Agreement Attraction in Turkish: Effects of Nominal and Verbal Plural Morphemes

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Abstract

This paper deals with agreement attraction because it's more important than literally anything else. Recently, Lago et al. (2018) demonstrated agreement attraction effects in comprension in Turkish, which is super-interesting because this finding allows us to make a lot of money. However, there is an alternative explanation for their findings: dark sorcery. In this paper we tested the predictions of these alternative accounts. In Experiment 1, we found that a particular kind of dark sorcery was not involved. In Experiment 2, we shall find ...

INTRODUCTION

Attraction errors in the production and comprehension of subject-verb agreement, in which a verb does not agree with the grammatical agreement controller, but with a potential attractor, have been the main topic of research in many studies for quite a long time. In fact, it is still a widely researched area in psycholinguistic studies. Despite the comprehensive research that has been carried out, studies that have been conducted on agreement attraction in Turkish have been very limited. In fact, Lago (2018) is currently the only study that explores this phenomenon in Turkish. Lago (2018) makes use of genitive-possessive structures in the subject position, in which the possessive-marked noun is the head of the noun phrase which acts as the grammatical agreement controller, and the genitive noun serves as a potential attractor. In a speeded acceptability judgment study, Lago (2018) found a significant effect of number agreement attraction. However, the interpretation of their findings may be a result of the fact that non-subjecthood cues originate from their use of morphologically ambiguous forms of the possessive. In the possessive forms that are used, all the head nouns in their stimuli are ambigiuous between possessive and accusative.

In Turkish, accusative number agreement controllers are extremely rare, while genitive

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agreement controllers are very frequent. Thus, Lago (2018)'s finding could potentially be explained with occasional shallow processing. When all syntactic relations in the sentence were processed fully, the possessive noun may have been identified as the controller. Meanwhile, the genitive noun may sometimes have been erroneously identified as the controller during shallow processing because genitives are more likely to act as agreement controllers than accusatives (SOURCE). A second alternative explanation for Lago (2018)'s findings may be the fact that participants may engage in even more shallow processing than outlined above. Participants may have erroneously responded *Yes* on some trials for two main reasons: (i) the presence of a plural morpheme on a noun (attractor or controller), and (ii) the presence of a plural agreement morpheme on the verb. We speculate that in such trials, participants would have simply tried to check for the presence of such morphemes, while largely disregarding the remainder of the sentence.

We first replicated Lago (2018)'s experiment with unambiguous head nouns. To this end, we revised the items that were used previously in order to avoid morphological ambiguity between possessive and accusative forms. The effect found in Lago (2018) was also observed when unambiguous nouns were used, as will be discussed in §2.

§3 discusses the alternative account that posits even more shallow processing as mentioned above and presents a pre-registered experiment using RC attractors with potential outcomes and their indications. Since both nominal and verbal plural morphemes in Turkish are expressed with the same form (*-ler* or *-lar* depending on the phonological environment), we can test this possibility with an experiment in which a relative clause with or without plural agreement on the verb in place of the genitive possessors is used. An agreement attraction effect similar in magnitude to that observed in Lago (2018) would indicate that participants use the aforementioned strategies.

§4 offers a discussion of the issue of number attraction and where this experiments leaves us. Lastly, §5 presents a brief conclusion and topics for future research.

Experiment 1

In their study, Lago (2018) investigates the comprehension of subject-verb agreement Turkish monolinguals. They use speeded acceptability judgments for the effects of number attraction in Turkish. Their sentences make us of genitive-possessive constructions in the subject position, where the genitive is the attractor and the possessive is the head noun. They manipulate the grammaticality of the sentence by changing the plural morphology of the verb, and they also manipulate the plurality of the attractor noun. In grammatical conditions, the subject and the verb both bear singular morphology with no overt morpheme. Moreover, in the ungrammatical conditions, the verb bears the overt *-lAr* morpheme whereas the subject is still singular as exemplified below.

