

# Turkish plural nouns are number-neutral: experimental data

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University / Macquarie University

Linguistic Evidence, Tübingen  
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# The project

- | The meaning of the plural across languages

# The case of Turkish

- | The case of the **Turkish** plural

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- | Argued to work quite **differently** from the English plural

# The case of Turkish

- | The case of the **Turkish** plural
- | Argued to work quite **differently** from the English plural
- | Experimental evidence suggesting that this isn't the case

# The importance of the Turkish case

- | It can shed light on the possible meanings that the plural can have across languages

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- | It can shed light on the **possible meanings** that the plural can have **across languages**
- | Thereby constraining cross-linguistically adequate theories of the semantics of number

# The roadmap

- | Background: the meaning of the plural in English



# The roadmap

- | Background: the meaning of the plural in English
- | The case of Turkish

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- | Background: the meaning of the plural in English
- | The case of Turkish
- | Two experiments

# The roadmap

- | Background: the meaning of the plural in English
- | The case of Turkish
- | Two experiments
- | Discussion, conclusion, and moving forward

# Outline

Background

The case of Turkish

Predictions

The experiments

Discussion

Conclusions

# The meaning of the plural

In English, plural marking typically conveys **multiplicity**

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(1) Tiger planted **trees**     *Tiger planted more than one tree*

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In English, plural marking typically conveys **multiplicity**

- (1) Tiger planted **trees**    *Tiger planted more than one tree*
- (2) Tiger planted a **tree**    *Tiger planted more than one tree*

# The meaning of the plural

This multiplicity generally disappears in downward-entailing contexts

(3) Tiger didn't plant **trees**



# The meaning of the plural

This multiplicity generally disappears in downward-entailing contexts

- (3) Tiger didn't plant **trees**  
6 *Tiger didn't plant more than one tree*

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6 *Tiger didn't plant more than one tree*  
*Tiger didn't plant any tree*

# The general view for English

- | Multiplicity **not** in the literal meaning of plural nouns

# The general view for English

- | The literal meaning of the plural as **number-neutral**

# The meaning of the plural in English

(4) Tiger planted **trees**

# The meaning of the plural in English

- (4) Tiger planted **trees**
- (5) Tiger planted **one or more trees**

## Immediate right prediction

(6) Tiger didn't plant **trees**

## Immediate right prediction

- (6) Tiger didn't plant **trees**
- (7) Tiger didn't plant **one or more trees**



## What about the positive case though?

- (8) Tiger planted **trees**
- (9) Tiger planted **one or more trees**

## Two options

- | The multiplicity meaning arises:

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  - | As an implicature (Sauerland et al 2005, Spector 2007)

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  - | As an **implicature** (Sauerland et al 2005, Spector 2007)

# The implicature approach

Three main ingredients:

- | A number-neutral literal meaning for plural nouns

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- | A theory of implicatures

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Three main ingredients:

- | A number-neutral literal meaning for plural nouns
- | A theory of implicatures
- | Assumptions about a competition between the singular and the plural



# The implicature approach

- (10) Sue met students  
= Sue met one or more students      literal meaning

# The implicature approach

- (11) Sue met students
- (12) Sue met exactly one student

# The implicature approach

As hearers we assume that the speaker will convey the strongest relevant piece of information she believes to be true

# The implicature approach

- (13) Sue met students (=Sue met one or more students)
- (14) Sue met exactly one student

# The implicature approach

(15) Sue didn't meet exactly one student

# The implicature approach

- (15) Sue didn't meet exactly one student
- (16) Sue met more than one student

# The implicature approach

What about the negative case?

(17) Sue didn't meet students

# The implicature approach

What about the negative case?

(17) Sue didn't meet students

(18) Sue didn't meet exactly one student



# The implicature approach

What about the negative case?

(17) Sue didn't meet students

(18) Sue didn't meet exactly one student

) no inference

# The implicature approach

- (19) Sue didn't meet students =  
Sue didn't meet one or more students

## An additional reading

(20) Sue didn't meet stuDENTS . . . she met only one

## An additional reading

Implicatures under negation

(21) not[Sue met students]

## An additional reading

Implicatures under negation

(21) not[Sue met students]

(22) not[S[Sue met students]]

## An additional reading

### Implicatures under negation

(21) not[Sue met students]

(22) not[S[Sue met students]]

(23) not[Sue met more than one student]  
= Sue didn't meet more than one student

- | The plural in English argued to be number-neutral

## in sum

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- | The plural in English argued to be number-neutral
- | The more-than-one inference arises as an implicature
- | This predicts sensitivity to monotonicity
- | It allows for a marked reading with implicatures under negation/in DE environments

# Outline

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# Turkish plural nouns

- | The Turkish plural also gives rise to **multiplicity**

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(24) Kaplan agac-lar ek-ti.  
tiger tree-pl plant-past  
'Tiger planted trees.'  
*Tiger planted more than one tree*

