Comprehension of subject and object relative clauses in monolingual Turkish children[*]

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1. Introduction

Previous research on the acquisition of relative clauses (RCs) has shown that in many languages RCs are relatively late acquired and in English subject RCs are easier to comprehend and produce than object RCs (e.g., Diessel & Tomasello, 2005 and references therein). In English, this asymmetry has been mostly attributed to the fact that subject RCs follow but object RCs violate the canonical word-order of English. To date, it is unclear whether or not the same picture emerges in Turkish, a typologically different language with an SOV word-order and overt case marking because the findings of previous studies do not seem to converge.

Slobin's (1982) study was the first to investigate the acquisition of RCs in 3-to-4 year old Turkish speaking children. This study was based on a child-parent language corpus elicited from Turkish and American families. Analysis of the frequency of RCs in the two groups showed that American parents and children used RCs more frequently than their Turkish counterparts (96 vs. 49 RCs in American and Turkish children, respectively; 40 vs. 22 RCs in American and Turkish parents, respectively). From the RCs used by Turkish speakers, only 12% were object RCs, and the remaining 88% were subject RCs. This asymmetry between subject and object RCs was in line with the studies on English RCs. To further examine RCs in Turkish children, he also collected experimental data using an act-out task with 4-year-old children. This showed that Turkish children had difficulty comprehending RCs and focused mainly on the canonical SOV sentence structure to act out the sentences.

Ekmekçi (1990) investigated further the acquisition of RCs in 3-to-6 year-old Turkish children using an imitation and a production task. In the imitation task, children were asked to repeat after the experimenter subject and object RCs along with simple sentences with adjectives. This showed a developmental effect; there was a significant correlation between age and success level. In addition, there were differences between the three sentence types; on average, the performance in simple sentences was the highest in all groups and success rate in object RCs was higher than it was in subject RCs at the age of 3, 4, and 5. At the age of 6, the children performed equally well in all sentence types. However, the opposite pattern was observed in the production task as children performed better in subject than in object RCs. Ekmekçi suggested that better performance in object RCs in the imitation task could be due to the similarity in articulation between the past tense morpheme and the object relativizing particle. Alternatively, this dissociation could also be due to inconsistencies in the variable formation. In the examples provided in Ekmekçi's paper, argument structure varied across sentence types. Subject RCs involved intransitive verbs,

whereas object RCs involved transitive verbs. This may have acted as a confounding factor affecting the asymmetry between subject and object RCs.

Özcan (1997) investigated the effect of RC type in combination with the grammatical role of the relativized noun in the main clause, i.e., subject RCs with subject (SS) and object role (OS) in the main clause and object RCs with subject (SO) and object role (OO) in the main clause. This study also compared the comprehension patterns of RCs in younger children (mean age = 3.5 and 5.5) with older children (mean age = 7.6). The results showed a significant effect of age on comprehension; the children's performance increased with age, but there was no significant effect of RC-Type or RC-Role. The hierarchy followed by older children was SS > SO > OS > OO whereas for younger ones it was OO > SO > SS > OS. It was concluded that awareness of RC structure appears as early as 3-year-old and that parallelism in the grammatical roles does not facilitate comprehension.

However, when the success rates in all four sentence types were compared, a striking picture emerged. 3-year-old children had very low accuracy in all conditions, but their highest accuracy was in object RCs with the object role (OO) (66 %). In contrast, 5- and 7-year-old children showed the lowest accuracy in OO RCs (58 % and 66 %, respectively).

Although it is unclear whether or not these differences reached significance level, one explanation for the discrepancy between 3- vs. 5- and 7-year-olds might be that the task demands for 3-year-olds were very high and therefore their performance was in general low. Alternatively, the variation in the performance of the three groups might be related to the variation among test items in terms of structural complexity (e.g., pro-drop, definiteness, or case marking), sentence length, and reversibility. Some items of the study were semantically reversible (i.e., both referents could equally act as an agent or a patient) while others were not (i.e., semantic features of the lexical items made the theta-role assignment obvious), as illustrated in examples (1a)-(1d) below. In (1a), world knowledge makes it clear that 'the man' is the agent and 'the newspaper' is the patient, but in (1b) and (1c) syntactic knowledge is necessary to assign theta roles correctly (examples from Özcan, 1997).