(1) a. UNGRAMMATICAL, SG ATTRACTOR
Şarkıcı-nın vokalist-i sahne-de sürekli zıpla-dı-lar.
singer-GEN vocalist-POSS stage-LOC non-stop jump-PST-3PL
The singer's backup vocalist jumped on the stage non-stop.

b. Grammatical, PL attractor

Şarkıcı-lar-ın vokalist-i sahne-de sürekli zıpla-dı
singer-PL-GEN vocalist-POSS stage-LOC non-stop jump-PST-∅

The singers' backup vocalist jumped on the stage non-stop.

c. Ungrammatical, PL attractor

Şarkıcı-lar-ın vokalist-i sahne-de sürekli zıpla-dı-lar.
singer-PL-GEN vocalist-POSS stage-LOC non-stop jump-PST-3PL

The singers' backup vocalist jumped on the stage non-stop.

d. Grammatical, SG attractor

Şarkıcı-nın vokalist-i sahne-de sürekli zıpla-dı
singer-GEN vocalist-POSS stage-LOC non-stop jump-PST-∅

The singer's backup vocalist jumped on the stage non-stop.

They found a significant effect of number attraction in Turkish ranging between 11%–15% across monolinguals. As seen in the results of the statistical analysis in Table (1), the acceptability judgments showed an immense effect of grammaticality, and there is also interaction between grammaticality and attractor number, which indicates the presence of a number attraction effect.

	Monolingual Speakers			
	β	SE	z	p
Attraction Task				
Grammaticality	**-5.51**	**0.33**	**-16.69**	**.000**
Attractor Number	0.14	0.25	0.57	.571
Grammaticality x Attractor Number	**1.69**	**0.53**	**3.19**	**.001**
Attractor Number: Ungram conditions	**0.94**	**0.26**	**3.68**	**.000**
Attractor Number: Gram conditions	-0.79	0.52	-1.51	.131

Table 1
Model results for the judgments of monolingual cited from @Lago.

Lago (2018) stipulate that the Turkish genitive case does not provide a strong cue against subjecthood since Turkish frequently makes use of genitive marked subjects in embedded clauses, as in example (2). This is in contrast with English, in which the genitive case is compatible with subjecthood. Thus, Lago (2018) argue that this robust agreement attraction effect has been linked to the case information carried by accusative and genitive.

(2) köy-ü bir haydut-un bas-tığ-ın-ı duy-du-m.
village-ACC a bandit-GEN raid-NMLZ-3SG-ACC hear-PST-1SG

I heard that a (certain) robber raided the village. (Adapted from Woolford (2009))

However, our initial hypothesis postulates that participants engage in shallow processing, which results in a situation in which not only the genitive case but also the possessive case plays a significant role in delivering the case information. None of the experimental

items in Lago (2018) have a head noun which ends with a vowel; thus, all of the possessive markers are morphologically and phonologically ambiguous between the accusative case and the possessive. Unlike genitive case, it is extremely rare for the accusative case to appear on the head noun of the subject, which only occurs in raising predicates as in example (3).

(3) Ben sen-i git-ti-n san-dı-m
I you-ACC go-PST-2SG suppose-PST-1SG
I thought you were gone.

In order to test this hypothesis, we have replicated the experiment of Lago (2018) with modified items, in which the possessive is not ambiguous with the accusative case. We tried to be as faithful as possible to the original sentences while also trying to make the sentences as plausable as possible. We keep the semantic relation between the head noun and the controller the same with what has been described in Lago (2018)'s study, which is either a relation regarding profession or a service that is given by the head noun for the possessor. A set of sentences are exemplified below.

