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THE EFFECT OF DISCOURSE-LEVEL CUES ON RC ATTACHMENT PREFERENCE IN L2 ENGLISH: IMPLICIT CAUSALITY IN VERBS¹

L2 İngilizce'de RC Bağlam Tercihinde Söylem Düzeyi İpuçlarının Etkisi:
Örtülü Nedensellik Fiilleri

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Abstract

Examining implicit causality and relative clause attachment ambiguity in bilingual participants, this study investigates whether adult second language (L2) English speakers share sensitivity with native speakers to implicit causality (IC) information during online resolution of relative clause attachment ambiguity. L1 Turkish/L2 English speakers and English natives participated in offline sentence completion and online self-paced reading tasks. Results revealed that L1 English speakers preferred high attachment in IC conditions and low attachment in non-IC conditions. In contrast, L2 speakers showed a preference for high attachment in both conditions, suggesting that L2 sentence processing relies more on lexical than syntactic information.

Keywords: Implicit Causality, Relative Clause, Attachment Ambiguity, Sentence Processing

Öz

İkinci dil (L2) konuşan yetişkinlerin İngilizce'deki örtülü nedensellik ve ilgi cümlecği bağlama belirsizliği konularını inceleyen bu çalışma, L2 İngilizce konuşmacılarının, İngilizce'de fiillerde kodlanan örtülü nedensellik (ON) bilgilerine ne kadar duyarlı olduklarını araştırır. L1 Türkçe / L2 İngilizce konuşmacılar ile İngilizce ana dil konuşmacıları, çevrimdışı cümle tamamlama ve çevrimiçi kendi hızlarındaki okuma görevlerinde test edilmiştir. Sonuçlar, L1 İngilizce konuşmacılarının ON koşullarında yüksek bağlama, ON olmayan koşullarda düşük bağlama tercih ettiğini gösterdi. Buna karşın, L2 konuşmacıların her iki koşulda da yüksek bağlama tercih ettikleri ortaya çıktı. Bulgular, L2 cümle işleme sürecinin daha çok sözdizimi bilgisi yerine leksikal bilgiye dayandığını destekliyor.

Anahtar Kelimeler: Örtülü Nedensellik, İlgi Cümlecği, Belirsizlik Bağlamı, Cümle İşleme

1. INTRODUCTION

It has been well attested that in first language (L1) sentence processing, the semantic information in verbs, in particular implicit

¹ Bu makale, "The Role of Discourse Information in the Resolution of Relative Clause Attachment Ambiguity in L2 English" adlı doktora tezinden üretilmiştir.

causality (IC) information, affects real-time comprehension of ambiguous structures, such as referential ambiguity and relative clause (RC) attachment ambiguity in English. IC information is defined as a semantic feature encoded in verbs, which implicitly points either to the subject or the object of the matrix clause as the cause of the event indicated by the verb (Garvey & Caramazza, 1974). In referential ambiguity resolution, for example, Garvey and Caramazza showed that some verbs such as *frighten* in (1) are subject-biased, whereas others, such as *love* in (2), are object-biased depending on the direction of IC information they carry.

- (1) “Sally frightened Mary because she...
- (2) Sally loved Mary because she...” (Hartshorne, 2013, p. 804).

Garvey and Caramazza suggested that L1 English speakers assign the ambiguous pronoun “she” to Sally in (1), because the main verb “frighten” implicitly indicates the subject as the centre of the underlying cause of the fright. In (2), they assign “she” to Mary because love implicitly points to the direct object as the locus of the underlying cause of the love. The conjunction “because” in both sentences introduces an explanation of causes.

In the same way, Rohde, Levy and Kehler (2011) showed that IC verbs significantly switched L1 speakers’ low attachment (LA) preference to high attachment (HA) in sentences with IC verbs like “detest” in (4), compared to those with non-IC verbs like “babysit” in (3). The author tested a group of native English speakers using an offline sentence-completion task and an online self-paced reading task involving RC attachment ambiguity. In the sentence completion task, which examined whether L1 English speakers can change their default low-attachment preference in non-IC condition (3) to high-attachment under the influence of IC verbs in IC condition (4).

- (3) “[Non-IC prompt] John babysits the children of the musician who...
- (4) [IC-prompt] John *detests* the children of the musician who...” (Rohde et al., 2011, p. 343)

The results of the sentence completion task showed that the percentage of RCs that modify NP1 (HA) in the IC condition (4) was higher than those in the non-IC condition (3). More importantly, the percentage of RCs with explanation in the IC condition (4) was significantly higher than

those in the non-IC condition, which confirmed the claim that IC verbs can lead more RCs with explanation than non-IC verbs. These findings indicated that L1 speakers establish discourse driven coherence relations between IC verbs and the ensuing RCs in English.

In the online self-paced reading task, using the same material of the sentence completion task, the author examined whether IC verbs affects comprehenders' syntactic attachment preference during online resolution of RC attachment ambiguity as in (5-6) below.