# The meaning of the plural in Turkish

- | Argued to be quite **different** from the English plural

# The meaning of the plural in Turkish

It is controversial whether the literal meaning of plural nouns is:

# The meaning of the plural in Turkish

It is controversial whether the literal meaning of plural nouns is:

- | **number-neutral**

(Sag 2017)



# The meaning of the plural in Turkish

It is controversial whether the literal meaning of plural nouns is:

- | **number-neutral** (Sag 2017)
- | **strict plural** (Bale & Khanjian 2014, Bale et al 2011)

# The meaning of the plural in Turkish

(25) Tiger planted trees

## The meaning of the plural in Turkish

(25) Tiger planted trees

(26) Tiger planted one or more trees

number-neutral

## The meaning of the plural in Turkish

- (25) Tiger planted **trees**
- (26) Tiger planted **one or more trees**      number-neutral
- (27) Tiger planted **more than one tree**      strict plural

# Outline

Background

The case of Turkish

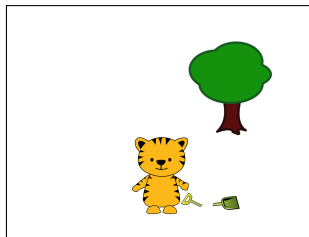
**Predictions**

The experiments

Discussion

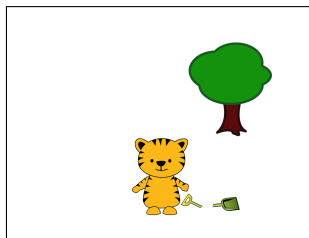
Conclusions

## Predictions — positive cases



- (28) Kaplan agac-lar ek-ti.  
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'Tiger planted trees.'

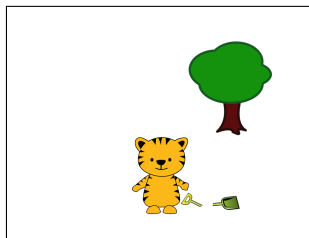
## Predictions — positive cases



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number-neutral strict plural

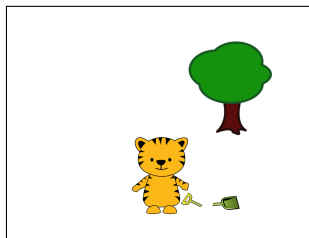
## Predictions — negative cases



- (29) Kaplan agac-lar ek-me-di.  
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'Tiger didn't plant trees.'  
*Tiger didn't plant any tree/more than one tree*



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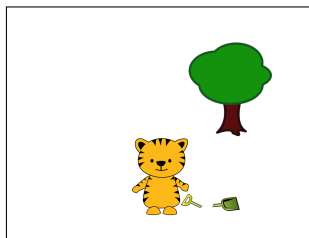
*Tiger didn't plant any tree/more than one tree*

**number-neutral    strict plural**

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×

## Predictions — negative cases

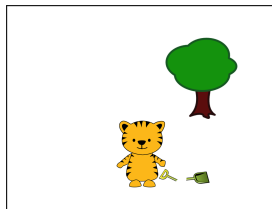


- (30) Kaplan agac-lar ek-me-di.  
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'Tiger didn't plant trees.'  
*Tiger didn't plant more than one tree*

**number-neutral    strict plural**

×

×



number-neutral    strict plural

---

T. planted trees.

---

T. didn't plant trees

/X

X

## Predictions — plural vs. implicatures

**strict plural** approach:

| **no** predictions

**number-neutral + implicature** approach:

**strict plural** approach:

- | **no** predictions

**number-neutral + implicature** approach:

- | children to access the 'more than one' meaning less than adults do
- | following the general pattern of standard scalar implicatures  
(Yatsushiro et al. 2017, Tieu et al. 2017, Renans et al. 2017)

# Our study

Two questions:

- | Does the literal meaning of the Turkish plural denote **strict plurality** or is it **number-neutral**?

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- | Does the literal meaning of the Turkish plural denote **strict plurality** or is it **number-neutral**?
- | If the latter, does multiplicity arise as an **implicature**?

# Our study

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- | plurals in upward- and downward-entailing contexts

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- | Two experiments testing Turkish-speaking adults and 4-6-year-old children
- | plurals in upward- and downward-entailing contexts
- | also compared to the 'not all' scalar inference of *baz* 'some'
- | compared the results to previous studies in English and Greek

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# Experiment 1

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- | We tested the predictions above
- | plural nouns in positive and negative contexts
- | also compared to scalar implicatures  
(Tieu et al 2014, 2017, Renans et al 2017)

## Participants

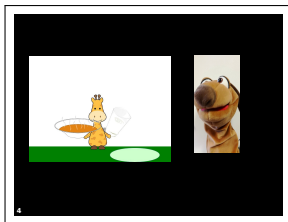
- | 22 children (age range 4-6 years,  $M = 5;02$ ) and 45 adult native speakers of Turkish
- | after exclusion: 21 children and 42 adults



