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

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In this paper, our objective is to explore the source of agreement attraction effects in Turkish found by Lago (2018). The interpretation of their finding is complicated by the fact that in their possessive form all head nouns in their stimuli are morphologically ambiguous between possessive and accusative. Due to the mismatch in the frequency of usage of accusative and genitive, which is used as a attractor in this experiment, as a controller, Lago (2018)'s findings could potentially be explained with occasional shallow processing. We have replicated Lago (2018)'s experiment with unambigious head nouns, and we have found the same agreement attraction effects. However, this may mean that participants may engage in even more shallow processing than we imagined. We postulate that participants solely check for the presence of a *-lAr* morpheme, while largely disregarding the remainder of the sentence. We utilize an experiment design in which we use a relative clause with or without plural agreement on the verb in place of the genitive possessor since both verbal and nominal plural morphemes are the same in Turkish. If participants did, in fact, adopt a superficial processing strategy, we would expect to find a number agreement attraction effect similar in magnitude to Lago (2018)'s. However, if number attraction is not an artifact of shallow processing strategies, we should expect to find no number attraction in this experiment.

Keywords: Turkish, agreement attraction, task effect, shallow processing

1 INTRODUCTION

Attraction errors in production and comprehension of subject-verb agrrement, in which a verb does not agree with the grammatical agreement controller, but with a potential attractors, have been the focal point of many research for quite a long time. In fact, it is still a widely researched are in psycholinguistic studies. Despite the thorough research that has been carried out, studies that have been conducted on agreement attraction in Turkish have been extremely few. In fact, Lago (2018) has been the only study to look into this phenomenon in Turkish. Lago (2018)'s study make 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, they found a significant effect of number agreement attraction. However, the interpretation of their finding may be a result of a non-subjecthood cues originating from their use of morphologically ambiguous forms of possessive. In their possessive form all head nouns in their stimuli are ambigiuous between possessive and accusative.

In Turkish, accusative number agreement controllers are extremely rare, while genitive agreement controllers are very frequent. Thus, Lago (2018)'s finding could possibly be explained by occasional shallow processing. When all syntactic relations in the sentence were processed fully, the possessive noun should 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. A second alternative explanation of Lago (2018)'s finding 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 due to (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 on 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 unambiuous head nouns. To this end, we have revised the items that were used previously, to avoid morphological ambiguity between possessive and accusative forms. The effect found by Lago (2018) replicates with unambiguous nouns as discused in §2.

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

§4 presents a discussion revolving around possible Lastly, §5 offers a brief conclusion and presents topics for future researches.

2 REPLICATON OF Lago (2018)

In their study, Lago (2018) investigated the comprehension of subject-verb agreement in Turkish-German bilinguals and Turkish monolinguals. They used speeded acceptability judments for the effects of number attraction in Turkish. Their sentences makes us of genitive-possessive constructions in the subject position, where the genitive is the attractor and the possessive is the head noun. They have manipulated the grammaticality of the sentence by changing the plural morphology of the verb, and they also manipulated the plurality of the attractor noun. In grammatical conditions, subject and the verb both bears the 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. 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.

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. 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.

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

According to Lago (2018)'s stipulation, Turkish genitive case does not provide a strong cue against subjecthood since it is extremely common to see genitive marked subjects in Turkish embedded clauses, as in example (2). Unlike English, genitive case is compatible with the subjecthood in English. Thus, Lago (2018) attributes the robust agreement attraction effects to the case information.

(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 first hypothesis was the possibility of participants engaging in a shallow processing, which ends up in a situation where not only genitive case but also possessive case plays a significant role in delivering the case information. None of the experimental items in Lago (2018) has 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, the accusative case in Turkish is extremely rare to see on the head noun of the subject, which only occurs in the 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 Lago (2018) study with modified items, where the possessive is not ambiguous with the accusative case. We have tried to be as faithful as possible to the original sentences while trying to make sentences as plauisable as possible at the same time. We keep the semantic relation between the head nound and the controller the same with A set of sentences are exemplified below.

(4) a. 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.

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, 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.

d. 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.

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* one. As for the filler items, we could not used or adapt from the original experimentsince the fillers of the original study were not online. We have used two types filler sentences: a grammatical ones where the verb bears plural agreement (5a), and an ungrammatical one where 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, and disregard other elements in the sentences when answering questions.