- (5) "[Non-IC] John babysits the children of the musician who...
 a. [LOW] ...lives in La Jolla.
 b. [HIGH] ...are students at a private school.
 (6) [IC] John detests the children of the musician who...
 a. [LOW] ...lives in La Jolla.
 b. [HIGH] ...are arrogant and rude." (Rohde et al., 2011, p. 346)

In IC-condition, the prediction was that if L1 speakers use coherence-based pragmatic knowledge (IC information of verbs) when they process sentences with RC attachments, this should be observed in their longer RTs on the critical and the spillover regions (are "arrogant" and "rude") in low attaching RCs than high attaching RCs in (6). In non-Condition, however, they should spend longer RTs on same regions in high attaching RCs than low attaching RCs in (5) under the influence of syntactic information.

The results of the online self-paced task confirmed this indicated that the critical and the spillover regions (are "arrogant" and "rude") in high attaching RCs (6b) were significantly read faster than those in low attaching RCs (6a) in the IC condition. In the non-IC condition (5), whereas high attachment' critical and spillover regions ("are", "students", and "at a private school" respectively) in (5b) were read more slowly than those in low attachment (5a). The author concluded that in L1 sentence processing, "discourse-level expectations can affect online disambiguation as rapidly as lexical and morphosyntactic cues" (Rohde et al.2011, p. 339).

In L2 sentence processing, however, it is still unclear whether L2 speakers are as successful as L1 speakers in utilizing pragmatic/discourse level cues, in particular the semantic/pragmatic information of verbs in the resolution of local ambiguities, in particular in the resolution of RC attachment ambiguity. Some of L2 researchers proposed that adult L2

speakers "... are guided more strongly than native speakers by semantic, pragmatic, probabilistic or surface-level information" (Clahsen & Felser, 2018, p. 694) rather than syntactic information. More importantly, there are few studies which have examined whether L2 speakers use pragmatic/discourse information in L2 processing, particularly in RC attachment resolution and the results are not conclusive yet (Dekydtspotter, et al., 2008; Pan, Schimke & Felser, 2015; Sokolova, 2018). Dekydtspotter (2008) proposed that L2 speakers can use both syntactic and contextual information in RC attachment even at a very early stage of language acquisition, whereas Pan et al. (2015) claimed that L2 speakers are more sensitive to discourse information than L1 speakers in their RC attachment preference. Sokolova (2018), on the other hand, reported that L2 speakers' attachment preference is affected by the semantic/pragmatic information of perceptual verbs (e.g., "see", "hear") in the same way as native speakers. Taken together, these results are inconclusive and signals the need for more research to understand whether L2 speakers can use semantic/pragmatic cues in the same way as L1 speakers in resolution of local ambiguities.

To meet this need, following Rohde et al.'s (2011) findings, we looked at the effects of IC verbs on the resolution of RC attachment ambiguity in L2 English. More specifically, we examined whether L2 speakers can use IC information of verbs to create an expectation for an explanation from the ensuing RC, and establish a discourse-driven causal relations between the direct object and the ensuing RC during the resolution of RC attachment ambiguity.

A Turkish and English language combination was selected, because Turkish is typologically different from English, with respect to the formation of RCs and word order. Turkish is a head-final, non-configurational language with a free word order (Öztürk, 2015). English, however, is head-initial language with a strict subject-verb-object (SVO) word order. RCs in English follows the head noun, whereas RCs in Turkish precede the head noun. English is an LA language (Fernandez, 1999), whereas Turkish more likely is a HA language, due to it being a head-final, non-configurational language with a free order. Within this perspective, the research questions of the thesis are formed as follows;

- 1.a. Do monolinguals of English prefer high-attachment site in the sentences with RC attachment ambiguity in implicit causality condition?
- 1.b. Do monolinguals of English prefer low-attachment site in the sentences with RC attachment ambiguity in non-implicit causality

condition?

2.a. Do Turkish L2 speakers of English prefer high-attachment site in the sentences with RC attachment ambiguity in implicit causality condition in the same way as the monolinguals?

2.b. Do Turkish L2 speakers of English prefer low-attachment site in the sentences with RC attachment ambiguity in non-implicit causality condition in the same way as the monolinguals?

1.1. Previous research on RC attachment ambiguity in L2

A considerable number of studies have looked at RC attachment ambiguity in L2 to examine whether L2 speakers' attachment preference is the same as that of L1 speakers, with mixed results (e.g., Fernandez, 2002; Dussias, 2003; Felser, Roberts, Marinis & Gross, 2003; Papadopoulou & Clahsen, 2003; Dekydtspotter et al. 2008). Some of these studies showed that unlike L1 speakers, L2 speakers do not have a clear attachment preference in sentences with a complex genitive NP, but do have LA in conditions where two NPs in the genitive construction are joined with a preposition like with (Felser et al 2003; Papadopoulou & Clahsen, 2003; Dussias, 2003). These findings were taken as evidence for the Shallow Structure Hypothesis (SSH), which states that L1 and L2 processing is different, in that "unlike native speakers, even highly proficient L2 speakers tend to have problems building or manipulating abstract syntactic representations and are guided more strongly than native speakers by semantic, pragmatic, probabilistic or surface-level information." (Clahsen & Felser, 2018, p. 694). In contrast to these findings, Dekydtspotter et al., (2008) showed that L2 speakers are as sensitive as native speakers to both syntactic and contextual information in RC attachment resolution.