## Procedure

Tieu et al.'s (2014, 2017), Renans et al.'s (2017) paradigm, ternary judgment task

- | short animations on a laptop
- | the experimenter asked questions to the puppet about the story
- | the puppet responded with sentences containing a plural noun
- | participants' task: judge the puppet's utterances by rewarding the puppet with 1, 2, or 3 strawberries



We manipulated 3 factors:

## Materials

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- | group (children vs. adults)

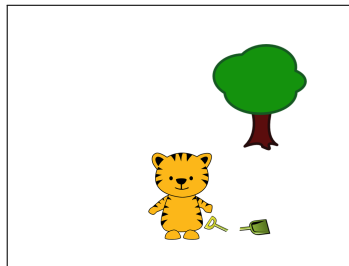
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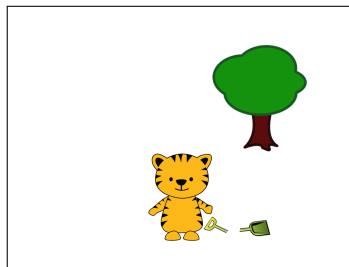
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- | group (children vs. adults)
- | inference type (multiplicity vs. scalar)
- | polarity (positive vs. negative)

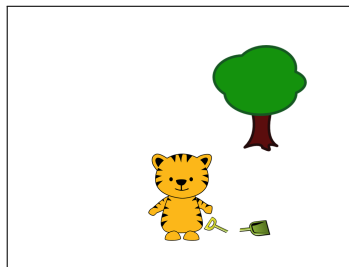


- (31) The context makes it clear that Tiger planted **only 1** tree and no others.



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Exp: Okay, Ellie, so Tiger didn't plant any others. What about trees?

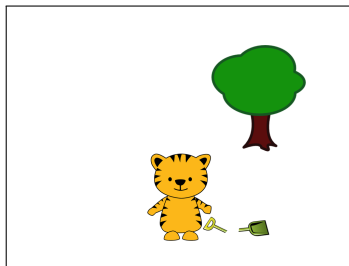


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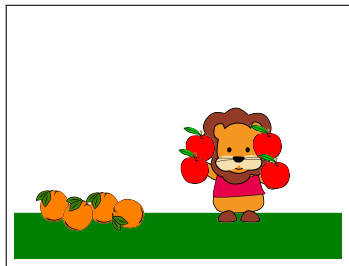


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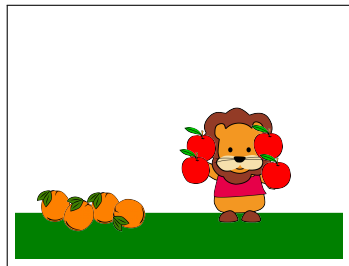
Positive

- (33) Kaplan agac-lar ek-me-di.  
tiger tree-pl plant-neg-past  
'Tiger didn't plant trees.'

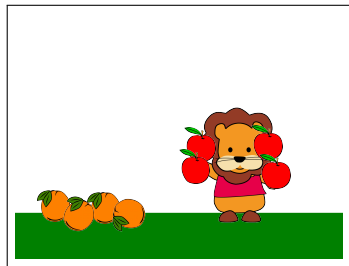
Negative



(34) The context makes it clear that the Lion carried **all of the apples**.



- (34) The context makes it clear that the Lion carried **all of the apples**.  
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Pupp: Aslan elma-lar- n baz -lar- -n tas -d .  
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  - | 3 plural positive trials

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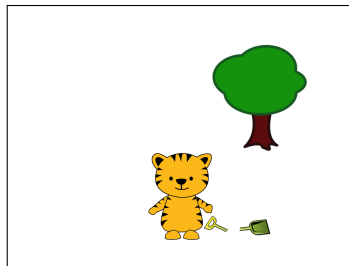
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  - | 3 plural negative trials
  - | 4 scalar implicature trials
- | 8 controls



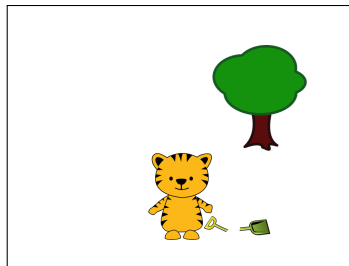
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- (35) Kaplan agac-lar ek-ti.  
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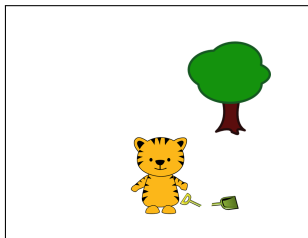
Positive