(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 as well as our fillers can be found at the Center for Open Science Framework website (https://osf.io/).

2.1 Participants and Procedure

One hundred seven Turkish speakers with mean age of X were recruited from the Bogazici University in {.I}stanbul. We did not collect participants' knowledge of other languages; however, we ensured that Turkish is their native language and they predominantly used in their daily lives. In the experiments, participants are asked to judge the experimental and filler sentences whether or not they sound acceptable in Turkish. All of the sentences were presented one word at a time in the center area of the screen for 500 ms per word unlike Lago (2018) and Wagers et al. (2009), in which researches used 300 ms visual presentation per word. Experiment was run on a web-based platform Ibex Farm, and all of the documentation can be found in our osf and github page.

Before the experiment, they have been instructed to give accurate and quick answers with their own intuition, and they were also notified about the time limit for answering. At the start of the experiment they were given 4 practice items with feedbacks.

What to write about analyze?

2.2 Results and Discussion

In Figure (**??**), y-axis shows proportion of "acceptable" answers, and x-axis indicates whether or not the sentences in that group is grammatical. Moreover, linetypes indicates an attractor noun with overt plural morphology. As seen from the figure, 22% of the sentences with plural attractors and singular verb were accepted by the participants following the findings of Lago (2018). We also see a number attraction rate of 10% which was already shown in Lago (2018) with close results.

In Table (**??**), ...

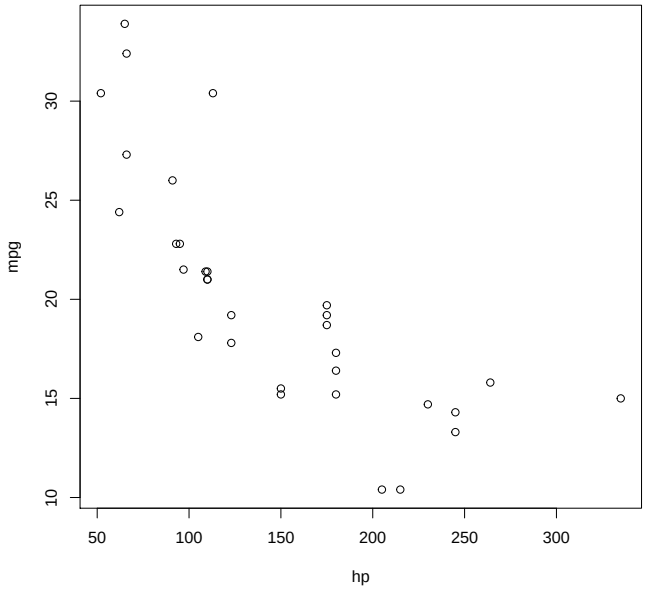

Figure 1: A figure

	mpg	cyl	disp
Mazda RX4	21.0	6	160
Mazda RX4 Wag	21.0	6	160
Datsun 710	22.8	4	108
Hornet 4 Drive	21.4	6	258
Hornet Sportabout	18.7	8	360
Valiant	18.1	6	225

Table 2: A table

3 EXPERIMENT 2: RC ATTRACTOR

3.1 Motivation

3.2 Items and Fillers

3.3 Expectations

3.4 Possible Outcomes and Discussion

4 DISCUSSION

Discuss.

5 CONCLUSIONS

Intro and repeat.

6 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 2014, 2015, 2018) and `rmarkdown` (Allaire et al. 2018, Xie et al. 2018) packages. All graphs have been done with `ggplot` (Wickham 2016). Thank the Mine and Kadir for their student from courses.

7 REFERENCES

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List of Tables

Table 3: A glimpse of the famous *Iris* dataset.

Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
5.1	3.5	1.4	0.2	setosa
4.9	3.0	1.4	0.2	setosa
4.7	3.2	1.3	0.2	setosa
4.6	3.1	1.5	0.2	setosa
5.0	3.6	1.4	0.2	setosa
5.4	3.9	1.7	0.4	setosa

Table 4: Now a subset of mtcars dataset.

