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Recency preference in ambiguous relative clause attachment in Turkish

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Abstract

In Turkish, Relative Clause (RC) attachment ambiguity arises when two noun phrases (NPs) in a genitive construction follow the (RC). The present paper studies Turkish RC attachment preferences of Turkish native speakers in two experiments through off-line comprehension tasks. While in the first experiment the main verb immediately follows the NP group, in the second experiment a group of adjuncts intervened between the second NP and the main verb. The aim of this setting was to observe the effect of Recency and Predicate Proximity in attachment preferences. The results of the first experiment showed a clear preference for low attachment (NP1). This preference was considered to be the result of Recency effect. The outcomes of the second experiment also showed a higher frequency for low attachment preference, but with an increasing rate for high attachment in comparison to the first experiment. This outcome showed first, the effect of Recency was still prevalent, and second, Predicate Proximity along with Relativized Relevance Principle may also have an increasing effect when there is an intervening group of adjuncts between the NP group and the main verb.

Keywords: Relative Clause; Ambiguity; Low/High Attachment; Recency; Predicate Proximity; Relativized Relevance.

1. Introduction

Studies on sentence processing make use of complex structures such as relative clauses and long – distance dependencies to understand how human parsing mechanism works. The examination of attachment preferences of relative clauses (RC), in which there are at least two potential NPs for RC attachment, is among the topics that are frequently studied in sentence processing (Cuetos and Mitchell, 1988; De Vincenzi and Job, 1995; Frazier, 1987a; Frazier and Clifton, 1997; Gibson et al., 1996; Kamide and Mitchell, 1997). Since ambiguous structures present two potential parsing strategies, the study of them provides productive results for speculating on the mechanisms of parsing decisions, and how these preferences work for interpreting sentences.

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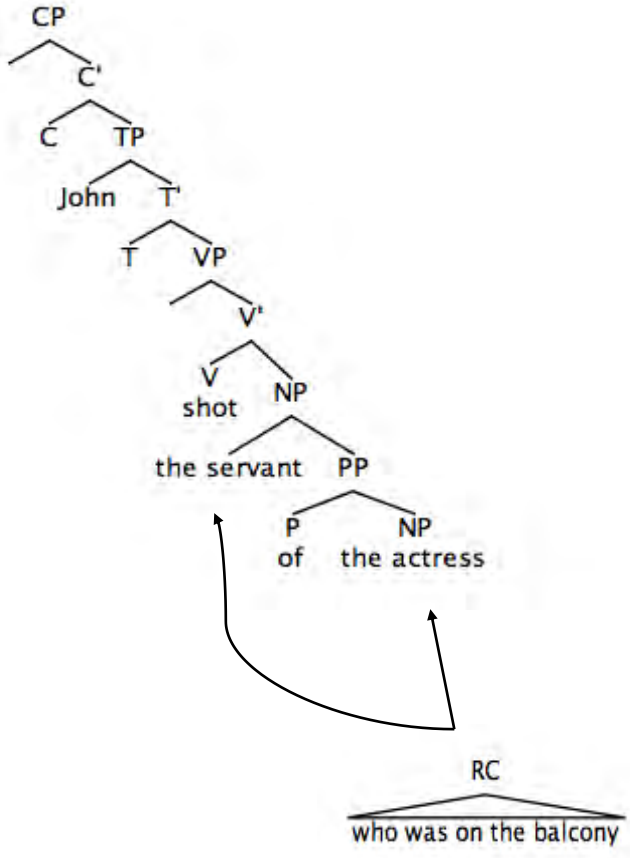
1.1. Theoretical background

The Garden-Path account, which was proposed by Frazier (1979, and 1987b), forms the firm ground in explaining how ambiguous structures are parsed. 'Minimal Attachment' and 'Late – Closure' are the two main principles of Garden – Path theory. They work on the basis of a two – stage account of sentence processing, claiming that the initial parsing decisions are based on syntactic grounds, and when it is necessary, the parser uses other data like plausibility, frequency, and etc., to interpret the ambiguous structure. The basic claim of this account is based on the cognitive system's need to use as fewest resources as possible to interpret the structure. This is explained in De Vincenzi and Job (1995), referring to Miller (1956), by the restrictions on short-term memory and the relationship between more structured material and its less demand for short-term memory. In terms of RC attachment preferences, Late Closure principle works in harmony with this claim. It proposes that incoming material should be attached to the clause or phrase that is currently being processed (Frazier and Fodor, 1978). For instance, in sentence (1), the RC *who was on the balcony* is to be attached to NP2 *the actress* due to the fact that, it is the NP, which is currently being processed while the parser reaches to the RC. This preference is also known as 'low attachment'.

(1) John shot [the servant NP1] of [the actress NP2] who was on the balcony.

Figure 1. The attachment of RC in an ambiguous structure



As it is seen in figure (1), NP2 *the actress* is the late one that is processed while the RC is received. Also, it is the low attached one, while NP1 is high and has already been processed. So, late closure predicts that the attachment site of the RC should be the second NP. It is reported by Cuetos and Mitchell (1988) that, English speakers made low attachment for sentence (2.a) as hypothesized by late closure principle. But they also state that, Spanish speakers showed preference for high attachment for the Spanish counterpart of the same structure as given in (2.b):

(2.a) The journalist interviewed [the daughter NP1] of [the colonel NP2] who had the accident.

(2.b) El periodista entrevisto a [la hija NP1] [del coronel NP2] que tuvo el accidente.

The Spanish speakers attached the RC to NP1, which is an instance of high attachment. Although the relative clause structure follows the NPs in both English and Spanish, the reported attachment preferences are different for these languages. The divergence in the outcomes seems to challenge the universality claim of Late Closure Principle, which is thought to be related to working memory limitations of human cognitive system. Similar variability in the attachment preferences of speakers was also presented through the examination of various languages. For instance, high attachment to NP1 was observed in French (Zagar, Pynte, and Rativeau, 1997). Also, Delle Luche et al. (2006) found, through two questionnaire experiments, that form of the relative pronouns, which could be ranked on the accessibility hierarchy, affected NP1 attachment preference in French. In their study, the relative pronoun *qui* 'who', which signaled highly accessible antecedents, were attached to NP1, while relative pronouns *lequel* 'which' and *laquelle* 'which', that related less accessible antecedents, had less strong NP1 attachments. Brysbaert and Mitchell (1996) state that the participants showed a preference for high (NP1) attachment in a complex NP modified by the RC in Dutch. Also, through an off-line comprehension task, Shabani (2018) finds out that NP1 (high) attachment has been observed in Persian when the NPs are bare, however this preference rate has decreased when there is a definite marker in the complex NP. The relative clauses follow the NP(s) they modify in the languages that are just mentioned. The variety in the outcomes of the previous studies in terms of high vs. low attachment seems to show that the linear placement of the RC and the NPs do not always give congruent outcomes in attachment preferences.