(1)   a. (SS)   Gazete okuyan adam telefona cevap verdi.
                 'The man who was reading the newspaper answered the phone.'
      b. (OS)   Kediyi kovalayan köpeği sevdim.
                 'I stroked the dog which was chasing the cat.'
      c. (OO)   Köpeğin kovaladığı kediyi   kucağıma aldım.
                 'I held the cat which the dog was chasing.'
      d. (SO)   Aradığı oyuncak masanın altında duruyordu.
                 'The toy he was looking for was under the table.'

Kükürt (2004) compared comprehension patterns of 41-to-52 month old children with that of adults with Broca's aphasia using a sentence-picture matching task. Participants were presented with three pictures and asked to choose the one described by the sentence they heard. This study fulfilled conditions regarding felicity, semantic reversibility, and consistency among test items. Both children and Broca's aphasics showed above chance performance in subject RCs (children: 88.2%; Broca's patients: 90.9%) but chance or

below chance performance in object RCs (47.1% and 27.3%). It was hypothesised that the participants may lack the agreement morphology that checks the genitive case as a subject-marker in object RCs. Two strategies (one relating to the word-order and another to case marking) were suggested to account for better performance in subject RCs: Pre-Verbal strategy taking the OV ordering as the canonical order and assigning the pre-verbal NP the patient role; and Acc-Obj strategy that attaches the object role to the NP with accusative case.

More recently, Hermon, Öztürk, and Kornfilt (2007) reported production and comprehension data elicited from monolingual Turkish children. A sentence-referent matching task and an elicitation task were used to test comprehension and production, taking into consideration felicity and semantic reversibility. The results showed that object RCs posed more problems than subject RCs in both modalities, with slightly higher performance in production than comprehension.

The present paper is part of a larger study investigating comprehension, production, and processing of RCs in monolingual Turkish and bilingual Turkish-English children (Özge, in progress). It focuses on the comprehension patterns and grammatical-role assignment strategies among monolingual children in Turkish RCs and it addresses the following research questions:

(i)   Is there a difference between the comprehension of subject vs. object RCs?
(ii)   Does the Acc-obj strategy affect performance in the comprehension of subject and object RCs?

2. Method

2.1 Participants

37 monolingual Turkish children aged 5-8 participated in this study. The children were divided into two groups: younger (16 pre-schoolers) and older children (21 primary-schoolers). All were reported to be neurologically intact with no behavioural, cognitive, or psychological problems, and all children had normal or corrected to normal vision. 21 undergraduate students of Middle East Technical University served as a control group. Turkish was the first language of all participants.

2.2 Materials and Design

Our task consisted of 32 experimental and 28 control items. Two factors were manipulated in the experimental items: relative clause type (RC-Type) and presentation type. In terms of RC-Type, each item was composed of a semantically reversible RC modifying either a subject (Subject RC) or an object (Object RC). With respect to the presentation type, each RC was presented either within an imperative sentence or within a question. All verbs in the experimental items were transitive. Control items consisted of two types: semantically non-reversible subject and object RCs with animate agents and inanimate objects, and subject RCs with intransitive verbs. The presentation type in the control items varied between question and imperative as it did in the test items. Table 1 provides an example for each sentence type.

Table 1. A sample for each sentence type and presentation type from the stimuli

Test Items (# 32)	• 16 semantically reversible subject RCs Ex.: Hangisi tavşanı öpen fare? / Which one is the mouse that is kissing the rabbit. Ex.: Tavşanı öpen ördeği göster. / Show me the duck that is kissing the rabbit. • 16 semantically reversible object RCs Ex.: Hangisi farenin gıdıkladığı tavşan? / Which one is the rabbit the mouse is tickling? Ex.: Ördeğin gıdıkladığı tavşanı göster. / Show me the rabbit the duck is tickling.
Control Items (# 28)	• 8 semantically non-reversible subject RCs Ex.: Hangisi dondurma yiyen çocuk? / Which one is the boy who is eating ice-cream? Ex.: Dondurma yiyen çocuğu göster / Show me the boy who is eating ice-cream. • 8 semantically non-reversible object RCs Ex.: Hangisi çocuğun tuttuğu dondurma? / Which one is the ice-cream the child is holding? Ex.: Çocuğun tutuğu dondurmayı göster. / Show me the ice-cream the child is holding. • 12 intransitive (subject) RCs Ex.: Hangisi uyuyan kuş? / Which one is the bird that is sleeping? Ex.: Uçan kuşu göster. / Show me the bird that is flying.