**number neutral    strict plurality**

1,2

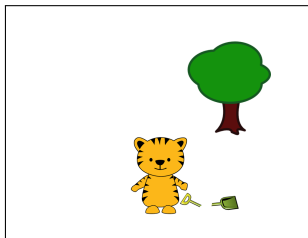
1,2

## Plural negative condition — predicted responses



- (36) Kaplan agac-lar ek-me-di.  
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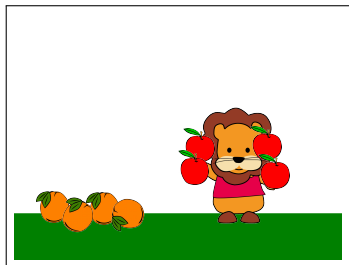
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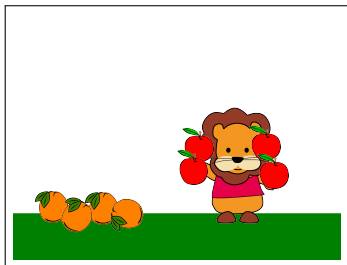
	number neutral	strict plurality
Tiger didn't plant any tree/more than 1 tree	1,2/3	3

## Scalar implicature condition — predicted responses



- (37) Aslan elma-lar- n baz -lar- -n tas -d .  
Lion apple-pl -gen some-pl -poss.3sg-acc carry-past  
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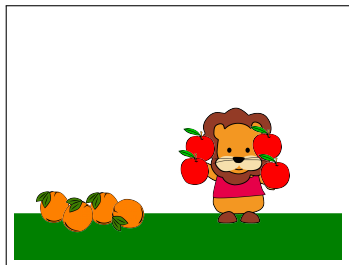
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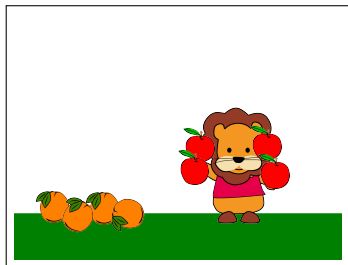
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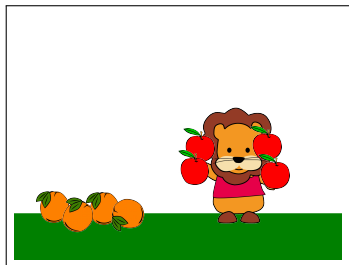
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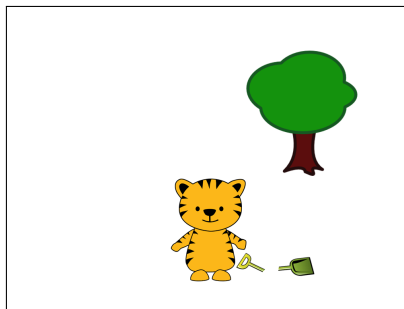
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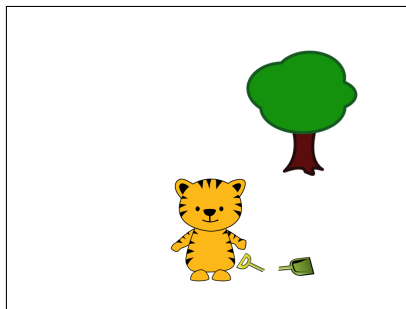
- (38) a. *Lion took some but not all of the apples*      Scal ar Impl .  
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## Predicted answers — summary



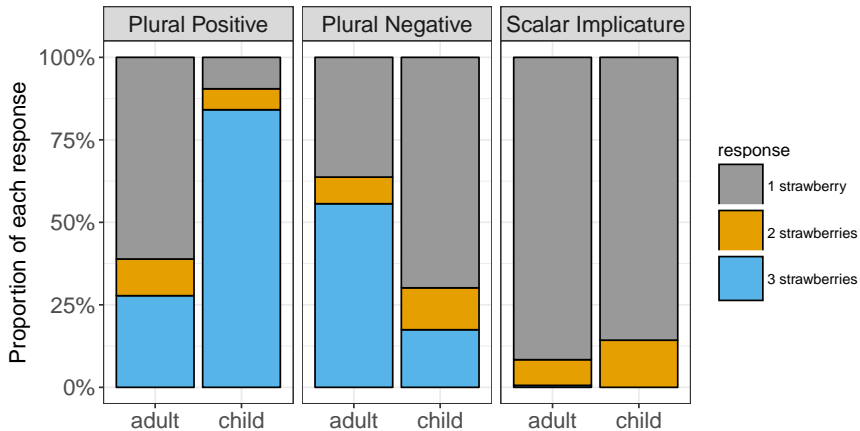
	number neutral	strict plurality
Tiger planted trees.	1,2	1,2
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## Predicted answers — summary

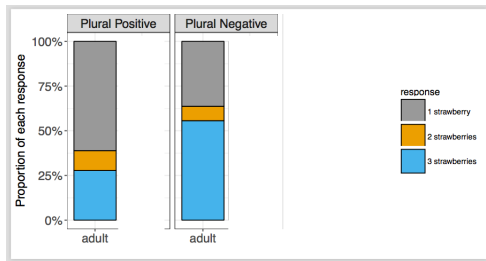


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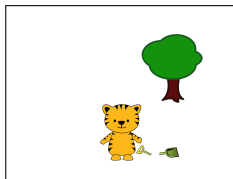
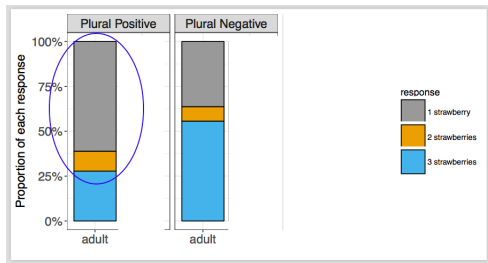
## Results