1.2. Recency preference and predicate proximity in relative clause attachment

As it is stated in section 1.1, cross-linguistic variation is observed in attachment preferences of the parser. Papadopoulou (2005) makes a list of languages having two types of attachment preferences as follows; English, Swedish, Norwegian and Arabic speakers prefer to attach the RC to the second NP, while the users of Spanish, French, German, Dutch and Greek attach the RC to the first NP. Cuetos et al. (1996) make a distinction related to noun modification by adjectives, and propose that in languages like Spanish, Italian and French, in which adjectives follow the nouns, high attachment is preferred; while in languages like English, Dutch and German, in which nouns are pre-modified, a reverse attachment preference should be observed. Gibson et al. (1996) propose the approaches 'Recency Preference' and 'Predicate Proximity' to explain the cross – linguistic variation in RC attachment. These two approaches are claimed to compete cross – linguistically. Recency Preference is defined as 'preferentially attach structures for incoming lexical items to structures built more recently'. In this sense, Recency Preference is stated to be a variant of Late Closure. Recency, like Late Closure, is stated to be universal, and according to this principle, the RC in sentences like (1) and (2.a) will be attached to the second NP, which is the recently processed one. According to Predicate Proximity, the RC should be attached as close as to the IP node (or a TP node related to the formal approach that is taken). In the scope of the mentioned study, the phrasal boundary of the VP, and the placement of the V can meet the same argument as IP/TP presents, since the formal distinction between IP/TP and VP projections is

beyond the scope of the related discussion. Gibson et al. (1996) define Predicate Proximity as 'attach as close as possible to the head of a predicate phrase'. This definition may help understand the essence of the approach. In this sense, in sentence (3) the RC is expected to attach to the first potential antecedent NP *the psychiatrist* (Papadopoulou, 2005).

(3) The woman saw [the psychiatrist NP1] of [the actress NP2] who was having a glass of wine.

In their study, Gibson et al. (1996) examine the processing times of sentences, which include three NPs preceding the RC in English and Spanish. They found that the participants processed the third NP most easily, which was the most recent NP to the RC. The first NP was reported to be in the second place for the time span that it takes for processing. Finally, the NP, which was between the first and the third NPs was the most difficultly processed one among all in both languages that were analyzed. The attachment to the third NP was explained by Recency, while Predicate Proximity was used to explain the attachment to the first NP. In ambiguous RC attachments, Predicate Proximity hypothesizes that the RC will be attached to the first NP (high attachment) since it is the closer one to a predicate phrase, while Recency favors the low site.

It is further predicted in Gibson et al. (1996) that, languages with VOS, VSO, SOV, or OSV word orders should have strong Predicate Proximity factors yielding to high preference in cases of ambiguous RC attachment. The power of Predicate Proximity is considered to stem from the average distance between the head of a predicate to its arguments. According to Gibson et al. (1996), in languages, which allow adjuncts to intervene between head and complement, Predicate Proximity becomes stronger due to the increasing distance between them. So, while Recency preference (low attachment) is mostly observed in languages, which have more rigid word orders, in languages with more flexible word orders, Predicate Proximity (high attachment) may become stronger. Regarding this proposal, Turkish may demonstrate results in accordance with Predicate Proximity since Turkish does not have a marked word order (Göksel and Kerslake, 2005).

1.3. Relative clause attachment in Turkish

In Turkish, relative clauses precede the noun phrases that they modify and these modifier clauses end in a participle form (Kornfilt, 1997). The only exception to this case is the construction formed with the subordinator *ki*, which has a very limited range in Turkish. The most typical types of relative clause constructions contain one of the following participle suffixes; *-(y)An, -DIK, or -(y)AcAk* (Göksel and Kerslake, 2005). These suffixes are attached on the embedded clause verb and precede the noun as given in (4), (5) and (6) below:

(4) kitaplarını oku-*yan* çocuk
book-Pl-3Sg.Poss-Acc read-Part kid
'the kid *who* reads/has read her/his books'

(5) okulda konuş-*tuğ*-um öğretmen
school-Loc talk-Part-1Sg.Poss teacher
'the teacher *whom* I talk to at school'

(6) içe-*ceğ*-i kahve
drink-Part-3Sg.Poss coffee
'the coffee *that* s/he is going to drink'

Although the above given examples do not pose any problem related to the attachment preferences of the RC, there are some instances in which relative clause can be attached to any of the two NPs in a complex noun phrase formed with a genitive construction:

(7) Arabası çalınan komşunun oğlu
car-Acc steal-Part Neighbour-Gen son-Poss
'*The son of the neighbor whose car has been stolen*'

In (7) the relative clause *arabası çalınan* 'whose car has been stolen' may both be attached to low NP1 *komşunun* 'neighbor-Gen' or to high NP2 *oğlu* 'son-Poss'. Although the structure resembles unambiguous Saxon genitive in English, there is ambiguity in (7). There are studies on Turkish relative clause attachment preferences, which try to analyze the strategies that are taken by Turkish parser. For instance, through an off – line study, Kırkıcı (2004) states that there is no statistically significant attachment preference when the two NPs are both [+human], however low NP is preferred when the NPs were [-human]. The low attachment preference in [-human] constructions is explained by referring to Construal Hypothesis. It is stated that by Kırkıcı (2004) that, in Turkish the RC can be placed between the two NPs, which eliminates the ambiguity on behalf of the high attachment just like the one given in (8) below:

(8) Komşunun arabası çalınan oğlu
Neighbour-Gen car-Acc steal-Part son-Poss
'*The son of the neighbor whose car has been stolen*'

In sentence (8), the relative clause can only modify *oğlu* 'the son-Poss' and attaches to the high NP. It is proposed by Kırkıcı (2004) that, in harmony with Avoid Ambiguity Hypothesis, the speaker will avoid ambiguity and prefer 'low attachment' *komşunun* 'neighbor-Gen' in ambiguous structures, since there is already an unambiguous alternative [*NP1 RC NP2*], in which the 'high attachment' is the only option. Thus, the outcome, indicating a 'low' attachment preference in the mentioned study, is explained via Construal Hypothesis and 'Recency' is not evaluated to be the reason of processing. But it is also stated in the same study that this fact does not explain why it did not work for RC attachment ambiguity for complex NPs, which are [+human] although the ambiguity is also resolved by placing the RC inside the complex NP.