(4) a. Ungrammatical, PL attractor
Komedyen-ler-in yardımcı-sı poyraz-dan dolayi üşü-dü-ler.
comedian-PL-GEN helper-POSS northeaster-ABL because.of feel.chilly-PST–PL
Because of the northeaster, comedians' assistant felt chilly.

b. Grammatical, PL attractor
Komedyen-ler-in yardımcı-sı poyraz-dan dolayi üşü-dü.
comedian-PL-GEN helper-POSS northeaster-ABL because.of feel.chilly-PST-∅
Because of the northeaster, comedians' assistant felt chilly.

c. Ungrammatical, SG attractor
Komedyen-in yardımcı-sı poyraz-dan dolayi üşü-dü-ler.
comedian-GEN helper-POSS northeaster-ABL because.of feel.chilly-PST-PL
Because of the northeaster, comedian's assistant felt chilly.

d. Grammatical, SG attractor
Komedyen-in yardımcı-sı poyraz-dan dolayi üşü-dü.
comedian-GEN helper-POSS northeaster-ABL because.of feel.chilly-PST-∅
Because of the northeaster, comedian's assistant felt chilly.

As seen in the examples, unlike Lago (2018)'s experimental items, all of our items bear the *-sI* possessive marker instead of the ambiguous *-I* marker. As for the filler items, we could not use or modify the original experiment items since the fillers of the original study were not online. We have used two types filler sentences: grammatical sentences in which the verb bears plural agreement (5a), and ungrammatical sentences in which the verb does not bear plural agreement (5b). We wanted to nullify a possible strategy by the participants where they associate the sentence-final morpheme directly with the acceptability of the sentence. And we also wanted to eliminate the possibility of participants disregarding other elements in the sentences while answering the questions we ask right after the sentence.

(5) a. Adam-ın anne-si fena-laş-ınca inek kurban et-ti-ler.
man-GEN mother-POSS bad-VRB-CVB cow sacrifice do-PST-PL
When his mother got ill, (they) sacrificed a cow.

b. *Pizzacı-nın kurye-si tökezle-yince sos-lar yer-e saç-tı.
pizzaria-GEN courier-POSS trip-CVB sauce-PL floor-DAT scatter-PST
Intended: When the pizza boy tripped, sauces scattered around.

All of our data, experimental materials, our experiment design, and our fillers can be found on the website of the Center for Open Science Framework (https://osf.io/).

Participants and Procedure

One hundred and seven Turkish speakers with a mean age of X were recruited from Bogazici University in İstanbul. We did not collect participants' knowledge of other languages; however, we verified that Turkish is their native language and that they predominantly use it in their daily lives. In the experiments, participants were asked to judge the acceptability of experimental and filler sentences in Turkish. All of the sentences were presented one word at a time in the center of the screen for 500 ms per word unlike Lago (2018) and Wagers, Lau, and Phillips (2009), in which the duration was 300 ms per word. The experiment was run on a web-based platform titled the Ibex Farm, and all of the documentation can be found on our osf and github page.

Before the experiment, participants were instructed to give accurate and quick answers based on their own intuitions, and they were also notified about the time limit for answering. At the start of the experiment, they were given 4 practice items with feedback.

What to write about analyze?

Results and Discussion

In FIGURE (1), the y-axis shows the percentage of "acceptable" answers, and the x-axis indicates whether or not the sentences in that group are grammatical. Moreover, the linet ypes indicate an attractor noun with overt plural morphology. As seen in the figure, 1% of the sentences with plural attractors and a singular verb were accepted by the participants, in line with the findings of Lago (2018). We also see a number attraction rate of 2% which was also observed in Lago (2018) with close results.

In TABLE (**??**), ...