## Results - adults



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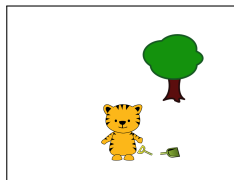
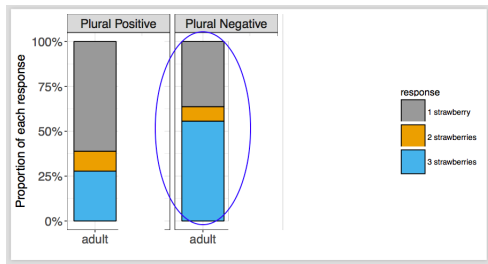
number-neutral      strict plural

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1,2

1,2

# Results



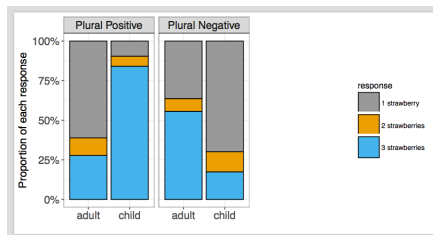
(40) Kaplan ağaçlar ekmedi.  
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number-neutral    strict plural

1,2/3

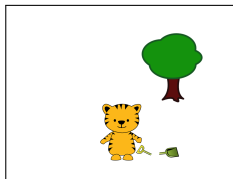
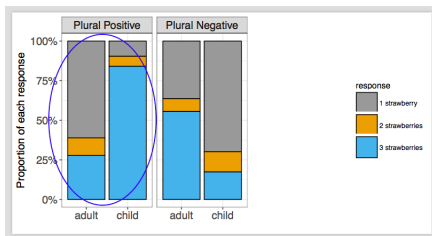
3

## Results - children





## Results - children



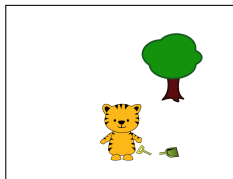
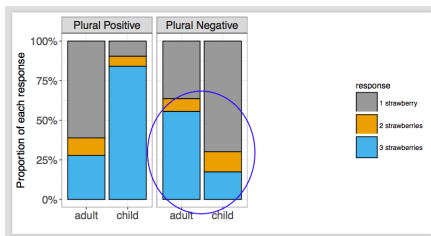
(41) Kaplan ağaçlar ekti.  
'Tiger planted trees.'

**number-neutral + implicature**

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children < adults

## Results - children



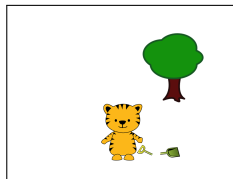
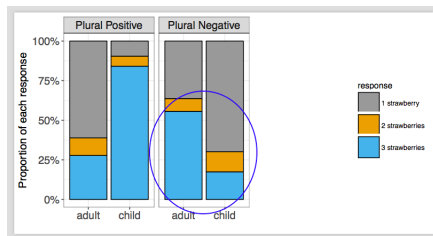
(42) Kaplan ağaçlar ekmedi.  
'Tiger didn't plant trees.'

**number-neutral + implicature**

---

children < adults

## Results - children



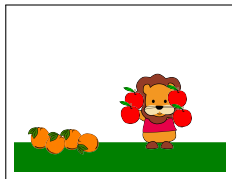
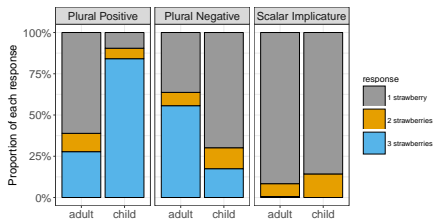
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# Results



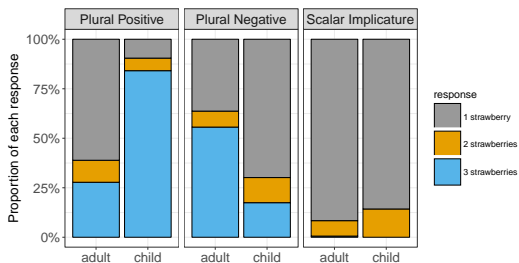
(44) Aslan elmalar n baz lar n tas d .  
'Lion carried some of the apples.'