	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Merc 280	19.2	6	167.6	123	3.92	3.440	18.30	1	0	4	4
Merc 280C	17.8	6	167.6	123	3.92	3.440	18.90	1	0	4	4
Merc 450SE	16.4	8	275.8	180	3.07	4.070	17.40	0	0	3	3
Merc 450SL	17.3	8	275.8	180	3.07	3.730	17.60	0	0	3	3
Merc 450SLC	15.2	8	275.8	180	3.07	3.780	18.00	0	0	3	3
Cadillac Fleetwood	10.4	8	472.0	205	2.93	5.250	17.98	0	0	3	4
Lincoln Continental	10.4	8	460.0	215	3.00	5.424	17.82	0	0	3	4

List of Figures

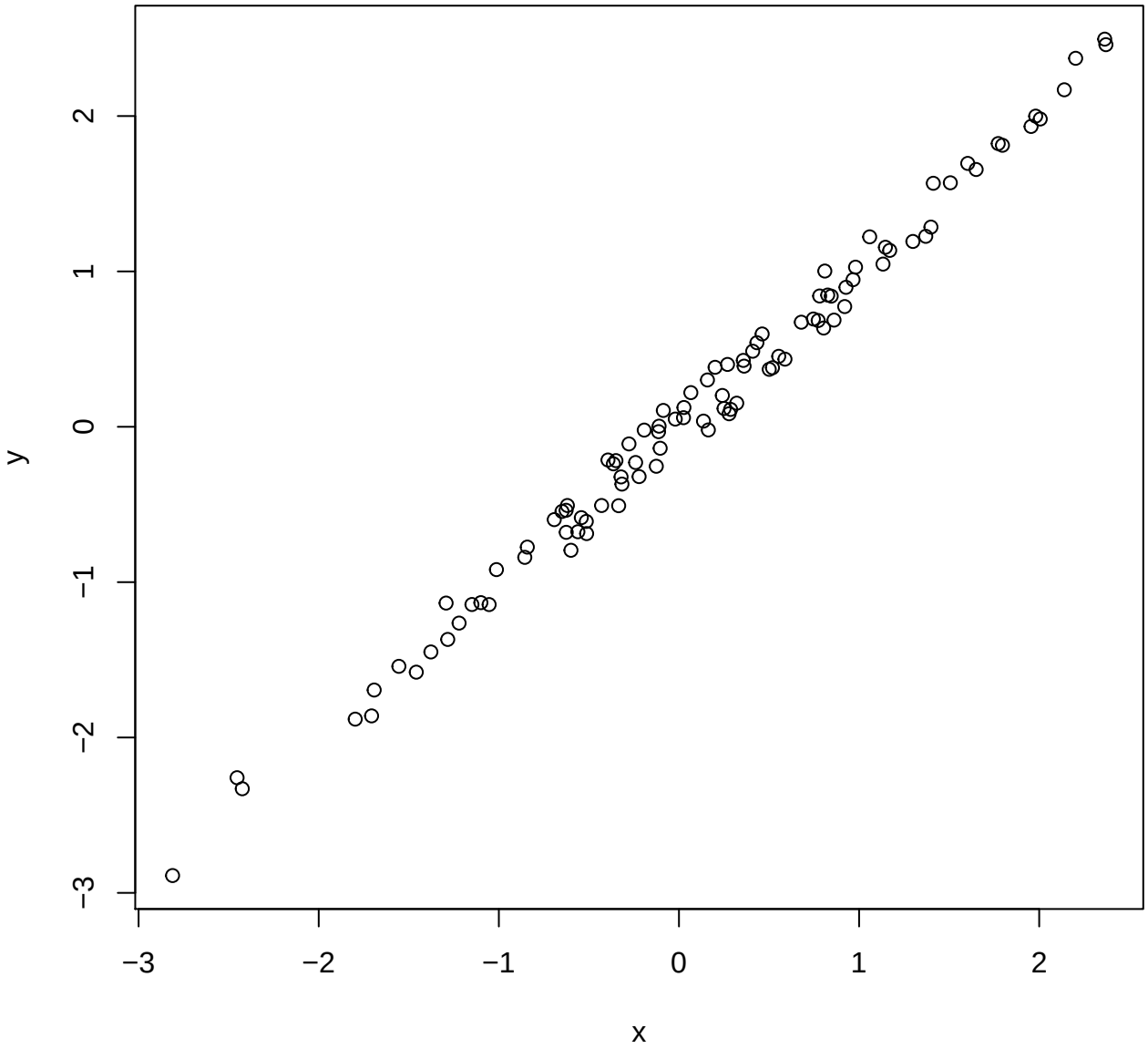

Figure 2: Just my first figure with a very fantastic caption.