In addition, studies which examined the claim that "L2 processing may prioritize semantic, pragmatic, or other types of non-grammatical information, compared to L1 speakers." (Clahsen & Felser, 2018, p. 695), provided inconclusive results (e.g., Pan et al., 2015; Sokolova, 2018). Pan et al. (2015) examined whether a preceding referential context affected both L1 English speakers' and L1 German- and L1 Chinese-speaking ESL learners' attachment preferences in RC resolution of English. An overall analysis of the offline tasks showed that both L1 and L2 groups preferred NP2 (LA) with a preceding NP2 context rather than a NP1 (HA) in a NP1 context. Further separate analyses of L1 and L2 groups indicated that both L2 groups preferred NP1 modification in the NP1 context to NP2 modification in the NP2 context. The L1 English group, however, showed NP2 modification preference in a NP2 context. In other words, L2 groups preferred HA more

frequently than LA in the offline task. In the online task, the author reported that in L2 groups, NP1 preference received shorter RTs, showing that the referential context affected L2 speakers' disambiguation preferences, but not the L1 English speakers'. Pan et al. took these findings as evidence supporting the claim that "non-native ambiguity resolution is more strongly affected by extra-sentential context information compared to native ambiguity resolution" (Pan et al. 2015, p. 311).

In a recent study, however, Sokolova (2018), provided contrasting evidence which showed that L2 speakers' RC attachment preference is affected by perceptual matrix verbs in the same way as L1 speakers. Sokolova, tested L2 Russian and English speakers' RC attachment preference. She found HA in both L2 English and Russian (e.g., the mother) in cases in which perception verbs function as matrix verbs. Thus, the results of Pan et al. and Sokolova' studies remain inconclusive and demonstrate the need for more research on the question of whether L2 learners are more or as sensitive as L1 speakers to semantic, pragmatic and discourse-level cues in the online resolution of RC attachment ambiguity. Within this context, the present study aims to examine the effect of semantic information of the main verb on L2 resolution of RC in English.

The main motivation underling this research is that in L2 sentence processing, there is limited research examining the effect of pragmatic and discourse level information on syntactic processing, in particular on RC attachment resolution. The findings of previous research, reviewed above, are not conclusive with respect to attachment preference in L2 English. This can be attributed to the fact that these studies did not control the effect of semantic information of the main verbs in their experimental stimuli, even though that effect has been attested in L1 research (e.g., Rohde et al., 2011; Grillo & Costa, 2014).

Moreover, previous studies mainly examined the extent to which referential context affected L2 speakers' attachment preferences, but none presented a context in which one could detect the change in L2 speakers' attachment preferences in cases in which syntactic and semantic/pragmatic information interact.

2. METHODOLOGY

2.1. The Participants

Two different groups participated in the current study; 30 adult L1 Turkish learners of L2 English as the experimental group and 30 L1 English

speakers as the control group. The two groups were homogeneous with respect to age, education, and gender. The adult L2 learners took the Oxford English Proficiency test to confirm their proficiency in L2 English. Table 1 displays the background information related to the experimental and control groups of the study.

Table 1. Background information of L1 and L2 groups

Group	Sex		Age				Any other Language
	Male	Female	Mean age of first exposure to L2 English	Mean age at time of testing	Age range		
L2 learners (n = 30)	18	12	12	35	25–42	none	
L1 speakers (n = 30)	21	9	From birth	36	30–54	none	

2.2. Materials

2.2.1. The sentence completion task

The offline sentence completion task involved 30 experimental sentences. In all sentences, the subject NP of the main verb was a proper noun with a [+human] semantic feature, and the object NP was a complex NP with two [+human] NPs in genitive construction. The verb in the main clause was either an object-biased IC verb as in (10), or a non-IC verb as in (9).

(9) “[non-IC PROMPT] John babysits the children of the musician who. . .

(10) [IC PROMPT] John detests the children of the musician who. . .” (Rohde et al., 2011, p. 346)

There were 60 fillers which involved the same forms of different grammatical structures such as tenses, modals, and conjunctions to prevent the participants from discovering experimental sentences and improving any mechanical answering strategies. The participants were asked to write a natural sentence completion covering the first completion that came to their mind and avoiding humour with using only finite verbs (e.g., was/were, have/has, is/are etc.).

2.2.2. Online self-paced reading task

The task had 48 experimental sentences and 96 fillers with a 2x2

design varied in verb-type and RC attachment-height. The experimental sentences were composed of four conditions, each of which had 12 experimental sentences as illustrated below.

- (11) “[IC Condition]
 a) John / detests /the children/ of /the musician/ who / is/ generally/ arrogant/ and rude.
 b) [HA] John / detests /the children/ of /the musician who / are / generally/ arrogant /and rude.
- (12) [Non-IC Condition]
 a) [LA preference] John / babysits /the children /of /the musician /who / is / generally / arrogant /and rude.
 b) [HA] John / babysits /the children /of /the musician /who / are / generally/ arrogant and rude.” (Rohde et al., 2011, p.356)

The NP consisted of two NPs, one singular and the other plural. The RC verb, the embedded verb, is either “be” or “have”, as it is influential for subject-verb agreement. The verb types and the height of the attachments were distributed equally, and the fillers had the same sentence structures as the experimental sentences. Each sentence was followed by a comprehension question; such as “Does John get frustrated with the children?” / “Could John be a teenager?” in order to make sure that the participants understood the sentence.