---

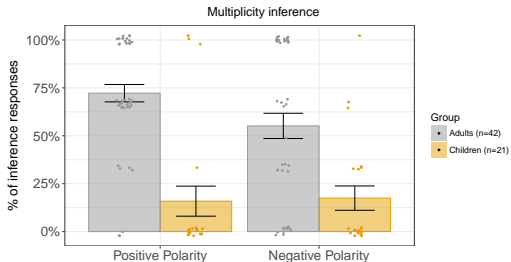
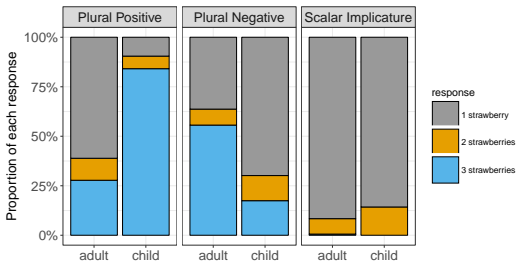
inference comp.	1,2
no inference comp.	3

---

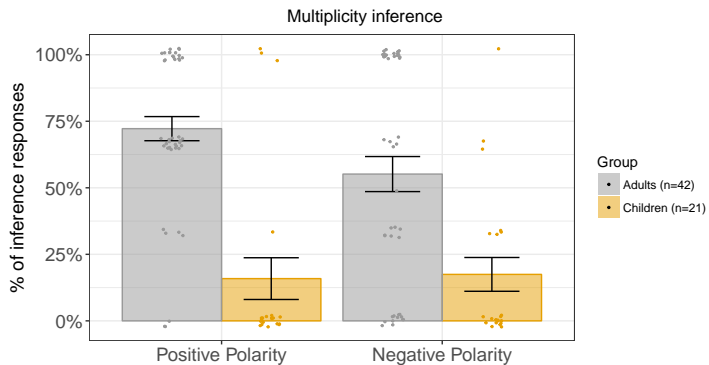
## Results — stats



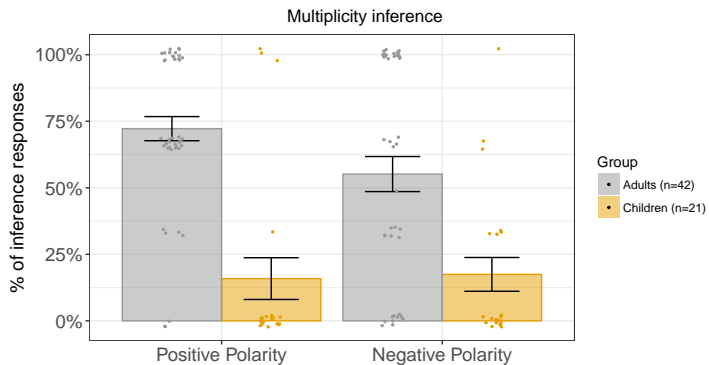
## Results — stats



## Results: polarity



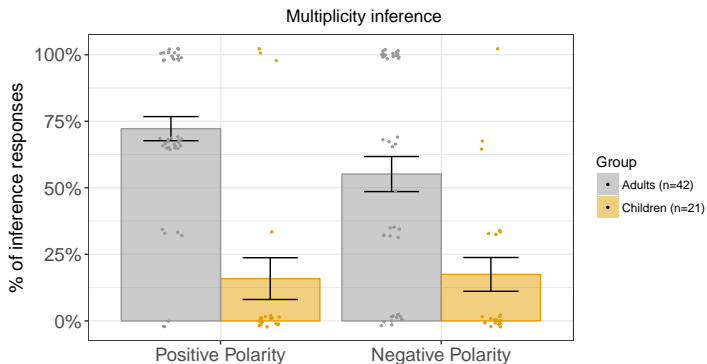
## Results: polarity



Logit model fitted to the data revealed:



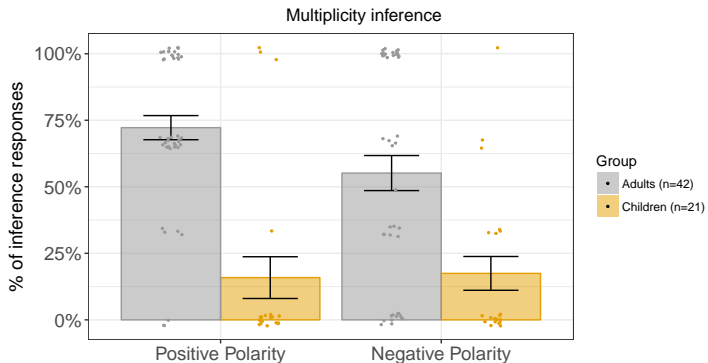
## Results: polarity



Logit model fitted to the data revealed:

- a significant effect of group ( $p < .001$ )

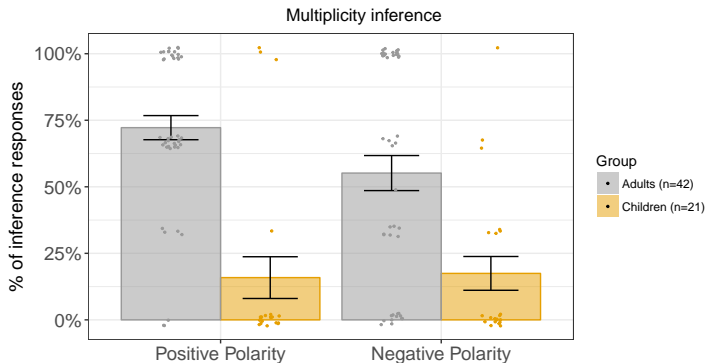
## Results: polarity



Logit model fitted to the data revealed:

- | a significant effect of group ( $p < .001$ )
- | no effect of polarity or interaction:

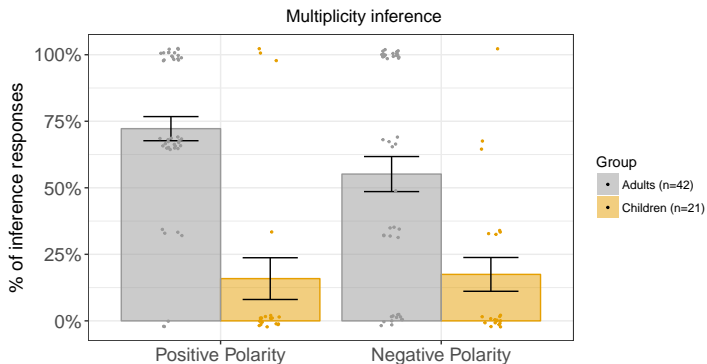
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Logit model fitted to the data revealed:

- | a significant effect of group ( $p < .001$ )
- | no effect of polarity or interaction:
- ) adults interpreted plurals as giving rise to the 'more than one' meaning more than children did
- ) and this difference did not vary across positive vs negative

# Outline

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The case of Turkish

Predictions

The experiments

**Discussion**

Conclusions

## Results - summary

Overall very similar results than in English/Greek:

- | adults rejected in the positive case

## Results - summary

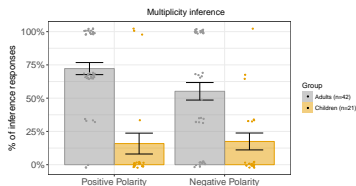
Overall very similar results than in English/Greek:

- | adults rejected in the positive case
- | children computed fewer multiplicity inferences than adults did

## A difference between Turkish vs. English/Greek

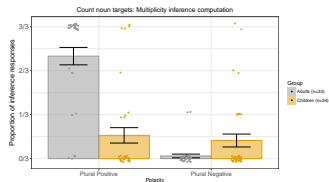
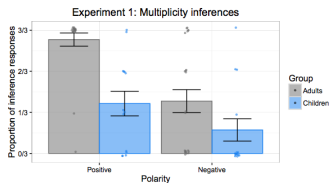
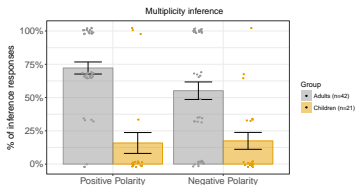
There was however a difference in the negative condition:

- Higher acceptance rate than in English and Greek (Tieu et al. 2017, Renans et al. 2017)





# Turkish vs. Greek vs. English



## Two potential sources of this difference

1. interpretation of implicature under negation
2. scopal interpretation of the plural ( $pl < neg$  or  $neg < pl$ )

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2. scopal interpretation of the plural ( $pl < neg$  or  $neg < pl$  )

## Scope of plural

- | Bare plurals in English generally regarded as **scopally inert** (Carlson 1977, a.o.)

(45) Mary wants to meet **doctors** (Carlson 1977)

- | only possible reading: *want* > *doctors*
- | Mary wants to meet some doctors or other (not a specific set of doctors)

## Scope of the plural

- | In Turkish, bare plurals are claimed not to be scopally inert (Bale & Kahnjian 2014, Bliss 2004)

(46) Mary doktor-lar bul-mak ist-iyor.  
Mary doctor-pl meet-inf want-prog.3  
'Mary wants to meet doctors.' (Bliss 2004)

- | plural narrow scope reading: want > doctor
- | plural wide scope reading: doctors > want
- ) There are some doctors that Mary wants to meet

## Why relevant for us

- | When bare plurals under negation in Turkish, two readings:

(47) Tiger didn't plant trees.

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(47) Tiger didn't plant trees.

(a) *It's not true that Tiger planted trees* (neg > trees)

(b) *There are some trees that Tiger didn't plant*  
(trees > neg)



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# Implicature under negation

English/Greek experiments:

(48) Exp: Tiger didn't plant any flowers. What about **trees**?

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English/Greek experiments:

(48) Exp: Tiger didn't plant any flowers. What about **trees**?

