-scope-true context is provided in (32); the corresponding image is provided in Figure 5. In this example, it is true that *there are tulips with blue leaves that Chicken didn't plant*.

An example of a target sentence in a wide-scope-false context is given in (33); the corresponding image is provided in Figure 5. In this example, the wide scope interpretation (i.e. *there are books with green covers that Tiger didn't buy*) is made false.

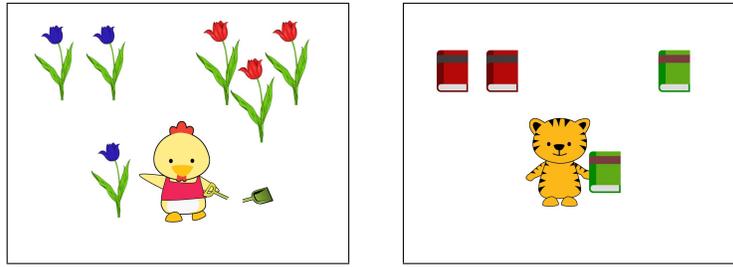


Figure 5 Target image for (32) (left) and for (33) (right).

- (32) WIDE-SCOPE-TRUE TARGET
Context: Chicken only planted this one tulip with blue leaves over here.
EXP: Okay, Ellie, can you tell us something about the story?
PUP: Tavuk mavi yaprak-lı lale-ler dik-me-di.
chicken blue leaf-with tulip-PL plant-NEG-PAST
'Chicken didn't plant tulips with blue leaves.'
- (33) WIDE-SCOPE-FALSE TARGET
Context: Tiger only bought this one book with a green cover over here.
Exp: Okay, Ellie, can you tell us something about the story?
Pupp: Kaplan yeşil kapak-lı kitap-lar al-ma-dı.
tiger green cover-with book-PL buy-NEG-PAST
'Tiger didn't buy books with green covers.'

As in Experiment 1, participants also received eight control items to ensure that

they could give minimal and maximal rewards where appropriate. Unlike in Experiment 1, however, participants were not presented with scalar implicature targets. To sum up, each participant received six positive plural targets, six negative plural targets (three in wide-scope-true contexts and three in wide-scope-false contexts), and eight controls.

The predictions of the contrastive focus and scope hypotheses are as follows: if scope plays a role in the interpretation of the plural, then we should expect a different response pattern in the wide-scope-true vs. wide-scope-false conditions. By contrast, if the singular question in Experiment 1 facilitated an exclusive interpretation under negation, we should expect more rejections of the negative targets in Experiment 2 compared to Experiment 1.

5.2 Results

Figure 6 displays the proportion of 1-, 2-, and 3-strawberry responses to the positive and negative targets, in wide-scope-true and wide-scope-false conditions. As in Experiment 1, the non-maximal 1- and 2-strawberry responses were treated alike, in contrast to the 3-strawberry responses. As before, for the positive plural targets, 1- and 2-strawberry responses were interpreted as a measure of the exclusive reading, while 3-strawberry responses corresponded to an inclusive reading. For the negative plural targets, 3-strawberry rewards were interpreted as being compatible with the exclusive reading, while 1- and 2-strawberry responses corresponded to an inclusive reading.

As we can see, similar to Experiment 1, the participants mostly rejected the positive sentences in contexts that were incompatible with the exclusive reading. On the plural negative targets, the participants also tended to give the puppet non-maximal rewards, in this case suggesting access to the inclusive reading.

Figure 7 displays the results for the positive and negative plural targets (both wide-scope-false and wide-scope-true targets), with the ternary responses recoded in binary terms (1 for the exclusive reading, 0 for the inclusive reading). Logistic regression models fitted to these data revealed a significant effect of Polarity ($X^2(1) = 34$ $p < .001$): the participants gave more exclusive responses to the positive targets than to the negative targets — an effect that was not observed in Experiment 1.

Figure 8 presents the results for the wide-scope-true and wide-scope-false negative targets, with the ternary responses recoded in binary terms (1 for the exclusive reading, 0 for the inclusive reading). Logistic regression models fitted to these data revealed no effect of scope.