The critical region of disambiguation for the RC attachment-height was the embedded finite verb (e.g., is/are), which agrees in number with only one of the preceding NPs, either NP1 or NP2, and the immediate post-critical region, the adverb (e.g., generally) and the subsequent word were the two spillover regions. It was assumed that HA preference would be easier in IC condition, which would be reflected in the participants’ shorter RTs on the critical and two spillover regions; and LA preference in non-IC condition, which would be reflected in both groups’ shorter RTs on the disambiguating regions.

2.3. Procedure

The participants completed all the tasks individually in the following order: (1) background information task, (2) proficiency test (for the L2 learners), (3) sentence completion task, and (4) the online self-paced word-by-word reading task in a moving window procedure in different sessions at different times. They took the online self-paced reading task, which was individually administered to all participants on a laptop using E-Prime 2.0 (Schneider, Eschman, & Zuccolotto, 2002), and the participants were

informed that it was a reading comprehension experiment and they were instructed how to proceed.

3. RESULTS

3.1. Results of the Sentence Completion Task

In the sentence completion task, the participants completed 30 experimental sentences in two conditions: the IC Condition and the non-IC Condition. Table 2 below presents attachment preferences of L1 and L2 English speakers in two conditions: sentences with non-IC verbs (13) and sentences with IC verbs (14).

(13) “[non-IC PROMPT] John babysits the children of the musician who. . .

(14) [IC PROMPT] John detests the children of the musician who...” (Rohde et al., 2011, p.355).

Table 2. The mean attachment scores of the sentence completion task

		IC-high (N = 6)		IC-low (N = 9)		Non-IC-high (N = 6)		Non-IC-low (N = 9)	
		M	SD	M	SD	M	SD	M	SD
L1	English (n = 30)	11.33	2.01	3.67	2.01	5.27	1.63	9.73	1.63
L2	English (n = 30)	11.37	1.88	3.63	1.88	11.03	1.10	3.97	1.90

Table 2 shows that in the IC condition, L1 speakers produced more RCs referring to high NPs, the children (M=11,33) than those referring to low NPs, the musician (M=3,67). In the non-IC condition, whereas, they produced more RCs referring to low NPs (M=9, 73) than those referring to high NPs (M=5, 27). This shows that L1 English speakers prefer high attachment in IC Condition under the influence of IC verbs and low attachment in non-IC Condition in which matrix verbs do not carry IC information. L2 speakers, however, produced more RCs referring to high NP (NP1) in both the IC (M=11,37) and non-IC conditions (M=11,03), which indicates that L2 English speakers have different RC-attachment preferences in non-IC condition.

The results of the repeated-measures ANOVA conducted with verb-types as the within-subject factors revealed a main effect for the verb-type in IC and non-IC conditions in the L1 group ($F(1, 3,87) = 243.005$, $p < 0.001$, $\eta^2 = 0.893$) and in the L2 group ($F(1, 3,87) = 396.64$, $p < 0.001$, $\eta^2 =$

0.932). A pairwise comparison (Bonferroni, 0.05) of the four conditions (IC high-NP, IC low-NP, the non-IC high-NP, and the non-IC low-NP) shows that the differences between the mean scores of the IC high-NP and the IC low-NP are statistically significant in both the L1 group ($p < 0.001$) and the L2 group ($p < 0.001$). Also, in the non-IC condition, the difference between the mean scores of the high-NP and the low-NP are significant in both the L1 group ($p < 0.001$) and the L2 group ($p < 0.001$).

This result suggests that in IC-condition, L1 speakers strongly preferred high-attachment under the influence of IC verbs in resolving RC attachment ambiguity whereas in the non-condition, they preferred low-attachment under the influence of syntactic information. That means, IC information encoded in the verbs affects syntactic attachment decisions of L1 speakers during the resolution of RC attachment ambiguity. As for the L2 group, the high attachment preference in IC and non-IC condition shows that they do not use the syntactic and pragmatic information in the same way as the native speakers in RC sentence completion. Figure 1 illustrates the distribution of mean scores for the four attachment sites in the IC and non-IC conditions.

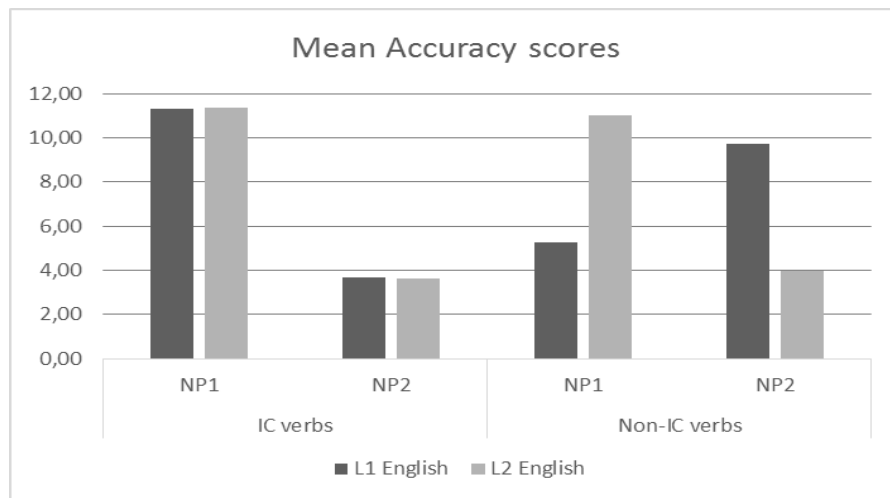


Figure 1. The distribution of mean scores across the four attachment sites by subject

