

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 discovered by Lago (2018). The interpretation of their finding is complicated by the fact that the possessive form of all head nouns used in their stimuli are morphologically ambiguous between possessive and accusative. In Turkish, genitive can be productively used for marking the subject of an embedded clause whereas accusative is rarely used for marking the subject. Due to this mismatch in the frequency of usage of accusative and genitive, which is used as an 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 unambiguous head nouns, and we have found similar agreement attraction effects. However, this may mean that participants 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, i.e. the exponent of both is *-lAr*. If participants did, in fact, adopt a superficial processing strategy, we would expect to find a number agreement attraction effect similar in magnitude to that in Lago (2018). However, if number attraction is not an artifact of shallow processing strategies, we should expect to find no number attraction effects in this experiment.

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

1 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 ambiguous 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 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.

2 REPLICATON OF LAGO ET AL. (2018)

In their study, Lago (2018) investigate the comprehension of subject-verb agreement in Turkish-German bilinguals and 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. Grammatical, SG attractor
Şarkıcı-nın vokalist-i sahne-de sürekli zıpla-dı
singer-GEN vocalist-POSS stage-LOC non-stop jump-PST-Ø
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-Ø
The singers’ backup vocalist jumped on the stage non-stop.
- c. Ungrammatical, PL attractor

81 *Şarkıcı-lar-ın vokalist-i sahne-de sürekli zıpla-dı-lar.*
singer-PL-GEN vocalist-POSS stage-LOC non-stop jump-PST-3PL
82 The singers' backup vocalist jumped on the stage non-stop.
83 d. Ungrammatical, SG attractor
84 *Şarkıcı-nın vokalist-i sahne-de sürekli zıpla-dı-lar.*
singer-GEN vocalist-POSS stage-LOC non-stop jump-PST-3PL
85 The singer's backup vocalist jumped on the stage non-stop.

86 They found a significant effect of number attraction in Turkish ranging between 11%–15% across
87 monolinguals. As seen in the results of the statistical analysis in TABLE (1), the acceptability
88 judgments showed an immense effect of grammaticality, and there is also interaction between
89 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.

90 Lago (2018) stipulate that the Turkish genitive case does not provide a strong cue against subjecthood
91 since Turkish frequently makes use of genitive marked subjects in embedded clauses, as in example (2).
92 This is in contrast with English, in which the genitive case is compatible with subjecthood. Thus, Lago
93 (2018) argue that this robust agreement attraction effect has been linked to the case information carried
94 by accusative and genitive.

95 (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
96 I heard that a (certain) robber raided the village. (Adapted from Woolford (2009))

97 However, our initial hypothesis postulates that participants engage in shallow processing, which results
98 in a situation in which not only the genitive case but also the possessive case plays a significant role in
99 delivering the case information. None of the experimental items in Lago (2018) have a head noun which
100 ends with a vowel; thus, all of the possessive markers are morphologically and phonologically
101 ambiguous between the accusative case and the possessive. Unlike genitive case, it is extremely rare for
102 the accusative case to appear on the head noun of the subject, which only occurs in raising predicates
103 as in example (3).

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

106 In order to test this hypothesis, we have replicated the experiment of Lago (2018) with modified items,
107 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 plausible 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. Grammatical, SG attractor
Komedyen-in yardımcı-sı poyraz-dan dolayı üşü-dü.
 comedian-GEN helper-POSS northeaster-ABL because.of feel.chilly-PST-Ø
 Because of the northeaster, comedian’s assistant felt chilly.
- b. Grammatical, PL attractor
Komedyen-ler-in yardımcı-sı poyraz-dan dolayı üşü-dü.
 comedian-PL-GEN helper-POSS northeaster-ABL because.of feel.chilly-PST-Ø
 Because of the northeaster, comedians’ assistant felt chilly.
- c. Ungrammatical, PL attractor
Komedyen-ler-in yardımcı-sı poyraz-dan dolayı 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 dolayı 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* 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-in 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.*
 pizzeria-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/>).

2.1 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

142 Turkish is their native language and that they predominantly use it in their daily lives. In the
 143 experiments, participants were asked to judge the acceptability of experimental and filler sentences in
 144 Turkish. All of the sentences were presented one word at a time in the center of the screen for 500 ms
 145 per word unlike Lago (2018) and Wagers et al. (2009), in which the duration was 300 ms per word.
 146 The experiment was run on a web-based platform titled the Ibex Farm, and all of the documentation
 147 can be found on our osf and github page.
 148 Before the experiment, participants were instructed to give accurate and quick answers based on their
 149 own intuitions, and they were also notified about the time limit for answering. At the start of the
 150 experiment, they were given 4 practice items with feedback.
 151 What to write about analyze?

152 **2.2 Results and Discussion**

153 In FIGURE (1), the y-axis shows the percentage of “acceptable” answers, and the x-axis indicates
 154 whether or not the sentences in that group are grammatical. Moreover, the linet ypes indicate an
 155 attractor noun with overt plural morphology. As seen in the figure, 22% of the sentences with plural
 156 attractors and a singular verb were accepted by the participants, in line with the findings of Lago (2018).
 157 We also see a number attraction rate of 10% which was also observed in Lago (2018) with close results.
 158 In TABLE (??),
 159 And yes, I plan to beautify the figures.



Figure 1: A figure

Table 2: A table

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*.

3.1 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 sentence by using overt plural morphology (*grammatical/ungrammatical*), which are demonstrated with item (7a), (7b), (7c), and (7d)

- (7) a. Grammatical, SG attractor

- 197 *Döv-düğ-ü çocuk mutfak-ta baygın hal-de yat-ıyor-du.*
beat-NMLZ-POSS kid kitchen-LOC unconscious state-LOC lie-PROG-PST
198 The kid that he/she beats was laying in the kitchen unconscious.
- 199 b. Grammatical, PL attractor
200 *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
201 The kid that they beat was laying in the kitchen unconscious.
- 202 c. Ungrammatical, PL attractor
203 *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
204 Intended: The kid that they beat were laying in the kitchen unconscious.
- 205 d. Ungrammatical, SG attractor
206 *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
207 Intended: The kid that he/she beats were laying in the kitchen unconscious.

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

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

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

- 219 (8) a. *Dur-dur-duk-lar-ı öğrenci şaşır-ınca arkadaş-lar-ı birden gül-dü-ler.*
stop-CAUS-NMLZ-PL-POSS student surprise-CVB friend-PL-POSS suddenly laugh-PST-PL
220 When the student which was stopped surprised, his friends burst out laughing.
- 221 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
222 Intended: When the cook that they hired did not come, advisors did not still give.

223 3.2 Participants and Procedure

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

229 3.3 Expectations

230 (This part is extremely tentative)

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

237 In the case that there will be a similar attraction effects with the replication of Lago (2018) and Lago
238 (2018) study, we think that... what do we think? I need to talk about the paper and idea more
239 thoroughly, I guess. Because I feel like I am repeating myself.

240 4 DISCUSSION

241 Discuss.

242 5 CONCLUSIONS

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

251 6 ACKNOWLEDGEMENTS

252 We used the statistical language R (R Core Team 2018) for all our analyses. These were implemented in
253 dynamic markdown documents using `knitr` (Xie 2014, 2015, 2018) and `rmarkdown` (Allaire et al.
254 2018, Xie et al. 2018) packages. All graphs have been done with `ggplot` (Wickham 2016). We also
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