The variation in the presentation type tested the Acc-Obj strategy. If accusative case provides a cue for the object, then the success rate in object RCs should be higher in imperatives than in questions. This is because in imperatives, the object in the RC is also the object of the main clause and is marked with accusative case, as shown in (2a) below. On the other hand, in questions, the object in the RC is the subject of the main clause and does not have accusative case marking, as shown in (2b) below.

(2)   a. Deve-nin   it-tiğ-i   at-ı   göster.
         Camel-GEN   push-DıK-POSS3SG   horse-ACC   show
         'Show me the horse that the camel is pushing.'
      b. Hangisi   deve-nin   it-tiğ-i   at?
         Which   camel-GEN   push-DıK-POSS3SG   horse
         'Which one is the horse that the camel is pushing?'

Finally, all lexical items in the experiment were controlled for morpheme length, imageability, frequency and age of acquisition[1]. In total, there were 16 animals and 8 action verbs, each one of which was repeated four times throughout the test. To avoid using exactly the same animals and action verbs in more than one sentence, each pair of animals was used with two different actions, and theta roles were reversed. For example, in one picture a rabbit was kissing a mouse, and in another picture a mouse was tickling a rabbit. In addition, we controlled for animal size in order to prevent a bias for bigger animals to be identified as agents.

2.3 Procedure

Participants were orally presented with a sentence accompanied by a picture with three animals involved in an action (e.g., a sheep kicking a cow that is kicking another sheep), and asked to point to the correct animal asked by the sentence (Fig. 1). The correct answer appeared equal number of times on the right, left or in the middle. Possible responses were as follows: choosing the correct animal by assigning correct theta roles, choosing the animal with the reversed theta role (role-reversal), or choosing the wrong animal in the middle. The test was adapted from Flavia Adani's task on the comprehension of Italian RCs, which was based on De Vincenzi (1996).

Each participant was tested individually in a quiet room. The following instruction was read aloud: "You will now see a picture. There will be animals or humans performing some actions. Listen to the sentence I will read aloud and point to the referent I am asking about."
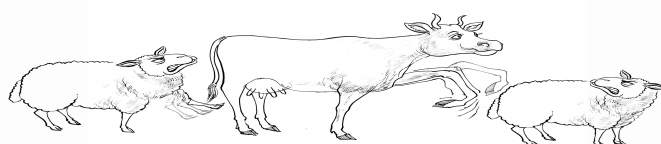

Figure 1: A sample test picture: "Show me the sheep that the cow is kicking"

3. Results

Adults performed at ceiling level for all sentence types, as illustrated in Table 2. Children performed above 98 % in the control items, but there were differences between the four conditions of the experimental items; their performance in object RCs (66.72 %) was lower than in subject RCs (96.45 %).

Table 2. Mean accuracy, standard deviation, and range (in percentage)

		Experimental items		Control items		
		Obj-RC	Sub-RC	Trans-SRC	Trans-ORC	Intrans- SRC
Adults	Mean	96.73	99.11	99.47	100	99.13
[N=21]	SD	17.82	09.42	07.27	0	09.28
	Range	87-100	96-100	88-100	100	90-100
Older	Mean	72.69	96.03	100	100	100
Children	SD	44.62	19.53	0	0	1
[N=19]	Range	5-100	81-100	100	100	100
Younger	Mean	60.29	98.16	98.52	99.26	99.50
Children	SD	49.01	13.41	12.08	08.57	07.00
[N=17]	Range	5-100	87-100	87-100	87-100	91-100