3.2. Results from the Self-paced Reading Task

The assumption was that if both L1 and L2 speakers' expectation for the attachment height mismatched with the attachment height indicated by the embedded verb (is/are), this would result in longer RTs on the embedded

verb. Therefore, the embedded verb (is/are) was the disambiguating /critical region of the experiment. Also, the two post-critical words were selected as spillover regions: (1) a semantically neutral adverb, which appeared immediately after the embedded verb (e.g., generally); and (2) the subsequent word (e.g., arrogant).

We expected longer RTs on the critical region (is/are) and the two spillover regions (generally and arrogant) of the RCs when the RC modified the low NP in the IC condition, due to the effect of the IC verb like (detest) in the main clause, which implicitly forces a high NP. In the non-IC condition, however, the RTs on the same regions of the RC were expected to be longer when the RC modified the high NP.

After excluding L2 participants whose accuracy was below 70%, we provided the mean accuracy for each condition in Table 3 below. We also analysed the raw RTs at the critical and the two spillover regions of the sentences (John (detests/babysits) /the children/ of /the musician/ who / (is/are) / generally/ arrogant/ and rude.) removing the raw RTs that were more than 2.5 standard deviations from the mean, per region, per condition in the sentences.

Table 3. Mean RTs, and the accuracy mean on the critical and the spillover regions

		RC Verb (is/are)		Spillover1 (generally)		Spillover2 (arrogant)		Accuracy	
		M	SD	M	SD	M	SD	M	SD
IC high (n = 12)	L1	959,97	237,48	693,13	232,07	756,83	232,36	9,00	1,56
	L2	959,23	395,39	942,83	397,97	981,33	401,20	7,97	2,20
IC low (n = 12)	L1	1221,20	231,67	776,40	234,41	807,00	232,13	10,00	1,46
	L2	1078,27	409,27	1002,80	404,72	893,30	398,92	8,33	1,69
Non-IC high (n = 12)	L1	1309,27	234,59	787,60	232,39	818,07	235,14	8,00	1,68
	L2	938,30	398,55	1140,67	410,31	963,20	397,14	7,00	2,13
Non-IC low (n = 12)	L1	628,70	234,63	596,90	232,10	608,80	234,05	7,00	2,13
	L2	1026,80	404,20	1020,63	412,16	939,90	393,01	9,97	1,10

Table 3 shows the RTs by condition for the critical region (is/are) and the spillover region1 (generally), spillover region 2 (arrogant) and the

mean accuracy scores for comprehension questions. Mean accuracy scores of the sentences in IC and non-IC conditions show that both groups read the sentences carefully, despite the fact that the L1 group appeared more accurate than the L2 group in both conditions.

Mean RTs in Table 3 show that both L1 and L2 speakers spent longer time on the spillover regions of the RCs which modified low NP in the IC condition. In the non-IC condition, however, while L1 speakers spent longer RTs on the same regions of the RCs which modified high NP, L2 speakers spent longer RTs on RCs which modified low NP.

These findings are consistent with those of the sentence completion and multiple-choice tasks above, which suggests that for both groups, online interpretation of HA is easier than LA in IC condition. In non-IC condition, L1 speakers consistently found LA easier than HA, whereas L2 speakers found HA easier than LA. Figure 2 and 3 below present the distribution of both L1 and L2 speakers' mean RTs on the critical and the spillover regions respectively.

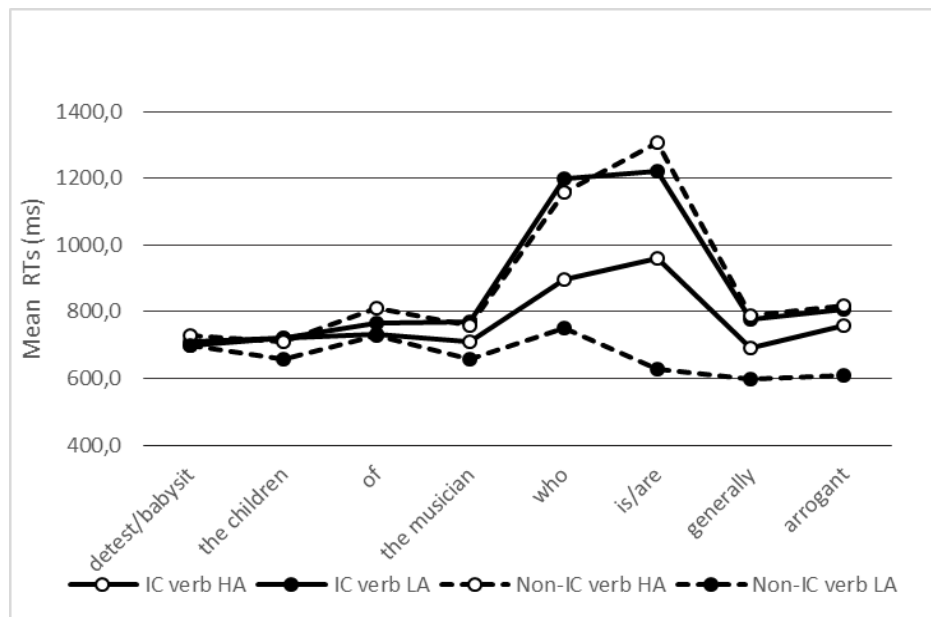


Figure 2. Distribution of L1 group's reading times on the critical and the spillover regions

