

The Acceptability of Resumptive Pronouns in Hebrew

Shira Farby, Gabi Danon, Joel Walters and Michal Ben Shachar

Bar Ilan University

1. Introduction

Hebrew has two types of object relatives. Relative clauses with a wh-trace in the embedded object position (1a; trace-relative), and relative clauses with a pronoun in the embedded object position (1b; RP-relative):

- (1) a. Dina maskima lifgoš et **ha-calemet_i** **še Dan pagaš t_i be-xeyfa**
 Dina agrees to meet the photographer_{i,acc.f} that Dan met t_i in Haifa
- b. Dina maskima lifgoš et **ha-calemet_i** **še Dan pagaš ota_i be-xeyfa**
 Dina agrees to meet the photographer_{i,acc.f} that Dan met her_i in Haifa

Both of these object relatives are considered to be grammatical in Hebrew (Doron, 1982; Shlonsky, 1992). In this paper we ask what is the function of object RPs, particularly positioned so close to the relative head. One syntactic difference between RP-relatives and trace-relatives is in their derivation: trace-relatives are derived by wh-movement, as indicated by their sensitivity to island constraints, making (2a) ungrammatical. Conversely, the RP in object position in (2b) is not restricted by island constraints; thus (2b) is considered to be grammatical, and assumed not to involve wh-movement¹:

- (2) a.* Dan pagaš et [_{NP} ha-calemet_i [_{CP} še ota_i [_{IP} Dina xavera
 Dan met the photographer_{i,acc.f} that her Dina (is) a friend
 šel [_{NP} ha-baxur še makir t_i]]]]
 of the fellow that knows t_i
- b. Dan pagaš et [_{NP} ha-calemet_i [_{CP} še [_{IP} Dina xavera
 Dan met the photographer_{i,acc.f} that Dina (is) a friend
 šel [_{NP} ha- baxur še makir ota_i]]]]
 of the fellow that knows her_i

This analysis of RPs considers them to be used as a last resort strategy, on a par with intrusive pronouns in English (Shlonsky, 1992); nevertheless, it fails to predict the availability of both trace-relatives and RP-relatives in object position in non-islands. This optionality in language has been analyzed as required for non-syntactic purposes (Doron, 1982; Erteschik-Shir, 1992) and also as required for general cognitive reasons (Ariel, 1999; Alexopoulou and Keller, 2002). Our hypothesis is that the syntactic view of RPs as a last resort is inappropriate for object relatives in which the RP appears close

¹ Psycholinguistic research shows that RP-relatives are preferred by speakers whose grammar is impaired/not complete and does not include wh-movement (Friedmann et al., 2008, Varlokosta & Armon Lotem, 1998)

to the head. The view of RPs as a last resort predicts them to be in complementary distribution with traces, and it is supported by studies showing that RPs are processed similarly to personal pronouns (in English). In contrast, we claim that RPs close to the head serve a pragmatic purpose, and that they are processed in a manner similar to traces. In order to examine the characterizations of RP processing, we compare the acceptability of RPs and traces in three environments: close to the relative head, in island environments, and embedded within an additional CP.

2. Accounts for the trace/RP alternation in Hebrew

2.1. Accounts that highlight differences between RPs and traces

We first consider the hypothesis that RPs in Hebrew are used as a last-resort strategy on a par with English (Shlonsky, 1992). This means that when movement is ungrammatical, an RP is inserted to save the dependency from ungrammaticality:

(3) a. The guy who we wondered whether *(he) was sane (Safir, 1986)

b. The book that I wondered whether I would get *(it) in the mail (Kayne, 1983)

This analysis predicts that when movement is grammatical, a trace will be preferred and an RP would be ungrammatical. This prediction is confirmed in Hebrew subject relatives, where a trace is obligatory:

(4) Ha-?iš_i še (*hu_i) ?ohev et rina (Shlonsky, 1992, ex 6)
the man_i that (*he_i) loves Rina.acc

The contrast between Hebrew subject and object relatives can be accounted for by offering two different derivations for object relatives and subject relatives (Borer, 1984). Object traces are derived by movement of the RP followed by its deletion, while subject traces are derived by empty Op movement. This is based on the observation that unlike object RPs, subject RPs cannot be fronted

(5) a. ha-?iš_i še oto_i xana ?amra še dalya ma?amina še kobi pagaš t_i...
the-man_i that him_i Chana said that Dalya believes that Kobi met t_i...
(ibid., 66 b)

b. *ha-?iš_i še hu_i xana ?amra še t_i ?ohev ?arayot (ibid., 66a)
the- man_i that he_i Chana said that t_i loves lions

Thus, the RP in (4) which is ungrammatical in the high subject position is regarded as violating a binding constraint, because in this position they are A-bar bound by an Operator. Similarly, the contrastive view of traces and RPs correctly predicts that when RPs are obligatory, traces are illicit²:

² The ungrammaticality of traces in these relatives is attributed to an ECP violation (Borer, 1984; Shlonsky, 1992).