To investigate the effect of RC-Type and Presentation-Type on children's comprehension, a mixed repeated measures ANOVA was conducted with the factors Group (younger, older) as a between subjects factor, RC-Type (Subject, Object) and Presentation Type (Question, Imperative) as within subjects factor. This showed a significant main effect of RC-Type (F $(1, 35)$ = 91.062, p < .001), and a significant interaction between RC-Type and Presentation Type (F $(1, 35)$ = 18.240, p < .001). To find out the source of the interaction, we conducted pair-wise comparisons using the Bonferroni correction. These showed that children performed better in Subject RCs (M = 97.04, SD = 16.95) compared to Object RCs (M = 66.84, SD = 47.11) when they were presented within an imperative (p < .001), and also when they were presented within a question (p < .001). However, in subject RCs, children showed a better performance when RC was introduced in a question (M = 99.67, SD = 2.02) compared to an imperative (M = 93.42, SD = 12.23) (p < .01), but the opposite occurred in object RCs, that is accuracy in object RCs was better when they were presented within an imperative (M = 70.72, SD = 25.54) compared to a question (M = 59.53, SD = 21.83) (p = .001) (Fig. 2).
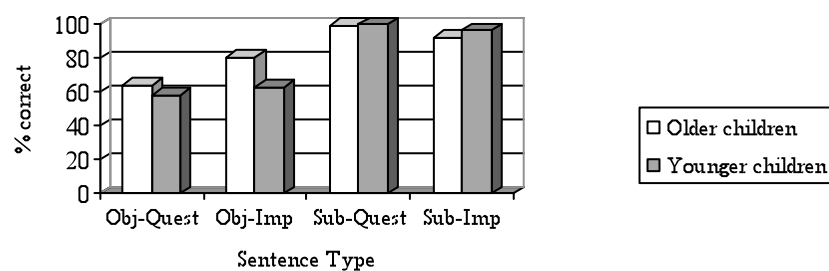
Figure 2: Children's accuracy in the experimental conditions (in percentage)

There was also a significant interaction between Group and RC-Type (F (1, 35) = 6.472, p = .01). Independent samples t-test comparing the two groups in subject and object RCs showed that the difference between two groups was significant only in object RCs (t (35) = 2.192, p = .03). On average, younger children had more difficulty in object RCs (M = 58.98 SD = 21.88) than their older counterparts (M = 72.61, SD = 15.99). Yet, the difference in subject RCs was not significant (t (35) = -1.350, p > 1).   This reveals a developmental pattern for object RCs but not for subject RCs.

Finally, to investigate the types of errors made in each RC type, we conducted a mixed repeated measures ANOVA with the factors Group (younger, older) as a between subjects factor, RC-Type (Subject, Object) and Error Type (Role Reversal, Middle) as within subjects factor. This showed a significant main effect of RC-Type (F (1, 35) = 86.74, p < .001) and Error Type (F (1, 35) = 52.68, p < .001). There was also a significant interaction between RC-Type and Error Type (F (1, 35) = 33.456, p < .01).

To break down this interaction, we performed first pair-wise comparisons between the two error types in subject and object RCs. These showed that for both object and subject RCs there was a significantly larger number of errors in the form of role reversals (object RCs: M = 4.65 SD = 3.25; subject RCs: M = 0.49 SD = 0.83) rather than middle responses (object RCs: M = 0.68 SD = 1.00; subject RCs: M = 0.08 SD = 0.27) (object RCs: t (36) = 6.625, p < .01; subject RCs: t (36) = 3.402, p < .01). Pairwise comparisons between subject and object RCs showed that there were more reversal errors in object RCs (M = 4.65 SD = 3.25) compared to subject RCs (M = 0.49 SD = 0.83) (t (36) = 7.403, p < .01), and the same was true for middle responses (object RCs: M = 0.68 SD = 1.00; subject RCs: M = 0.08 SD = 0.27; t (36) = 3.392, p < .01).

4. Discussion

The results of this study showed that adults reached ceiling level in all RC-types. In addition, all groups showed high performance in the control items, i.e. transitive and intransitive non-reversible RCs, reflecting their ability to use lexical and discourse-related cues to comprehend RCs.

Similarly to English, Turkish children showed lower accuracy in the comprehension of object compared to subject RCs, and there was a developmental effect in object RCs (i.e., accuracy increased with age), but not in subject RCs. This indicates that subject RCs are

fully acquired at an earlier stage than object RCs. These findings are in line with most of the research in the acquisition of Turkish RCs (Slobin, 1986; Özcan, 1997; Kükürt, 2004; and Hermon, et al. 2007; however cf. Ekmekçi, 1990 and part of Özcan, 1997), and provide more solid evidence for the asymmetry between subject and object RCs, which could be accounted for in the following way. [2]

Firstly, subject RCs involve a subject relativizing particle –EN, which appears only in subject RCs. In contrast, object RCs involve the object relativizing particle –DIK which appears also in other structures. Previous research has shown that structures involving one-to-one mappings of form-function are acquired earlier than structures involving one-to-many mappings between form-function (e.g., Grimshaw, 1981). Secondly, the OVS word order in subject RCs is closer to the canonical SOV word order of Turkish; in both structures the object precedes the verb. In contrast, in object RCs the object follows the verb as it has the SVO order. Thirdly, object RCs involve genitive case and possessive-agreement morphology on the relativized verb, whereas there is no agreement relation in subject RCs. Lower accuracy in object RCs may be attributed to difficulties with genitive-possessive agreement morphology (Kükürt, 2004).