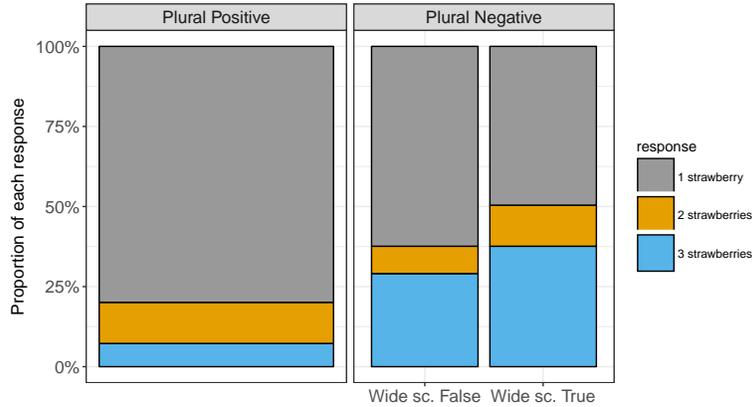


Figure 6 Proportion of 1-, 2-, and 3-strawberry responses across conditions.

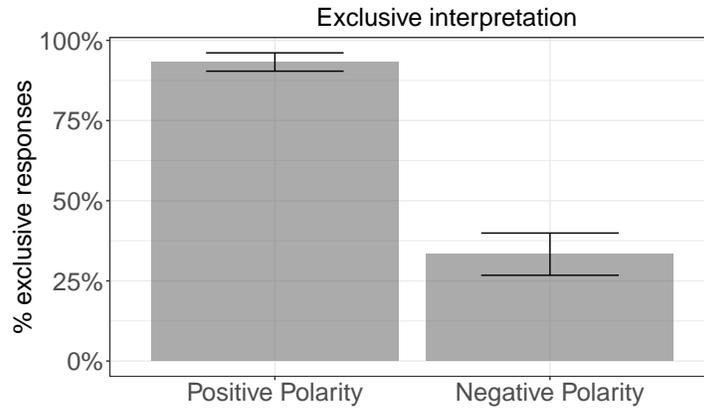


Figure 7 Percentage of exclusive responses in positive and negative conditions, after recoding the ternary responses in binary terms (1 for the exclusive reading, 0 for the inclusive reading).

5.3 Discussion

The results of Experiment 2 generally provide further support for the TWO-READINGS approach. In particular, we found no evidence that scope played a role in Experiment 1, in terms of explaining the relatively high acceptance of the negative plural targets. The participants in Experiment 2 mostly rejected the sentences in the negative condition, whether they were presented in wide-scope-true or wide-scope-false

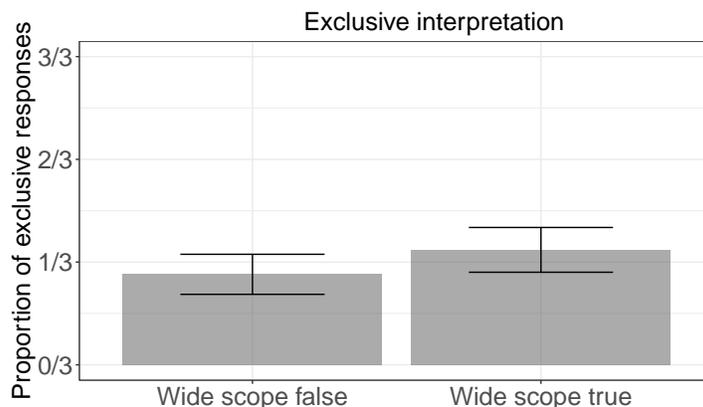


Figure 8 Proportion of exclusive responses in the wide-scope-true and wide-scope-false negative conditions, after recoding the ternary responses in binary terms (1 for the exclusive reading, 0 for the inclusive reading).

contexts.

In addition, after changing the experimenter’s question to the puppet so that it would not encourage the otherwise dispreferred exclusive reading under negation, acceptance of the negative sentences decreased from 55% in Experiment 1 to 33% in Experiment 2. Experiment 2 revealed an effect of polarity that was absent in Experiment 1, with more exclusive interpretations in the positive than in the negative conditions. The difference between Experiment 1 and Experiment 2 strongly suggests that the experimenter’s question containing the singular in Experiment 1 influenced participants’ acceptance of the negative plural targets.