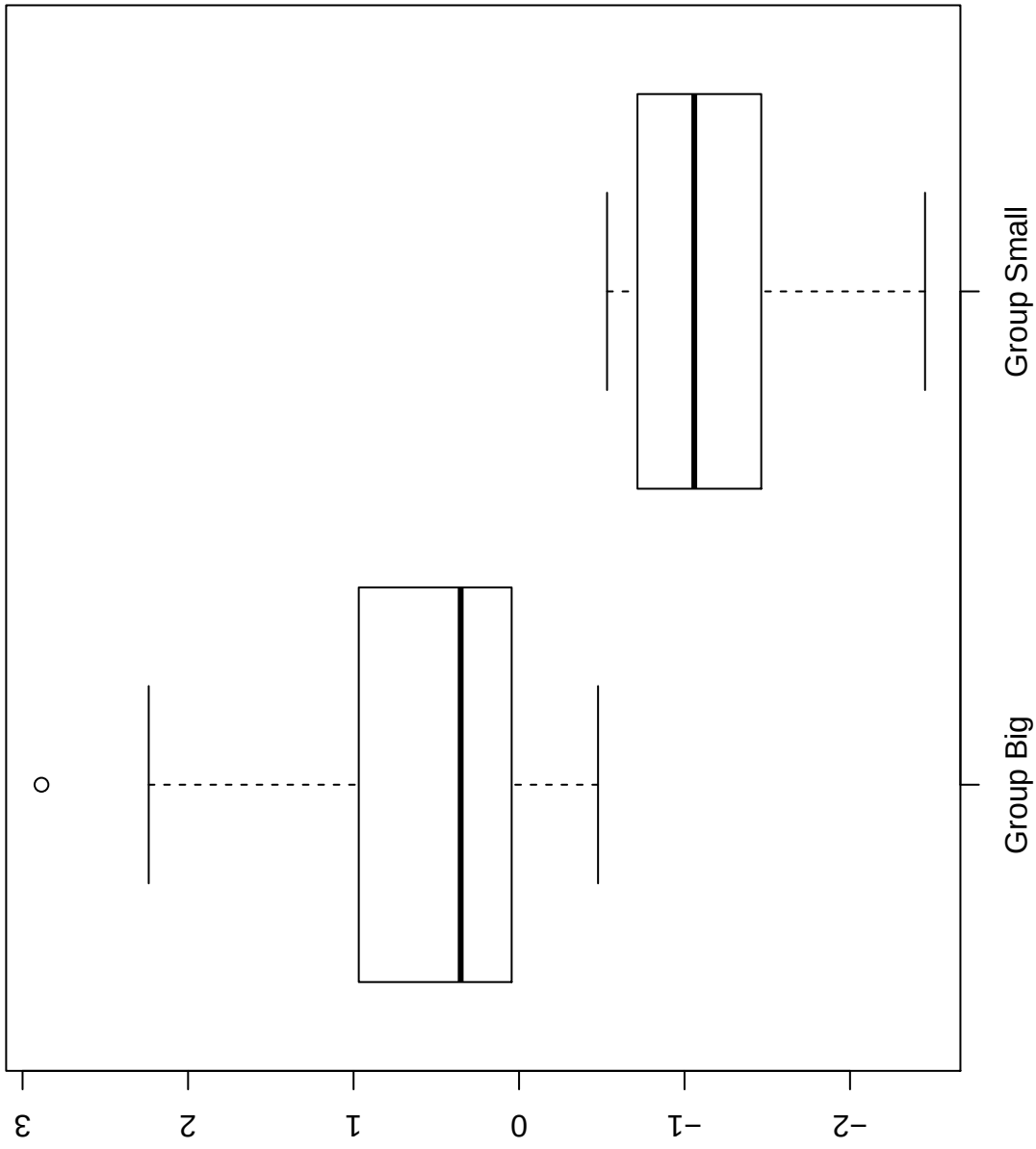

Figure 3: Second figure in landscape format.