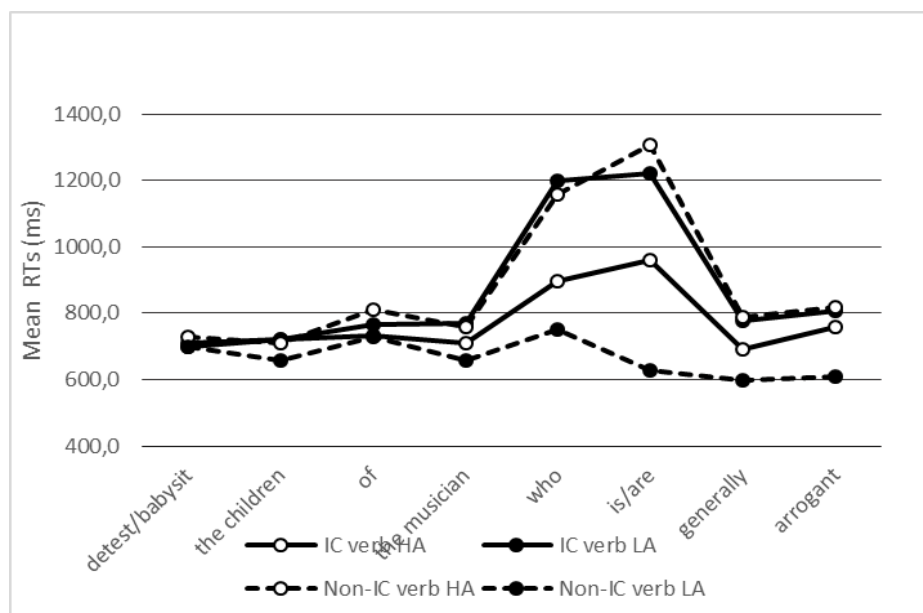


Figure 3. Distribution of L2 group's men RTs on the critical and the spillover regions

We conducted separate 2x2x2 mixed design repeated-measures ANOVAs with verb type (IC and non-IC) and attachment height (low/high) as the repeating within-subject factors and the languages (L1 English and L2 English) as the between-subjects' factors. The results of the subject analysis indicated a main effect of verb type (is/are) ($F(1, 58) = 46.80, p < 0.001, \eta^2 = 0.447$), and a main effect for the attachment-height ($F(1, 58) = 21.32, p < 0.001, \eta^2 = 0.269$) which confirms differences in RTs on critical regions in the two conditions. We also found a significant interaction between verb type and language ($F(1, 58) = 13.71, p < 0.001, \eta^2 = 0.191$); a significant interaction between attachment-height and language ($F(1, 58) = 186.77, p < 0.05, \eta^2 = 0.763$), and a significant interaction between verb-type and attachment-height interaction ($F(1, 58) = 362.35, p < 0.05, \eta^2 = 0.862$). There was also a significant verb-type–attachment-height–language interaction ($F(1, 58) = 318.42, p < 0.05, \eta^2 = 0.846$). However, the difference between L1 and L2 groups in overall RTs on the critical region was not significant ($F(1, 58) = 607.09, p = .725, \eta^2 = 0.002$). To better understand the significant interaction for verb-type–attachment-height–subjects, we conducted separate ANOVAs for the L1 speakers and the L2 groups.

3.3. L1 Speakers

The first 2x2 repeated-measures ANOVA was conducted with the L1 group, with verb-type and attachment-height as the within-subject factors. The results of the subject analyses indicated a main effect for the verb-type ($F(1,29) = 64418.16$, $p < 0.05$, $\eta^2 = 1.000$) and a main effect for the attachment-height ($F(1,29) = 82395.61$, $p < 0.05$, $\eta^2 = 1.000$). Also, there was a significant verb type–attachment-height interaction ($F(1,29) = 486925.10$, $p < 0.05$, $\eta^2 = 1.000$). A pairwise comparison (Bonferroni, 0.05) of the verb-type revealed that the embedded finite verbs (is/are) in the IC conditions took a significantly longer time to read than those in the non-IC conditions. Also, the high-attaching RCs took a significantly longer time to read than the low-attaching RCs. Further analysis of the verb-type–attachment-height interaction revealed that in the IC conditions, the low-attaching RCs took significantly longer RTs, whereas in the non-IC conditions, the high-attaching RCs took significantly longer times. These findings are in line with those of the previous task - the sentence completion task - which showed that L1 speakers prefer high-attaching RCs in the IC condition and low-attaching RCs in the non-IC condition. In other words, the results confirm our predictions regarding short RTs on HA in the IC condition under the influence of the IC verbs and LA in the non-IC condition under the influence of syntactic information during online RC resolution in L1 English.