6 General discussion

The results of our experiments provide support for the TWO-READINGS approach to the interpretation of the plural in Turkish. That is, any of the accounts proposed for English, based on implicature, ambiguity, or homogeneity, could straightforwardly be extended to account for the Turkish results. The findings suggest that the Turkish plural is not so different from the English or Greek plural after all.

In addition, our results are compatible with the additional prediction of the implicature-based account within the TWO-READINGS approach, with children accessing fewer exclusive readings than adults (though, as we discussed, children’s adult-like behaviour in the scalar implicature condition of Experiment 1 is more puzzling from this perspective).

As for the observation that Turkish bare singulars have inclusive interpretations when in a non-case-marked direct object position (Bliss 2004, Görgülü 2012, Sağ 2017, 2018), as in (34), we follow Sağ (2017, 2018) who argues that the inclusive interpretation of bare singulars is a simple by-product of pseudo-incorporation, rather than arising directly from the denotation of the singular (Massam 2001).¹³

- (34) Ali **kitap** oku-du.
Ali book read-PAST
'Ali did book-reading (one or more books).'

Pseudo-incorporated nouns differ from canonical arguments, such as definites, quantified expressions, etc., in forming a syntactic unit with the verb immediately preceding it and not receiving case marking. (Sağ 2017, Öztürk 2005). More specifically, pseudo-incorporated bare singulars are singular kinds that are introduced in the event kind domain as thematic arguments to yield sub-event kinds. For example, in (34) Ali is involved in the book-reading event kind as an agent, and the book-reading event kind is formed by the reading event kind taking the singular book kind as its theme argument. The assertion that at least one token of the book-reading event kind exists yields the inference of reading one or more books, namely the instantiations the singular kind is conceptually associated with.¹⁴ Of relevance for our purposes is that this account maintains that the interpretation of the singular is simply a set of atomic individuals, which is compatible with a TWO-READINGS approach to the plural.¹⁵

7 Conclusions

In English and many other languages, plural nouns are associated with two possible readings: an exclusive reading in upward-entailing contexts and an inclusive reading in downward-entailing contexts. By contrast, Turkish is generally cited as a language in which the plural only has an exclusive interpretation. We reported two experiments

¹³ See also Martí 2017

¹⁴ Sağ (2017), Sağ (2018) follows Dayal (2004) in that singular kinds are impure atomic taxonomic kinds that do not allow grammatical access to instantiation sets via type-shifting operators like *pred*. The relation between a singular kind and its instantiations, therefore, is established at the conceptual level, and the object-level readings are achieved via inference.

¹⁵ Existential copular constructions that are roughly translated into English as 'have'-predicates are another place where bare singulars have number-neutral interpretations. Sağ (2018) considers them an instance of pseudo-incorporation. In addition, Bale et al.'s (2010) claim is based on the ability of bare singulars to occur in the predicate position of both singular and plural subject terms. In Sağ (2017), Sağ (2018), this is argued to follow from the fact that they occur as singular kinds in this position, rather than from their alleged number neutrality. They participate in kind naming constructions in which the subject term is named with respect to a kind it belongs to, regardless of its number.

conducted with Turkish-speaking adults and children, the results of which reveal that the Turkish plural, just like the English plural, gives rise to the exclusive interpretation in upward-entailing contexts and to the inclusive interpretation in downward-entailing contexts. This result, as well as the finding that children compute fewer exclusive readings of the plural than adults, supports a TWO-READINGS approach to the plural in Turkish.

In sum, the Turkish plural appears to be just like the plural in English in the relevant respects. We also discussed how this treatment of the plural can be integrated within a theory of the Turkish number system more generally. By investigating the case of Turkish more closely, our study sheds light on the question of whether there are languages that only allow an exclusive reading of the plural, and contributes to the ongoing discussion on the meaning of the plural from a cross-linguistic perspective.

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