Responses

Response Times

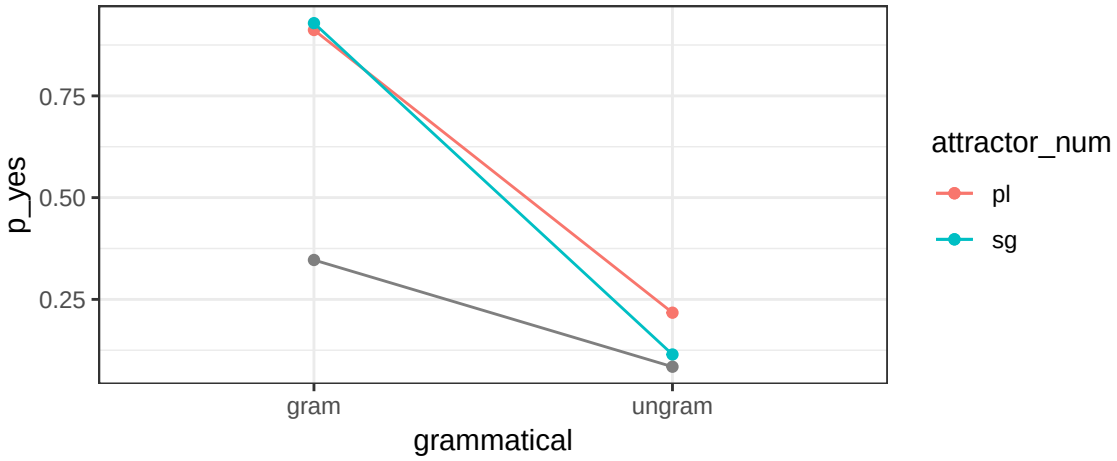

Figure 1. Estimates and 95% credible intervals for the analysis of the probability of a 'yes' response.

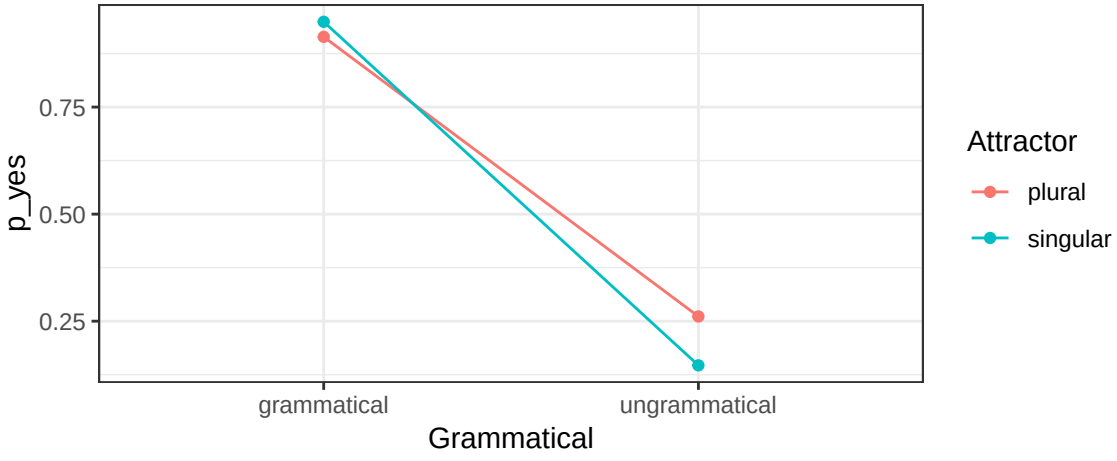

Figure 2. Estimates and 95% credible intervals for the analysis of the probability of a 'yes' response.

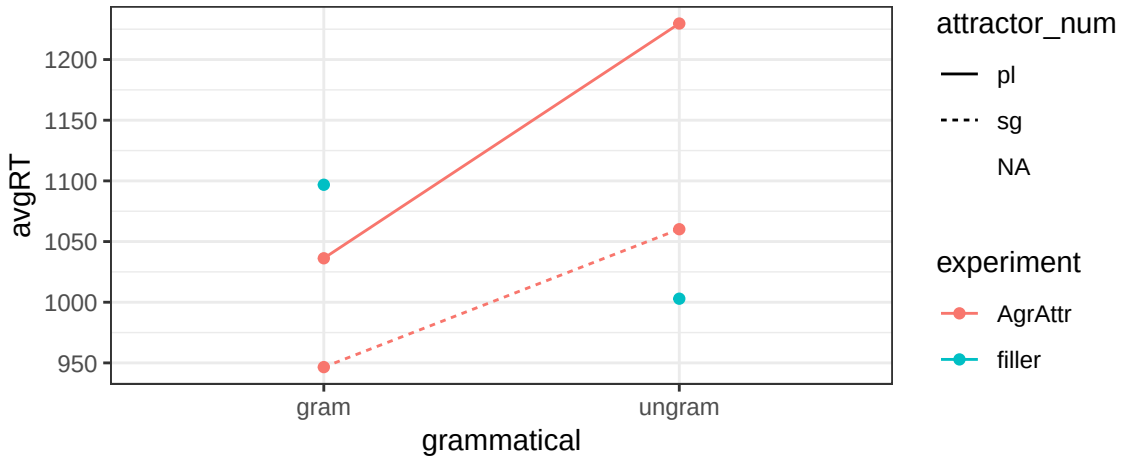
avgRT
1200
1150
1100
1050
1000
950
gram
ungram
grammatical
attractor_num
pl
sg
NA
experiment
AgrAttr
filler