Turkish:

(49) Exp: Kaplan çiçekler ekmedi. Peki **ağaç**?  
'*Tiger didn't plant any flowers. What about tree?*'

## Implicature under negation

- (50) Exp: Kaplan çiçekler ekmedi. Peki ağaç?  
'Tiger didn't plant any flowers. What about tree?'
- Pupp: Kaplan ağaçlar ekmedi.  
'Tiger didn't plant trees.'
- | this contrast between singular and plural could encourage a contrastive focus interpretation of the plural
  - | and facilitate the otherwise dispreferred interpretation with implicature under negation (Fox & Spector 2016)

# Experiment 2

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- | to check more directly the wide-scope interpretation and implicature-under-negation

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## Aims:

- | to check more directly the wide-scope interpretation and implicature-under-negation
- | to replicate the results with more natural constructions interpretation



# Materials

3 changes in the design:

1. **targets:**

(51) Tavuk **mavi yapraklı** laleler dikmedi.  
*'Chicken didn't plant tulips **with blue leaves.**'*

2. **questions:**

(52) Exp: Bize hikaye hakkında birşeyler söyler misin?  
*'Can you tell us something about the story?'*

3. **contexts:** negative targets presented in either wide scope-true or wide scope-false contexts

# Materials

- | 6 positive plural targets

# Materials

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- | 6 negative plural targets

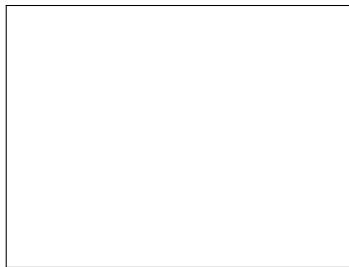
# Materials

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- | 6 negative plural targets
  - | wide scope-true
  - | wide scope-false

# Materials

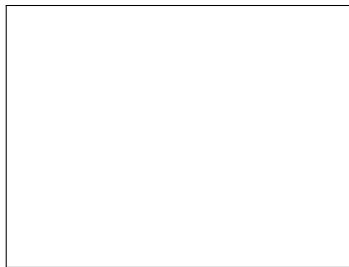
- | 6 positive plural targets
- | 6 negative plural targets
  - | wide scope-true
  - | wide scope-false
- | 8 controls

## Wide-scope true



- (53) Context made it clear that Chicken only planted this one tulip with blue leaves over here.

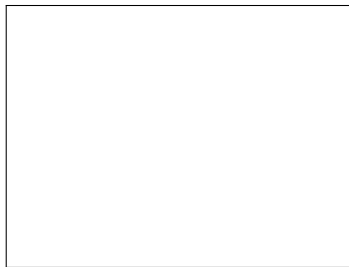
## Wide-scope true



(53) Context made it clear that Chicken only planted this one tulip with blue leaves over here.

EXP: Okay, Ellie, can you tell us something about the story?

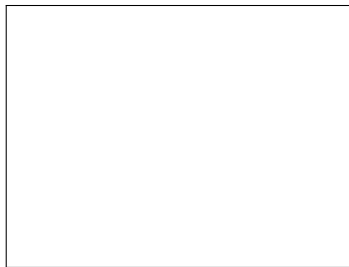
## Wide-scope true



- (53) Context made it clear that 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 yapraklı laleler dikmedi.  
`Chicken didn't plant tulips with blue leaves.



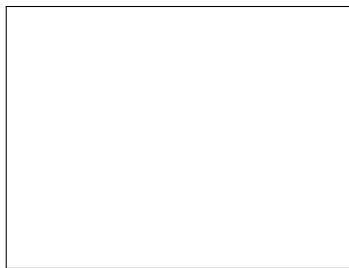
## Wide scope false



(54) Context made it clear that Tiger only bought this one book with a green cover over here.

Exp: Okay, Ellie, can you tell us something about the story?

## Wide scope false



(54) Context made it clear that 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 kapaklı kitaplar almadı .  
`Tiger didn't buy books with green covers!

# Predictions

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- | if scope plays a role in the interpretation of the plural
- ) a different response pattern in the wide scope-true vs. wide scope-false contexts
- | if the singular question facilitated an embedded implicature interpretation
- ) more rejections of the negative targets in Exp.2 compared to Exp.1

# Results

Results: wide scope-true vs. wide scope-false



## Results: wide scope-true vs. wide scope-false

- | no evidence that the scope of the plural played a role in the interpretation of the target sentences
- ) no difference between wide scope-true and wide scope-false targets

Results: plural positive vs. plural negative targets

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## Results: plural positive vs. plural negative targets

- | The results suggest that the question played a role in the acceptability of the negative targets:
  - ) in Exp.2, the rejection rate was more similar to what has been reported for English and Greek
  - ) Logit models fitted to the data revealed a significant effect of Polarity ( $p < .001$ ), which was not observed in Exp.1.

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# Conclusions

- | Turkish plural was argued to work **di erently** than in English (and Greek)
- | We tested it experimentally
- | The overall results **challenge** the idea that the Turkish plural is di erent from the plural in English and Greek

## Next directions

- | How do we fit a number-neutral interpretation of the plural within a general theory of number in Turkish
  - | Number-neutral interpretations of the singular
  - | The interaction between numerals and number

## Next directions

- | Is there a language in which plural is only strict plural? e.g. Western Armenian, Korean ...