In another study, Dinçtopal-Deniz (2010) studies the RC attachment preferences of Turkish L2 speakers of English through a self – paced reading and an off – line questionnaire task. It was found out that Turkish speakers preferred low NPs in attaching relative clauses in both on-line and off-line tasks. This outcome was interpreted to be compatible with the Construal Hypothesis since in Turkish there is a second way of constructing RCs that do not create ambiguity. If the relative clause follows the first NP, only the second NP is modified. So, it was interpreted that, if there was an unambiguous option for forming RCs, in which only the second NP was modified, the parser would choose the first NP (low attachment) in the ambiguous structure following Avoid Ambiguity principle. It was further indicated in the same study that, the findings of the study were not compatible with Gibson et al. (1996)'s Predicate Proximity proposal for languages like Turkish, which have flexibility to some degree in word order. According to this proposal, the second NP should have been preferred as an attachment site since it was the closer one to the main predicate of the sentence.

Turkish has an unmarked SOV order and also allows the major constituents in various positions in sentence. So, Turkish speakers' ambiguous RC attachment preferences may present outcomes in accordance with Gibson et al. (1996)'s proposal on SOV languages. On the other hand, the outcomes may also support Recency preference. If Recency is supported, this may be related to the universal properties of Recency preference in general, and more specifically, this may also be explained by Cuetos et al. (1996)'s proposal based on the modification properties of nouns. According to this proposal, low attachment preference may be expected in Turkish since nouns are pre-modified. Also, Kamide and Mitchell (1997)'s study on Japanese may give some insight about RC attachment expectation in Turkish,

since word orders of Japanese and Turkish are similar, and in both languages the RC precedes both of the NPs that can be modified. In their study they found through an off – line task, that readers prefer high attachment (second NP), although the on – line task indicates an attachment operation takes place as soon as the first NP is revealed, but than switched back at the end of the sentence. This outcome led them to conclude that RC attachment in Japanese is non-deterministic, and so discourse factors and plausibility effects may be at work in attachment preferences.

1.4. Aim of the study

In the light of the theoretical background and discussions given above, the present study aims at discussing Turkish speakers' attachment preferences in ambiguous relative clauses. There are previous studies (Dinçtopal-Deniz, 2010; and Kırkıcı, 2004), which analyze RC attachment preferences in Turkish. However, the present study, unlike the previous ones, hypothesizes that the explanation of RC attachment preferences in Turkish may not be based on Avoid Ambiguity, but may depend on a structural reason like 'Recency' or 'Predicate Proximity'. The argumentation will be discussed in section 3 through the analysis of the outcomes by taking into account Gibson et al. (1996)'s proposal on ambiguous RC attachments. According to their proposal, Predicate Proximity favors a high attachment preference since higher NP is the one that is closer to the predicate, and thus, this principle should work more strongly for languages, which allow longer distance between the verb and its arguments. It is further stated by Gibson et al. (1996) that the relative weight of Predicate Proximity varies across languages, and as a result of this, it has stronger effects on parsing in some languages yielding dominance over Recency. It is proposed that languages with VOS, VSO, SOV, or OSV word orders should have strong Predicate Proximity factors causing a high preference in RC attachment ambiguity. In order to find out if Turkish parser is compatible with either Recency or Predicate Proximity in ambiguous RC attachment, the present study tests the attachment preferences of 92 Turkish speakers in two sets of data collection tasks. The structures of sentence sets will be discussed in section 2.1 in detail. While, in the first set of sentences, the two potential attachment sites (NP1 and NP2) are directly located between the RC and the main verb, in the second set of sentences, intervening adjuncts are located between NP2 and the main verb. The main reason of inserting adjuncts between NP2 and the main verb is to observe the potential effect of manipulating Predicate Proximity on attachment preferences.

2. Method

2.1. Materials

The data collection tool is composed of two sentence sets, each of which includes 10 target and 15 filler items. In total, 20 target sentences that have been presented to 92 participants provide the data for analysis.

2.1.1. First set of sentences

The first set of sentences includes 10 target items with relative clause attachment ambiguity and 15 filler items. The structures of the filler items are different from the structures of target sentences. Filler items were used in order to distract the attention of the participants from the target structure and inhibiting them from developing an understanding about the aim of the study. The sentences in the first set includes a subject NP, the relative clause structure, a complex NP structure, which includes a genitive construction, and a following main verb as follows: [Subject NP – RC – NP1 – NP2 – Main Verb].

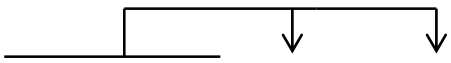
(9) Sekreter	salonda	bekleyen	oyuncunun	yardımcısıyla	konuştu.
Secretary	hall-Dat	wait-Part	actor-Gen	assistant-Inst	talk-Pst

'*The secretary talked to the assistant of the actor who was waiting in the hall*.'

As it is seen in sentence (9) above, both of the NPs (NP1 *oyuncunun* 'actor-Gen' and NP2 *yardımcısıyla* 'assistant-Inst') can be modified by the relative clause structure. While NP1 directly follows the embedded verb, NP2 is positioned just before the main verb.

2.1.2. Second set of sentences

The second set includes target and filler sentences in the same number with the first set. The difference in the structure of the sentences in the second set is the placement of an intervening adjunct between the second NP and the main verb as follows: [Subject NP – RC – NP1 – NP2 – Adjunct Group – Main Verb].



(10) Sekreter salonda bekleyen oyuncunun yardımcısıyla çekinerek sakince konuştu.
Secretary hall-Dat wait-Part actor-Gen assistant-Inst timidly calmly talk-Pst

'*The secretary talked to the assistant of the actor who was waiting in the hall timidly and calmly*.'

As it is given in (10), adjuncts are located between the main verb and the NP group. The placement of the adjuncts comprises the main distinction between the two sets of sentences. The reason of inserting adjuncts is to observe the effect of manipulating the distance between the second NP and the main verb, and thus to find out if Predicate Proximity has any role in determining attachment preferences. As Gibson et al. (1996) propose Predicate Proximity is expected to be stronger in languages, which allow adjuncts to be inserted between the argument and the head. So, comparing the participants' preferences in attaching the RC to one of the two potential NPs in these two different sentence types may help understanding the parsing strategies in Turkish.

2.2. Participants

A total of 92 native speakers of Turkish participated in the study in two groups (46 participants in each group). The mean age of the participants is 26.3 in the first group, while it is 26.7 in the second one. Age, gender or education levels of the participants are not among the variables in selecting the participant groups. The only criterion that is considered in the formation of the groups is that each participant is the native speaker of Turkish. The participants were unaware of the aim of the study, except an instruction about how the procedure should be done. None of the participants were an early bilingual, and their foreign language knowledge was based on formal education.