The second 2x2x2 repeated-measures ANOVA was conducted on the mean RTs for the first spillover region (generally). The results of this analysis indicated a main effect for the verb-type ($F(1,29) = 6746.27$, $p < 0.05$, $\eta^2 = 0.996$) and the attachment-height ($F(1,29) = 4173.15$, $p < 0.05$, $\eta^2 = .993$). There was also a significant verb-type–attachment interaction ($F(1,29) = 58015.18$, $p < 0.05$, $\eta^2 = 1.000$). Pairwise comparisons (Bonferroni, 0.05) of the verb-type and the attachment-height revealed that the L1 speakers spent significantly longer RTs in IC conditions than in non-IC conditions ($p < 0.001$) and that they spent significantly longer RTs on HAs. Further analysis of the verb-type–attachment interaction indicated that the L1 speakers read the LAs more slowly than the HAs in IC conditions ($p < 0.001$), but faster in non-IC conditions ($p < 0.001$).

The third 2x2x2 repeated-measures ANOVA test conducted on the mean RTs for the second spillover region (arrogant) indicated a main effect for the verb-type ($F(1,29) = 8075.88$, $p < 0.05$, $\eta^2 = 0.996$) and the attachment-height ($F(1,29) = 61053.91$, $p < 0.05$, $\eta^2 = 1.000$) and a significant verb-type–attachment interaction ($F(1,29) = 126370.59$, $p < 0.05$,

$\eta^2 = 1.000$). Pairwise comparisons (Bonferroni, 0.05) of the verb-type and the attachment-height showed that IC conditions took significantly longer RTs than non-IC conditions and that the HAs were read more slowly than the LAs. Further analyses of the significant interaction revealed that the L1 speakers read LAs more slowly than HAs in IC conditions but faster in non-IC conditions. All of these findings are consistent those of the previous two tasks above and suggest that during online incremental processing of RC ambiguity attachment, L1 speakers prefer HA in the IC condition and LA in the non-IC condition. These finding confirm L1 English speakers are sensitive to the discourse coherence relations and which enable them to generate expectations that will affect their syntactic attachment decisions.

3.4. L2 Learners

As for the L2 group, the first 2x2x2 repeated measures ANOVA was conducted on the mean RTs of the L2 group on the critical and the spillover regions. The results indicated no main effect for the verb type ($F(1,29) = 2.46$, $p = 0.127$, $\eta^2 = 0.078$), but a significant effect for the attachment-height ($F(1,29) = 20.49$, $p < 0.05$, $\eta^2 = 0.414$). The verb type–attachment-height interaction was not significant ($F(1,29) = 0.358$, $p = 0.555$, $\eta^2 = 0.012$). A pairwise comparison (Bonferroni, 0.05) of the attachment-height indicated that the L2 learners spent longer RTs on the low-attaching RCs in both IC and non-IC conditions. This finding is in line with those of the sentence completion task where L2 speakers had significantly higher HA preferences in both the IC and non-IC condition. In other words, L2 speakers found HA significantly easier than LA in both conditions, which was reflected in their significant shorter RTs on the disambiguating region of the RCs modifying HA.

The second 2x2x2 repeated-measures ANOVA was conducted on the mean RTs for the first spillover region (generally). The results of this analysis indicated a main effect for the verb type ($F(1,29) = 12.07$, $p < 0.05$, $\eta^2 = 0.294$), but not for the attachment-height ($F(1,29) = 0.953$, $p = 0.337$, $\eta^2 = 0.032$). There was a significant verb type–attachment interaction ($F(1,29) = 7.25$, $p = .012$, $\eta^2 = .078$). Pairwise comparison of the verb type revealed that the RTs of the L2 group on the first spillover region of the RCs modifying HA were significantly shorter than those on the same region of the RC modifying LA, in both IC and non-IC condition.

The third 2x2x2 repeated-measures ANOVA conducted on the mean RTs for the second spillover region (arrogant) showed no significant effect for the verb type ($F(1,29) = 0.345$, $p = 0.562$, $\eta^2 = 0.012$) and a marginal

effect for the attachment-height ($F(1, 29) = 3.07$, $p = 0.090$, $\eta^2 = 0.096$), and no significant verb type–attachment interaction ($F(1, 29) = 1.55$, $p = 0.223$, $\eta^2 = 0.051$). Further analysis of the attachment-height indicated that L2 learners spent longer RTs with low-attachments in both IC and non-IC conditions, suggesting that LA reading is more difficult than HA reading in both conditions. These findings are in line with the sentence completion task discussed earlier, which confirms that L2 speakers prefer HA in both offline and online reading of ambiguous RCs in L2 English.

4. DISCUSSION AND CONCLUSION

In this study, we examined whether L1 and L2 English speakers were sensitive to discourse level-cues, in particular IC information of verbs in both online and offline resolution of RC attachment ambiguity in English. The two tasks involved sentences with RC attachment ambiguity in two conditions: IC condition and non-IC condition. In the IC conditions, the main verbs were IC verbs (e.g., John detests the child of the musician who is generally arrogant and rude.), and in the non-IC conditions, they were not (e.g., John babysits the child of the musician who is generally arrogant and rude). Our first hypothesis was that in the IC condition, if both L1 English and L1Turkish/L2 English speakers are sensitive to discourse-level cues, in particular the IC information in the main verbs, which implicitly refer to the direct object as the attachment site, they will prefer HA in both offline and the online resolution of RC attachment ambiguity in English. In the non-IC condition, whereas, in the absence of IC information of the main verbs like babysit, they will prefer LA under the influence of syntactic information.