Figure 3

EXPERIMENT 2: RC ATTRACTOR

Even though our first hypothesis regarding shallow processing did not hold, we still need to entertain the second possibility we have discussed in this paper. Participants may indeed engage in an even shallower process of sentence comprehension, in which they merely match the use of *-lAr*. Moreover, we still need to discuss how much it is an effect of case information rather than only a number attraction. We have seen that the anti-subjecthood cues of the accusative are not significant since in both cases where the possessive is ambiguous with the accusative and the possessive is clearly marked, we have observed extremely close results in the speeded acceptability judgments.

In order to check both the sole effect of number agreement and the possibility of a task effect, we propose an experiment design in which a head noun is a bare NP, is not marked with any other morpheme and preceded by a relative clause construction. This relative clause consists of only a verbal component, which bears an overt plural marker. Since Turkish verbal and nominal plural morphemes are identical, we plan to check the participants' strategy with regards to whether or not it is a cue that helps in the reconstruction of the ungrammatical sentence or whether it is merely a task effect in which participants disregard the rest of the sentence and focus the existence of the morpheme *-lAr*.

Materials

Like genitive-possessive structures, attractors do not intervene between the grammatical agreement controller and the verb in relative clause constructions. Turkish relative clauses always precede the head noun, except for in special cases in which they are marked with unique prosody. Item (6a) is an example of a RC structure, and item (6b) shows the possibility of using only the verbal component of the relative clause since it is grammatical to drop arguments in Turkish. (add a footnote here giving the details of such events, and restrictions.)

(6) a. On-lar-ın ev-e gel-me-den gör-dük-ler-i çocuk soğuk-ta
they-PL-GEN home-DAT come-NEG-ABL see-NLMZ-PL-POSS kid cold–LOC
üşü-müş-tü.
feel.chilly-PERF-PST
The kid that they saw right before coming to home was feeling chilly.

b. Gör-dük-ler-i çocuk soğuk-ta üşü-müş-tü.
see-NLMZ-PL-POSS kid cold–LOC feel.chilly-PERF-PST
The kid that they saw home was feeling chilly.

As for the experimental sentences, we plan to use sentences that are similar to the ones used in Lago (2018). Instead of a genitive controller, we utilize an RC, which we manipulate for its values for bearing the plural morpheme. The head noun of the subject is always singular, and it is followed by a 2/3 word adverbial. Moreover, the matrix verb of the sentences is also manipulated in terms of plurality, deeming the sentence grammatical or

ungrammatical. Lastly, the relative clause has to be an object relative clause, since Turkish subject relative clauses never bear a plural morpheme on the embedded verb. As in the Lago (2018)'s study and our replication, we will have a four condition, where we manipulate the plurality of the attractor (*plural/singular*) and the grammaticality of the sentece by using overt plural morphology (*grammatical/ungrammatical*), which are demonstrated with item (7a), (7b), (7c), and (7d)

(7) a. Grammatical, SG attractor
Döv-düğ-ü çocuk mutfak-ta baygın hal-de yat-ıyor-du.
beat-NMLZ-POSS kid kitchen-LOC unconscious state-LOC lie-PROG-PST
The kid that he/she beats was laying in the kitchen unconscious.

b. Grammatical, PL attractor
Döv-dük-ler-i çocuk mutfak-ta baygın hal-de yat-ıyor-du.
beat-NMLZ-PL-POSS kid kitchen-LOC unconscious state-LOC lie-PROG-PST
The kid that they beat was laying in the kitchen unconscious.