2.3. Procedure

The data collection procedure of the present study is an off – line pen and paper comprehension task. A total of 92 Turkish native speakers participated in the study in two groups. Each group consisted of 46 participants. Neither of the participants saw any target sentence belonging to the other set. The questions have two answer options, each of which includes one of the two potential attachment sites (either NP1 or NP2) related to 10 target items. A written and an oral instruction were given to the participants stating that they should choose the most natural and convenient answer for the questions. Also, the participants answered comprehension questions for the filler items. The reason of forming comprehension questions for the filler items was to provide coherence for the whole data collection process. Each participant answered 25 comprehension questions in total (10 target, 15 filler). The filler items included simple and

complex structures that were structurally different from the target items. Both the order of the items and the answer choices were randomized for each group. The participants were informed that the task was on a voluntary basis and they could quit without completing the task on demand.

3. Results and Discussion

3.1. Analysis of RC attachment preferences in the first experiment

The structure of the sentences in the first set is as given: S - [RC] - NP1 - NP2 - V. Potential attachment sites (NP1 – NP2) directly follow the RC. In the first set, the frequency of the participants' RC attachment preference for the first (low) NP (79.5%) is significantly higher than their preference for the second (high) NP (20.5%). One-sample t-test is applied in order to observe if there is a certain preference for low or high attachment (M=[.80], SD=[.404]), t(459)=[42.275], p=[0.000]. The present outcome is an indication for a low attachment preference. Sentence (11) is given as a sample of target sentences used in the first set.

(11) Sekreter [salonda bekleyen] oyuncunun yardımcısıyla konuştu.
Secretary hall-Dat wait-Part actor-Gen assistant-Inst talk-Pst
'*The secretary talked to the assistant of the actor who was waiting in the hall*.'

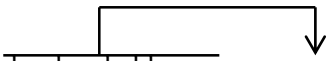
This finding is in harmony with the attachment preferences observed in languages like English, Norwegian, Arabic and Swedish as reviewed in Cuetos et al. (1996). Also, the finding is similar to the outcomes of two previous studies on Turkish RC attachment preference. Dinçtopal-Deniz (2010) reports that Turkish speakers have preferred low attachment with both animate and inanimate NPs in an off-line task, which was also supported by self-paced reading in the same study. The present outcome is also in harmony with Kırkıcı (2004) to some degree. In Kırkıcı (2004) it is reported that when two potential attachment sites are -human/-human, the participants favored low attachment, but this difference has not been observed for +human/+human NPs as strongly as it has been observed for non-human NPs. In the present study, the NPs were all +human, and the preference rates in the first experiment show a clear, and statistically significant value in favor of the low NP attachment. Both Kırkıcı (2004) and Dinçtopal-Deniz (2010) assume that low attachment preference in Turkish can be accounted for via Construal Hypothesis in accordance with Avoid Ambiguity Principle. They support their argument with the existence of an unambiguous RC structure with two NPs formed in a genitive construction. If the RC is located between the two NPs [*NP1 RC NP2*], it can only be attached to the high NP, as shown in (12):

(12) Sekreter oyuncunun salonda bekleyen yardımcısıyla konuştu.
Secretary actor-Gen hall-Dat wait-Part assistant-Inst talk-Pst
[NP1] [Relative Clause] [NP2]
'*The secretary talked to the actor's assistant who was waiting in the hall*.'

This situation is associated to the Norman/Saxon genitive divergence in English. As it is stated in Brysbaert and Mitchell (1996), according to Frazier (1990), when the RC follows a Saxon genitive (*the actor's daughter*) it forms only one attachment option, however, while in Norman genitive (*the daughter of the actor*) the RC can be attached to both nouns. So, the bias in favor of low attachment to Norman genitives is related to the existence of an unambiguous (Saxon genitive) form. This interpretation is adopted to account for low attachment preference in Turkish ambiguous RC structures in the above-

mentioned studies. They considered that the existence of an unambiguous high attachment structure like the one given in (12) supports a low attachment preference in cases of ambiguity in accordance with Avoid Ambiguity Principle.

However, this assumption may be challenged by the existence of a second type of construction, which also eliminates ambiguity in RC attachment with two NPs in Turkish. For instance, in (13) given below, the RC strongly modifies NP1 *oyuncunun* 'the actor-Gen', which is an instance of 'low attachment'.



(13) Sekreter	salonda	bekleyen	oyuncunun	becerikli	yardımcısıyla	konuştu.
Secretary	hall-Dat	wait-Part	actor-Gen	skillful	assistant-Inst	talk-Pst
	[Relative Clause]		[NP1]		[NP2]	

'*The secretary talked to the actor's skillful assistant who was waiting in the hall*.'

So, this is an indication of the fact that there are two different word orders [*NP1 RC NP2*], [*RC NP1 adjective NP2*] each of which eliminates the same RC attachment ambiguity in two different ways. In the first one (as given in sentence 12 above), there is an obligatory 'high attachment', while in the second order (as given in sentence 13) 'low attachment' is mandatory. This seems to create a conundrum, since two different orders, each of which eliminates ambiguity, create two different attachment sites for the RC. So, it appears that the parser will not be able to find any possible option to choose in cases of ambiguity, thus leading to a possible failure of Avoid Ambiguity Principle in explaining 'low attachment' preference. Since this is the case, the reason of 'low attachment' preferences of Turkish speakers in ambiguous RC structures cannot be explained via Avoid Ambiguity Principle, which is an indication of Construal Hypothesis. The preference for 'low attachment' must stem from a more structural reason like 'Recency'. The participants preferred to attach the RC to the low NP (NP1) in ambiguous structures simply because it is the closer one to the recently produced Relative Clause. This outcome appears to be in harmony with the prediction given in Cuetos et al. (1996). It is proposed that low attachment can be expected in Turkish since nouns are pre-modified. Moreover, since Recency Preference is associated with the universal properties of human short-term memory (Gibson et al., 1996), an increasing exponential decay function may have a role in attaching the RC to the first NP (low attachment) that follows it. However, the findings of Kamide and Mitchell (1997) report contradictory results gathered through an off-line comprehension task in Japanese. It is stated that the participants favored high – attachment preference in Japanese. Both Turkish and Japanese show a similar pattern in placing the RC and the potential attachment sites. So, different outcomes gathered through two structurally similar languages need further explanation, which is beyond the scope of the present paper.

At this point, the outcomes of the second experiment provide further support to understand and interpret the mentioned outcome.