The findings of the sentence completion indicated that native English speakers preferred HA in the IC condition, and LA in the non-IC condition when they were completing main clauses with RCs. In the IC condition, L1 English speakers' HA preference was in line with the findings of Rohde et al.'s (2011) study, which suggests that L1 speakers utilize IC information encoded into verbs to create expectation for an explanation from an ensuing RC and establish discourse-driven causal/coherence relations between the direct object and the explanation –providing RCs. In the non-IC condition, they used syntactic information reflected in their low-attaching RC completions. These findings support the findings of Rohde et al. (2011), which suggest that L1 English speakers are sensitive to IC information of verbs during the comprehension and production of sentences with RC attachment ambiguity. In other words, using IC information of the main verbs, L1 English speakers can create an expectation for an explanation from the ensuing RC and establish discourse-driven causal relations between the

direct object and the ensuing RC, which results in HA preference in RC resolution.

This effect is more robust in the findings of online self-paced reading. L1 speakers spent significantly longer RTs on the critical region (RC verbs: *is/are*), and the spillover regions in the IC condition, when the ensuing RC forces LA. The similar effect was also observed for the same regions in the non-IC condition when the ensuing RC forces HA. These findings confirm the claim that IC verbs affect L1 speakers' moment-by-moment syntactic processing. The findings observed in all tasks in the IC condition are also in line with predictions of the Referential Theory (Altmann & Steedman, 1988), which predicts immediate integration of pragmatic/discourse information during online L1 sentence processing. Also, these results revealed that an IC verb is a must in establishing a discourse-driven causal relation between the direct object and the explanation-providing RCs.

The finding of LA attachment in all tasks in the non-IC condition, supports the predictions of the Late Closure Principle (Frazier, 1978) and Recency (Gibson et al., 1996), which predict local attachment in RC resolution. To sum up: these findings confirm our first hypothesis regarding L1 RC resolution.

L2 speakers' HA preference in both the IC condition and the non-IC condition in all tasks shows that unlike native English speakers, L2 English speakers are not sensitive to IC information encoded in verbs, which will lead them to create expectations for an explanation from the ensuing RC and establish discourse-coherence relations between the direct object in the main clause and the ensuing RC. In other words, unlike native English speakers, L2 English speakers' HA preference in the IC condition cannot be attributed to the fact that they can use IC verbs to create a discourse-driven coherence relation between the direct object and the ensuing RC, because the same attachment site was also preferred in the non-IC condition, too.

All in all, the difference observed in RC attachment preference in L1 and L2 English speakers' production and comprehension tasks support the findings of the previous studies which suggest that L1 and L2 sentence processing strategies are different (e.g., Felser, Roberts, Marinis & Gross, 2003; Papadopoulou & Clahsen, 2003).

L2 speakers may be not as good as native speakers in using semantic/pragmatic and syntactic information in L2 sentence processing. The reason that underlies L2 speakers' failure in using the syntactic

information in L2 RC attachment resolution involving non-IC verbs can be attributed to the difference in the way RCs are constructed in L1 Turkish and L2 English. Turkish is a head final, non-configurational language in which RCs precede NP heads without using an overt RC pronoun. These findings were explained by the Predicate Proximity Hypothesis (PPH, Gibson et al., 1996), which states “attach as close as possible to the head of a predicate phrase” (p. 42). That means HA (NP1) is preferred in these languages because NP1 is closer to the predicate than LA (NP2).

5. SUMMARY

This study delves into the comparison of sentence processing strategies between L1 and L2 of English in resolving RC attachment ambiguity. The primary objective is to investigate whether L2 speakers can employ pragmatic/discourse-level cues, particularly IC information embedded in verbs, akin to the proficiency of L1 speakers during the resolution of local ambiguities in sentence processing.

The study employs both an online self-paced reading task and an offline sentence completion task to scrutinize the attachment preferences of participants in different conditions with 30 L1 and 30 L2 participants.

In the first part, the focus is on L1 speakers, where the results of the online task confirm that in IC conditions, the critical and spillover regions in high-attaching RCs are read faster than those in low-attaching RCs. Conversely, in non-IC conditions, high-attaching RCs are read more slowly than low-attaching ones. The author concludes that discourse-level expectations can impact online disambiguation in L1 sentence processing. However, in the second part the L2 speakers preferred to attach to the NP1 (high attachment site) in IC and NON-IC conditions.

The discussion and conclusion section presents the findings, indicating that L1 English speakers show attachment preferences in line with previous research, supporting the idea that they are sensitive to IC information in verbs during sentence processing. However, L2 speakers exhibit a strong preference for high attachment in both IC and non-IC conditions, suggesting a potential lack of sensitivity to IC information. The difference observed between L1 and L2 speakers supports previous studies suggesting distinctions in sentence processing strategies between native and non-native speakers. The explanation for L2 speakers' failure to use syntactic information is attributed to differences in RC construction between L1 Turkish and L2 English.

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