c. Ungrammatical, PL attractor
Döv-dük-ler-i çocuk mutfak-ta baygın hal-de yat-ıyor-lar-dı.
beat-NMLZ-PL-POSS kid kitchen-LOC unconscious state-LOC lie-PROG-PL-PST
Intended: The kid that they beat were laying in the kitchen unconscious.

d. Ungrammatical, SG attractor
Döv-düğ-ü çocuk mutfak-ta baygın hal-de yat-ıyor-lar-dı.
beat-NMLZ-POSS kid kitchen-LOC unconscious state-LOC lie-PROG-PL-PST
Intended: The kid that he/she beats were laying in the kitchen unconscious.

As for the fillers, we need two different set of fillers in order to counterbalance the ever-present grammaticality of singular and plural verbs. For grammatical fillers with a plural verb (example (8a)) we propose a structure in which the head noun is followed by a converb. With this modification, the controller of the experimental sentences becomes a controller for a subclause, and the main verb is saturated with another subject introduced right after the subclause.

For ungrammatical fillers with a singular verb (example (8b)), we have used strictly transitive verbs without an overt object. By utilizing the same structure with the other type of fillers, we ensure that participants will not come up with a strategy in which they always check the second word for dependency resolution. The controller of the fillers and the controller of the experimental items differ in the linear order they are shown in the experiment.

Question: Can we do subject relative clause here? Like durdurulan ogrenci.

(8) a. Dur-dur-duk-lar-ı öğrenci şaşır-ınca arkadaş-lar-ı birden
stop-CAUS-NMLZ-PL-POSS student surprise-CVB friend-PL-POSS suddenly
gül-dü-ler.
laugh–PST-PL

When the student which was stopped surprised, his friends burst out laughing.

b. *Tut-tuk-lar-ı aşçı gel-me-yince danışman-lar hala ver-di.
hire-NMLZ-PL-POSS cook come–NEG-CVB advisor-PL still give-PST
Inteded: When the cook that they hired did not come, advisors did not still give.

Participants and Procedure

We plan to have participants from the undergrad students of Bogazici University, which will be given an extra credit incentive. They will again carry out the experiment on an online experiment platform Ibex Farm. The experiment process will be exactly the same with the replication of Lago (2018), including descriptions before the experiment, the layout of the experiment, the time spared for visualization of every word, exclusion criteria, and analysis.

Expectations

(This part is extremely tentative)

Our objective is to explore the number attraction phenomenon without the effects of case information and without the limits of nominal paradigm. By doing so, we expect participants to engage with the sentences which are ungrammatical in an extremely shallow fashion. We argue that instead of reconstructing the sentence utilizing every detail from the attractor and the controller, participants disregard the information from other sources in the sentence and look for a matching morpheme, i.e. *-lAr*.

In the case that there will be a similar attraction effects with the replication of Lago (2018) and Lago (2018) study, we think that... what do we think? I need to talk about the paper and idea more thoroughly, I guess. Because I feel like I am repeating myself.

DISCUSSION

Discuss.

CONCLUSIONS

In this paper, we have entertained the idea of task effect in the so-called Turkish number attraction phenomenon. We argue that the findings of the Lago (2018) study is not clear and there are too many variables to account for in the experiment, one of them being the ambiguous morphology that the head noun bears. In the first experiment, we have replicated the attraction task of Lago (2018). We have found the similar effects of agreement with a bigger pool of participants. Then, for entertaining the other possibility in which we argue that participants do not fully reconstruct the sentence; however, they make us of the direct cue of overt morpheme *-lAr*, we offer an experiment where we use object relative clauses as an attractor.

ACKNOWLEDGEMENTS

We used the statistical language `R` (R Core Team, 2018) for all our analyses. These were implemented in dynamic rmarkdown documents using `knitr` (Xie, 2018) and `rmarkdown` (Xie, Allaire, & Grolemund, 2018) packages. All graphs have been done with `ggplot` (Wickham, 2016).

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