3.2. Analysis of RC attachment preferences in the second experiment

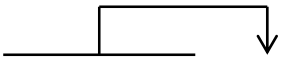
The sentence structure in the second experiment set is as given: S - [RC] - NP1 - NP2 - *Adjunct* - V. The potential attachment sites (NP1 – NP2) follow the RC structure. However, in the second set, an intervening group of adjuncts is located between NP2 and the main verb, as shown in sentence (14) below:

(14) Sekreter	[salonda	bekleyen]	oyuncunun	yardımcısıyla	*çekinerek*	*sakince*	konuştu.
Secretary	hall-Dat	wait-Part	actor-Gen	assistant-Inst	timidly	calmly	talk-Pst

'*The secretary talked timidly and calmly to the assistant of the actor who was waiting in the hall.'*

The reason of placing an adjunct group between NP2 and the main verb is to observe the potential effect of Predicate Proximity on the participants' RC attachment preferences. As it is stated in Gibson et al. (1996), the average distance between the head of a predicate and its arguments may determine the strength of Predicate Proximity. If the distance gets longer, the predicate needs to be more strongly activated to permit longer distance attachments. It is further predicted in their study that languages with VOS, VSO, SOV or OSV word orders may have relatively strong Predicate Proximity factors, which causes a high preference in two-word-NP-site RC attachment ambiguities. So, Turkish, which is an SOV language, and which allows material between the predicate head and its arguments, needs to be tested to see whether Predicate Proximity would have a stronger effect than Recency. The outcomes of the second experiment show that, low attachment (NP1) preference (60.8%) is stronger than high attachment (NP2) preference (39.2%). One-sample t-test is also applied in order to observe if there is a certain preference for low or high attachment (M=[.61], SD=[.489]), t(459)=[4.772], p=[0.000] in the second experiment. The present outcome is in harmony with the results of the first experiment.

It is evident that, even if the distance between the NPs and the main predicate is lengthened, Turkish speakers still prefer to attach the RC to the first (low) NP. The argumentation that has been presented for low attachment preference in the first experiment also seems to work for the second experiment. Turkish speakers have chosen to attach the RC to the most recent NP. Overall, when the findings of the two experiments are taken into consideration, the preference for low attachment seems like to depend on Recency Principle, but not to an Avoid Ambiguity strategy. It is unnecessary to repeat the whole argumentation presented to support Recency in section 3.1 since the same reasoning also works for sentences in the second set. As it has been given in section 3.1, there are two types of RC structures in Turkish each of which eliminates ambiguity (sentences 12 and 13 respectively). However, the problem is that while sentence (12) eliminates ambiguity in favor of high attachment, sentence (13) eliminates it causing a strong preference for low attachment. The structure that is used in (13) for the first set of sentences is also applicable for the second set of sentences as given below in sentence (15):



(15) Sekreter salonda bekleyen oyuncunun becerikli yardımcısıyla *çekinerek sakince* konuştu.

Secretary hall-Dat wait-Part actor-Gen skillful assistant-Inst timidly calmly talk-Pst

'*The secretary talked timidly and calmly to the actor's skillful assistant who was waiting in the hall*.'

Sentence (15) is a proof that there are at least two ways of eliminating ambiguity in RC attachment in Turkish. One of the ways necessitates high attachment (see sentence 12), while the other necessitates low attachment (see sentences 13 and 15). So, the problem pertaining to Avoid Ambiguity proposal for RC attachment in Turkish is about the multiplicity of structures that eliminates ambiguity. The parser will have trouble in choosing the necessary structure to avoid ambiguity while each of them creates a different attachment site. As a result, it seems that the only probability, which explains low attachment preferences of Turkish speakers is Recency. The most recent NP to the RC is chosen in both of the experiments implemented in the present study.

Although the outcomes of two experiments do not present a difference in attachment preferences, the cross-experimental comparison of the attachment frequencies of NP1 and NP2 presents an interesting outcome. This will be discussed in section 3.3.

3.3. Intervening adjunct effect

As it has been previously mentioned, the placement of adjuncts between NP2 and the main verb in the second experiment forms the difference between sentence structures in two experiments. Sentences (15) and (16) are sample sentences for experiment one and two respectively: (sentences 11, and 14 are repeated as 15 and 16):

(15) Sekreter [salonda bekleyen] oyuncunun yardımcısıyla konuştu.
Secretary hall-Dat wait-Part actor-Gen assistant-Inst talk-Pst
'*The secretary talked to the assistant of the actor who was waiting in the hall*.'

(16) Sekreter [salonda bekleyen] oyuncunun yardımcısıyla *çekinerek sakince* konuştu.
Secretary hall-Dat wait-Part actor-Gen assistant-Inst timidly calmly talk-Pst
'*The secretary talked timidly and calmly to the assistant of the actor who was waiting in the hall.'*

To compare and find out if the differences in two participant groups' attachment preferences in two experiments are significantly different from each other, a non-parametric Mann-Whitney *U* test is applied. A statistically significant difference is observed out of cross-experimental comparison. The preference for low attachment (NP1) in the second experiment (60.8%) decreases significantly in comparison to the first experiment (79.5%; $U = 599.500$, $p = .000$). As expected, the preference for high attachment (NP2) also increases significantly in the second experiment (39.2%) in comparison to the first one (20.5%; $U = 599.500$, $p = .000$). In table 5, percentages of frequencies are given:

Table 1. Attachment preferences in two experiments

	NP1 (Low Attachment)	**NP2 (High Attachment)**
Experiment 1 S - [RC] - NP1 - NP2 - V	79.5%	20.5%
Experiment 2 S - [RC] - NP1 - NP2 - ***Adjunct*** - V	60.8%	39.2%

Also in Figure 2 below, the decreasing and increasing tendencies for the preferences are shown cross-experimentally:

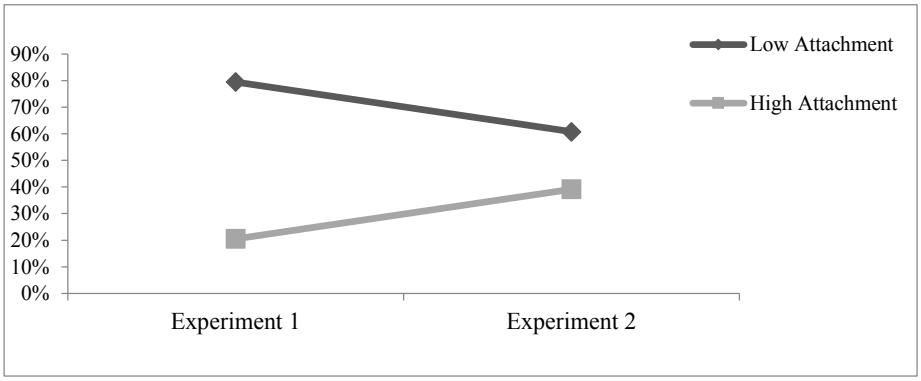


Figure 2. Attachment preferences for the RC in both word orders

Since intervening adjuncts is the only differentiating factor between two experiments, the reasons of differences in attachment preferences can be the structural organizations of sentences. This means that when the distance between the main verb and the potential attachment sites (NPs) grows longer (experiment two), the preference frequency for low attachment decreases. Gibson et al. (1996) state that in two-NP-site cases, the conflict is resolved on behalf of which factor (Predicate Proximity or Recency) is stronger in the related language. Since Predicate Proximity is more viable to parameterization, it should be associated with a higher cost than Recency in high site attachment preference. The mentioned reasoning also seems to work for Turkish two-site RC attachment preferences in sentences with a longer distance between the NPs and the main verb. When adjuncts intervene between the NPs and the main verb (see sentence 16 above), the tendency to attach RC to the second NP (high) increases (experiment two) in comparison to the attachment preferences without any intervening item with the high NP and the main verb (experiment one). The possible reasons of cross-experimental alternation in attachment preferences are discussed below.

The increasing rate of NP2 (high) attachment in experiment two in comparison to the first one may support Gibson et al. (1996)'s Predicate Proximity Hypothesis. Gibson et al. (1996) propose that if the distance between the verb and its arguments grows longer, the verb initially needs to be activated more strongly in order to make longer distance attachments work. It is highly probable that placement of a group of adjuncts in verb initial position contributes to the strength of retaining argument information in working memory, which affects the final decision of the processor for RC attachment. It is further stated in Gibson et al. (1996) that cost of violating Predicate Proximity gets greater when the distance between a verb and its arguments gets longer. This is actually in harmony with the outcomes of cross-experimental comparison in the present study. The placement of the adjuncts increased the distance between the NP group and the main verb, sequentially causing a bigger cost of violating Predicate Proximity. As a result of this, in order to avoid the cost of violating Predicate Proximity, the parser's attachment preference for NP2 (high NP) increased in the second experiment in comparison to the first one.

Besides the present discussion, the tendency for a high attachment increase in the second experiment may also be explained by referring to Frazier (1990)'s Relativized Relevance Principle, which proposes that in cases of multiple grammatical, informative and appropriate interpretations, the parser prefers to construe a phrase as being relevant to the main assertion of the sentence. This is also directly related to Referentiality Principle, which claims that heads of phrases are referential since they introduce discourse entities. As a result of this, heads are preferred as the hosts of modifier attachments. Following Gibson et al. (1996), the main assertion of the sentence may be associated to the main verb. In Turkish genitive constructions, the second NP carries the possessive marking, and it is the head of the composite NP (Göksel and Kerslake, 2005). Since the high NP is the head of the complex genitive NP, it may have been preferred as a potential attachment site for the RC due to its strengthened value by the help of intervening adjuncts modifying directly the main verb. In that respect, Delle Luche et al. (2006)'s findings and argumentation for French NP attachment may contribute some insight to present findings. Delle Luche et al. (2006) report that accessibility hierarchy ranking of relative pronouns in French can affect attachment preferences in ambiguous RCs. The relative pronoun *qui* 'who', which illustrates highly accessible antecedents, causes NP1 attachment, while the relative pronouns *lequel* 'which' and *laquelle* 'which', that signal less accessible antecedents, have less strong NP1 attachment. Following Gibson et al. (1996), they state that, Recency is a stronger constraint for *lequel/laquelle* 'which' than for *qui* 'who'. However, it is further indicated that there is no principled reason why this is the case. They find the answer in accessibility theory stating that markedness of the relative pronoun affects comprehension of RCs, and consecutively, participants' attachment preferences. This argumentation may be supportive for the findings of the present study in relation to the decrease in low attachment

preference in the second experiment. As the form of the relative pronoun affects the attachment preferences in French, the manipulation of the predicate proximity by inserting adjuncts appears to affect the accessibility of the related NP (high NP) in Turkish. The intervening adjuncts (modifying the main verb) between the NP group and the main verb might have strengthened predicate – argument relationship, by emphasizing the main assertion of the sentence. Consecutively, this may have made the high NP (head of the complex NP object) more accessible for the parser causing an increase in the attachment preferences for high NP in the second experiment.

However, it is important to note that, in both of the experiments, the participants significantly preferred to attach the RC to the low NP. The main argumentation presented in 3.3 is about increasing frequency for high attachment cross-experimentally. On structural grounds, it is observed that the longer the distance between the main verb and its arguments becomes, the stronger Predicate Proximity effects are observed. Along with this finding, it is probable to state that the strengthened Predicate Proximity effects appear to reduce the effect of Recency, although Recency is still prevalent in attachment preferences.

4. Conclusions

The two experiments conducted in the present study revealed similar outcomes about Turkish speakers' attachment preferences in ambiguous RC structures. In the first word order (S - [RC] - NP1 - NP2 - V), which is tested in the first experiment, the preference for low attachment (NP1) is higher than high attachment (NP2). The difference between the two preferences is statistically significant. This outcome shows that Recency preference is at work for ambiguous RC attachment in Turkish. This interpretation, which favors Recency, against previous proposals like Construal, and Avoid Ambiguity, depends on the fact that there is more than one construction to eliminate the RC attachment ambiguity. These constructions form different attachment sites for the RC, therefore, it is hypothesized in the present study that the reason of parser's low attachment preference cannot be the existence of an unambiguous structure, since there are at least two unambiguous constructions each of which forms different attachment sites. Then, it seems that the parser does not attach the RC to one of the two NPs in order to Avoid Ambiguity in line with the previous literature. Consequently, the reason of low attachment preference should be Recency. The most recent NP to the RC is preferred more frequently.

The second experiment tries to answer if there is any effect of Predicate Proximity on the attachment preferences. The word order that is used in the second experiment (S - [RC] - NP1 - NP2 - Adjunct - V) included an adjunct group between NP2 and the main verb. This type of ordering increases the distance between the potential attachment sites and the main verb. At the end of the second experiment, it is observed that low attachment (NP1) preference is significantly more frequent than high attachment (NP2). However, what is interesting is that the preference rate for high attachment increases when the distance between the second NP and the main verb grows bigger. This outcome may be explained through Gibson et al., (1996)'s Predicate Proximity and Frazier (1990)'s Relativized Relevance Principle. In both sentence types, the second NP (the possessor) is the head of the genitive NP construction. Along with Referentiality Principle, the head of the complex NP may be the target of attachment. The existence of the intervening adjunct appears to boost the impact of the main assertion in the sentence, since the adjunct itself modifies the main verb. In accordance with this interpretation, the parser might have developed a tendency to attach the RC to the head of the object group (NP2), which is directly related to the main assertion of the sentence that is strengthened by the existence of the adjunct. This outcome also demonstrates that while the impact of Recency is decreased, the effect of Predicate Proximity is increased with the growing distance between the arguments and the main predicate (Gibson et al., 1996).