A final novel finding regards the impact of presentation type on the comprehension of RCs in children: object RCs showed higher accuracy in imperatives than in questions, whereas subject RCs showed higher accuracy when presented in questions than in imperatives. This is likely to be due to a facilitatory effect of accusative case marking cues or an Acc-Obj Strategy, i.e., the children's knowledge that accusative case unambiguously marks the object in Turkish. This strategy could lead to the correct theta-role assignment in object-RCs presented in imperatives, such as in (3a) below. Here the NP$_{ACC}$ is the object of both the RC and the main clause and is marked with accusative from the main verb 'show'. On the other hand, in object-RCs presented in questions, such as in (3b), the relativized noun, 'horse', is not marked with accusative case. Children may be showing better performance in object RCs presented in the imperative because they make use of the accusative cue unambiguously marking the object. This line of thinking also gains support from longitudinal studies reporting that Turkish children acquire accusative case morphology before the age of two while genitive case is not acquired until the age of five (Aksu-Koç and Slobin, 1985).

(3) a. Deve-nin   it-tiğ-i   at-ı   göster.
        Camel-GEN   push-DIK-POSS3SG   horse-ACC   show
        'Show me the horse that the camel is pushing.'

      b. Hangisi   deve-nin   it-tiğ-i   at?
        Which   camel-GEN   push-DIK-POSS3SG   horse
        'Which one is the horse that the camel is pushing?'

A similar effect was observed in subject RCs. When it is presented in a question, as in (4a) below, there is one NP$_{ACC}$, which is unambiguously the object. On the other hand, when it is presented in the imperative, as shown in (4b) below, there are two NPs marked with accusative case: the first one is the relativized NP and the second one is the NP in the

main clause. Hearing two NPs in the accusative may be putting an extra processing cost and causing a 6% drop in the children's accuracy.

(4)   a. Hangisi   deve-yi   it-en   at?
          Which   camel-ACC   push-YAN   horse
          'Which one is the horse that is kicking the camel?'

       b. Deve-yi   it-en   at-ı   göster.
          Camel-ACC   push-YAN   horse-ACC   show
          'Show me the horse that is pushing the camel'

Here the effect of presentation type provides evidence for possible strategies used by children when they comprehend RCs. In languages with strict word order like English, word-order seems to provide an important cue for theta-role assignment. In agglutinating languages, such as Hungarian (MacWhinney, Pleh, & Bates, 1985), Japanese (Hakuta, 1981), Serbo-Croatian (Slobin & Bever, 1982), and Turkish (Slobin,1986; Kükürt, 2004), case marking and morphological cues seem to facilitate theta role assignment.

5. Conclusion

This study investigated the comprehension of reversible subject and object RCs and non-reversible RCs in 5-to-8 year-old monolingual Turkish children and a control group of adults. Results showed that adults performed at ceiling in all items, but children performed at ceiling only in non-reversible subject and object RCs. Children were more accurate in reversible subject than in object RCs, a finding that is in line with most of previous studies on the acquisition of Turkish RCs, and accuracy in reversible object RCs increased with age. Presentation type interacted with RC type, which is a novel finding. Reversible subject RCs were more accurate in questions than in the imperative, but the opposite pattern was observed with reversible object RCs. This could be attributed to the facilitatory effect of accusative case marking for theta role assignment in Turkish.

Further research combining comprehension with production, and off-line with on-line tasks is required in order to understand better the reasons behind the asymmetry between subject and object RCs in Turkish and the effect of presentation type. These issues are being addressed in Özge (in progress) that provides an in depth study of RC acquisition in monolingual and bilingual Turkish speaking children using variety of off-line and online experiments.

Notes

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1 For frequency and age of acquisition, we used an English database (Bird, et. al., 2001) because there is no such database for Turkish, and also because we aim to collect data from Turkish-English bilingual children.
2 Due to space limitations, we are unable to discuss the implications of the present data in relation to most well-known theories such as Linear Distcance vs. Structural Distance Hypotheses, NVN-schema or Canonical Word Order Hypothesis, Trace Deletion Hypothesis, and Accessibility Hierarcy. See Kükürt (2004), Özge (2007), and Hermon et. al. (2007) for some relevant discussion.

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