Overall, in both experiments, Turkish speakers showed low attachment (NP1) preference in ambiguous RC structures. This is explained through Recency preference. However, in the second experiment, although low attachment preference is still higher than high attachment, the difference between the attachment preferences decreased. This is explained through the potential effect of Relativized Relevance and Referentiality Principles along with increasing Predicate Proximity effects. Finally, it is important to note that the present study implements two experiments, which gather data through off-line comprehension tasks. In order to see the initial attachment preferences, and potential reanalysis, gathering on-line data would also be useful.

5. Ethics Committee Approval

The author(s) confirm(s) that the study does not need ethics committee approval according to the research integrity rules in their country (Date of Confirmation: August 31, 2020).

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Appendix A. Target sentences in the first experiment

1) Eczacı camı kıran boyacının çırağını aradı.

'The pharmacist called the apprentice of the painter who broke the window.'

Camı kim kırdı?

'Who broke the window?'

a) boyacı *'the painter'* b) çırak *'the apprentice'*

2) Tamirci aracı getiren şoförün muavinini azarladı.

'The mechanic scolded the assistant of the driver who brought the car.'

Kim aracı getirdi?

'Who brought the car?'

a) muavin *'the assistant'* b) şoför *'the driver'*

3) Emlakçı ev arayan komşunun babasıyla anlaştı.

'The real estate agent met the father of the neighbor who was looking for an apartment.'

Kim ev arıyor?

'Who is looking for an apartment?'

a) baba *'the father'* b) komşu *'the neighbor'*

4) Sekreter salonda bekleyen oyuncunun yardımcısıyla konuştu.

'*The secretary talked to the assistant of the actor who was waiting in the hall*.'

Salonda kim bekliyor?

'Who is waiting in the hall?'

a) oyuncu *'the actor'* b) yardımcı *'the assistant'*

5) Simitçi sabahları parkta koşan bankacının kardeşini selamladı.

'The bagel seller greeted the brother of the banker who runs at the park in the mornings.'

Kim parkta koşuyor?

'Who runs at the park?'

a) bankacı *'the banker'* b) kardeş *'the brother'*

6) Hemşire tansiyonu düşen arkadaşının annesini tanıdı.

'The nurse recognized the mother of her friend who had low blood pressure.'

Tansiyonu düşen kim?

'Who had low blood pressure?'

a) anne *'the mother'* b) arkadaş *'the friend'*

7) Taksici şehir dışında oturan doktorun asistanını gördü.

'The taxi driver saw the assistant of the doctor who lived in the country.'

Şehir dışında kim oturuyor?

'Who lives in the country?'

a) doktor *'the doctor'* b) asistan *'the assistant'*

8) Müdür işi bırakan muhasebecinin stajyeriyle görüştü.

'The manager met the trainee of the accountant who quit the job.'

İşi kim bıraktı?

'Who quit the job?'

a) stajyer *'the trainee'* b) muhasebeci *'the accountant'*

9) Yazar düzeltme yapan editörün sekreterine çıkıştı.

'The author blistered the secretary of the editor who proofread.'

Kim düzeltme yapıyor?

'Who is proofreading?'

a) editör *'the editor'* b) sekreter *'the secretary'*

10) Psikolog rahat görünen şarkıcının eşini dinledi.

'The psychologist listened to the wife of the singer who seemed at ease.'

Kim rahat görünüyor?

'Who seems at ease?'

a) eş *'the wife'* b) şarkıcı *'the singer'*

Appendix B. Target sentences in the second experiment

11) Taksici şehir dışında oturan doktorun asistanını durakta beklerken gördü.

'The taxi driver saw the assistant of the doctor who lived in the country, while s/he was waiting at the bus stop.'

Şehir dışında kim oturuyor?

'Who lives in the country?'

a) doktor *'the doctor'* b) asistan *'the assistant'*

12) Psikolog rahat görünen şarkıcının eşini ofisinde sessizce dinledi.

'In her/his office, the psychologist silently listened to the wife of the singer who seemed at ease.

Kim rahat görünüyor?

'Who seems at ease?'

a) eş *'the wife'* b) şarkıcı *'the singer'*

13) Simitçi sabahları parkta koşan bankacının kardeşini bugün mutlulukla selamladı.

'Today, the bagel seller happily greeted the brother of the banker who runs at the park in the mornings.'

Kim parkta koşuyor?

'Who runs at the park?'

a) bankacı *'the banker'* b) kardeş *'the brother'*

14) Sekreter salonda bekleyen oyuncunun yardımcısıyla çekinerek sakince konuştu.

'*The secretary timidly and calmly talked to the assistant of the actor who was waiting in the hall.'*

Salonda kim bekliyor?

'Who is waiting in the hall?'

a) oyuncu *'the actor'* b) yardımcı *'the assistant'*

15) Yazar düzeltme yapan editörün sekreterine sinirlenip sertçe çıkıştı.

'The author, getting annoyed, blistered harshly the secretary of the editor who proofread.'

Kim düzeltme yapıyor?

'Who is proofreading?'

a) editör *'the editor'* b) sekreter *'the secretary'*

16) Eczacı camı kıran boyacının çırağını sinirlenip defalarca aradı.

'Having annoyed, the pharmacist called the apprentice of the painter who broke the window, several times.'

Camı kim kırdı?

'Who broke the window?'

a) boyacı *'the painter'* b) çırak *'the apprentice'*

17) Müdür işi bırakan muhasebecinin stajyeriyle dün istemeyerek görüştü.

'Yesterday, the manager unwillingly met the trainee of the accountant who quit the job.'

İşi kim bıraktı?

'Who quit the job?'

a) stajyer *'the trainee'* b) muhasebeci *'the accountant'*

18) Hemşire tansiyonu düşen arkadaşının annesini hemen kolayca tanıdı.

'The nurse directly and easily recognized the mother of her friend who had low blood pressure.'

Tansiyonu düşen kim?

'Who had low blood pressure?'

a) anne *'the mother'* b) arkadaş *'the friend'*

19) Tamirci aracı getiren şoförün muavinini dinlemeden öfkeyle azarladı.

'Without listening, the mechanic angrily scolded the assistant of the driver who brought the car.'

Kim aracı getirdi?

'Who brought the car?'

a) muavin *'the assistant'* b) şoför *'the driver'*

20) Emlakçı ev arayan komşunun babasıyla hemen memnuniyetle anlaştı.

'Immediately, the real estate agent willingly met the father of the neighbor who was looking for an apartment.'

Kim ev arıyor?

'Who is looking for an apartment?'

a) baba *'the father'* b) komşu *'the neighbor'*

Appendix C. Filler sentences

1) Profesör asistanının hazırladığı sunumu beğendi.

'The professor appreciated the presentation, which her/his assistant had prepared.'

Sunumu kim beğendi?

'Who liked the presentation?'

a) asistan *'the assistant'* b) profesör *'the professor'*

2) Görevli çöpleri toplayıp merdivenleri sildi ve gitti.

'The attendant cleaned the stairs and left after collecting the garbage.'

Görevli hangisini önce yaptı?

'Which one did the attendant do first?'

a) çöpleri topladı *'collected the garbage'* b) merdivenleri sildi *'cleaned the stairs'*

3) Market alışverişi yapmış tamirciye uğramış ve eve gelmiş.

'Having made shopping, stopping by the mechanic, s/he came home.'

Hangisini önce yapmış?

'Which one did s/he do first?'

a) tamirciye uğramak *'stopping by the mechanic'* b) market alışverişi yapmak *'making market shopping'*

4) Adam saatinin kayışını koparttığı için saatçiye kızdı.

'The man got angry with the watchmaker since he broke off the belt of his watch.'

Saat kimin?

'To whom does the watch belong?'

a) adamın *'the man's'* b) saatçinin *'the watchmaker's'*

5) Dişçi yarın için randevu veremeyeceğini söyledi.

'The dentist told that s/he wouldn't be able to schedule an appointment for the day after.'

Dişçi randevuyu ne zaman için veremedi?

'For when was the dentist not able to schedule the appointment?'

a) yarın için *'for tomorrow'* b) bugün *'for today'*

6) Kitapçı haftaya tatile gideceği için kapalı olacağını hatırlattı.

'The bookseller reminded that the store would be closed since s/he would be on vacation next week.'

Kitapçı neden kapalı olacağını hatırlattı?

'Why did the bookseller remind that the store would be closed?'

a) tatile gideceği için *'because s/he will be on vacation'* b) tatilden döneceği için *'because s/he will be back from vacation'*

7) Mavi yarış ve dağ bisikleti aldığını duymuş.

'S/he has heard that s/he has bought blue racing and mountain bike.'

Hangi bisiklet mavi?

'Which bike is blue?'

a) her ikisi de *'both'* b) yarış bisikleti *'the racing bike'*

8) Müdür yardımcısına yarın gelmeyeceğini söyledi.

'S/he told the deputy manager that s/he would not come the day after' or *'The manager told her/his assistant that s/he would not come the day after.'*

Yarın gelmeyeceğini kim söyledi?

'Who told that s/he would not come tomorrow?'

a) stajyer *'the apprentice'* b) müdür *'the manager'*

9) Öğretmen ödevlerin teslim tarihini dün söyledi.

'The teacher mentioned the due date of the assignment yesterday.'

Öğretmen ödevlerin teslim tarihini ne zaman söyledi?

'When did the teacher mention the due dates of the homework?'

a) dün *'yesterday'* b) iki gün önce *'two days ago'*

10) Evden çıkmadan pencereyi kapatmayı unuttuğunu söylemiş.

S/he told that s/he forgot to close the window before s/he had left the house.'

Pencerenin durumu nedir?

'What is the position of the window?'

a) açık *'open'* b) kapalı *'closed'*

11) Yarın geleceğini söyleyecek.

'S/he will tell that s/he will be coming tomorrow.'

Yarın ne yapacak?

'What will s/he do tomorrow?'

a) gelecek *'s/he will come'* b) geleceğini söyleyecek *'s/he will tell that s/he will come.'*

12) Çocuk pahalı oyuncaklarını ve kitaplarını kaybedince çok üzüldü.

'The kid was so sorry after losing her/his expensive toys and books.'

Pahalı olan nedir?

'What is expensive?'

a) oyuncaklar ve kitaplar *'toys and books'* b) oyuncaklar *'toys'*

13) Kargocu paketi evin kapısının önüne bırakmış.

'The delivery person left the package in front of the door of the house.'

Kargocu paketi nereye bırakmış?

'Where did the delivery person leave the package?'

a) evin önüne *'in front of the house'* b) kapının önüne *'in front of the door'*

14) Adam çocuğuna oyun bilgisayarı almak istediğini söyledi.

'The man told his kid that he would like to buy a gaming pc' or *'The man told that he would like to buy a gaming pc for his kid.'*

Adam oyun bilgisayarı almak istediğini kime söyledi?

'To whom did the man tell that he would like to buy a gaming pc?'

a) satıcıya *'to the seller'* b) çocuğuna *'to the kid'*

15) Kitabın başından 60. sayfaya kadar okumuş.

'S/he has read the book from the beginning to the 60th page.'

Kaç sayfa kitap okumuş?

'How many pages did s/he read?'

a) 60 b) 59

Türkçede belirsiz ilgi tümceciği iliştirmesindeki yenilik tercihi

Öz

Türkçede ilgi tümceciklerinin iliştirilmesindeki belirsizlik iyelik yapılarında iki ad öbeğinin ilgi tümceciğinden sonra geldiği durumlarda ortaya çıkar. Bu çalışma Türkçe anadil konuşucularının ilgi tümceciği iliştirme tercihlerini çevrimdışı kavrama yöntemiyle iki ayrı deney üzerinden incelemektedir. İlk deneyde tümcenin ana eylemi ad öbeği grubundan hemen sonra gelirken, ikinci deneyde ana tümce eylemiyle ikinci ad öbeği arasında bir eklenti grubu bulunmaktadır. Bu düzenlemenin sebebi, iliştirme tercihlerinde Yenilik ve Yükleme Yakınlık etkilerini gözlemlemektir. İlk deneyin sonuçları açık bir şekilde alt iliştirme tercihini (AÖ1) göstermektedir. Bu tercihinin sebebinin Yenilik etkisi olduğu düşünülmektedir. İkinci deneyin sonuçları da alt iliştirme için daha yüksek bir tercihle birlikte, üst iliştirme tercihinde ilk deneye kıyasla artış olduğunu göstermektedir. Bu sonuç, ilk olarak, Yenilik etkisinin hala geçerli olduğunu, ikinci olarak da ad öbeği grubuyla ana tümce eylemi arasına giren eklenti grubu olduğunda Göreli Bağıntılılık İlkesiyle birlikte Yükleme Yakınlığın artan bir etkisinin olabileceğini göstermektedir.

Anahtar sözcükler: İlgi tümceciği, Belirsizlik, Alt/Üst İliştirme, Yenilik, Yükleme Yakınlık, Göreli Bağıntılılık.

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