- (6) a. * Ha-ʔiš_i še rina xoševet al t_i (Shlonsky, 1992 ex 4)
 the man_i that Rina thinks about t_i
 b. Ha-ʔiš_i še rina xoševet al-av_i
 the man_i that Rina thinks about-him_i
- (7) a. * Ha-ʔiš_i še raʔiti et ʔiš_t-t_i (ibid., 5)
 the man_i that saw-1sg wife.acc t_i
 b. Ha-ʔiš_i še raʔiti et ʔiš_t-o_i
 the man_i that saw-1sg wife-his_i.acc

In this view, RPs and traces are in complementary distribution; however, this contrastive view does not predict the optionality of traces and RPs in object relatives. The solution suggested by Shlonsky (1992) is that relative clauses in Hebrew can be introduced by one of two homophonous complementizers (both pronounced *Se*), one selecting trace and the other an RP. Despite the ad-hoc nature of this solution, the analysis Hebrew RPs as a last resort is still pervasive in syntactic theory, mainly because it allows RPs in Hebrew to be analyzed in a manner similar to RPs in other languages. This analysis further predicts that RPs inside islands will improve the acceptability of the sentence (as in (3b)), since RPs (unlike traces) are not subject to island constraints.

This prediction has been tested for English, where RPs are only used as a last resort device, and not in single clause object relatives (Alexopoulou and Keller, 2002 among many others). Furthermore, it has been suggested that RPs can be used to improve the acceptability not only of islands, as in (3) above, but also when the dependency is formed across a long distance (more than 2 CP nodes crossed; Dickey, 1996; Gibson, 1998). The main hypothesis regarding use of RPs is that processing of long distance dependencies is difficult because it creates a heavy memory load. The information associated with the head of the dependency, such as its ϕ -features, is ‘forgotten’ when further embeddings are added. The process of looking for the object position (with the trace) requires keeping this information in working memory; hence, longer distance increases memory load. In this sense, RPs can facilitate the processing of the dependency, because unlike traces they are specified for ϕ -features, and can identify their antecedent by themselves.

Support for this analysis of RPs as facilitators of memory is found in Alexopoulou and Keller (2002). In an experiment using magnitude estimation of the acceptability of long distance dependencies, they measured the acceptability of RPs and traces in different levels of embedding in English, Greek and German. Their results show a similar pattern across these languages, with an opposite distance effect on the

acceptability of traces and RPs. The acceptability of RPs two clauses away from its antecedent (9b) was higher than an RP in an embedded clause (8b); however, for traces the opposite is true, (8a) was more acceptable than (9a):

- (8) a. Who_i does Mary claim [_{CP} that we will fire t_i]? (ibid., 8b)
 b. * Who_i does Mary claim [_{CP} that we will fire him_i]?
- (9) a. ? Who_i does Jane think that Mary claims [_{CP} that we will fire t_i]?(ibid. 8c)
 b. ? Who_i does Jane think that Mary claims [_{CP} that we will fire him_i]?

However, when the RP was used inside an island, it did not facilitate processing; thus, (10b) with a pronoun was not more acceptable than (10a) with a trace:

- (10) a.* Who_i does Mary meet the people [_{CP} that will fire t_i]? (ibid 10a)
 b.* Who_i does Mary meet the people [_{CP} that will fire him_i]?

The authors conclude that some RPs improve the low acceptability of the sentence, if it is a result of processing cost (like distance), but not if it is a result of violating a grammatical constraint, like in (10). Nevertheless, the improved acceptability of an embedded RP-relative supports an analysis of RPs as similar to personal pronouns. In the process of forming a long distance dependency, the wh-phrase is searching for the trace position (embedded object); this search introduced the expected cost for traces: more CP nodes along the way lowered acceptability. However, RPs were not affected by the greater distance, because they do not depend on the process of the wh-phrase searching for the object position; these RPs are parsed by instigating their own search for an antecedent. In this sense, RPs resemble personal pronouns, which are processed by initiating a search for an appropriate antecedent (Bever and McElree, 1988).

Moreover, if RPs are considered to be similar to other pronouns, their role in object relatives can be accounted for by a general theory of reference, like Accessibility Theory (Ariel, 1990). According to this theory, cognitive factors, like memory accessibility, govern the distribution of referring expressions, including traces and RPs. This theory claims that the degree of accessibility of the relative head determines which referring expression will be used in the relativized position (trace/RP). When the head is highly accessible, traces are the default referring expression because they mark a high degree of mental accessibility. In contrast, RPs are used when the relationship between the relative head and the relativized position is looser or more difficult to establish. The degree of accessibility of the relative head is independently predicted by its distance from the relativized position, the complexity of the head-phrase, and the type of relative clause. This hypothesis is supported by the results of a corpus study in Hebrew (Ariel,

1999). Indeed, RPs are attested to be used in island domains by speakers (11), and in embedded positions (12):

(11) Kmo šor [CP še ata yode'a [CP še [CP im hayom hu ole alexa...(ibid. 6)
Like an ox that you know that if today it climes on-you...

(12) ha-makhela še maya šam'a še iddo amar še ?t/hi kibla pras...(ibid. 8b)
The chorus that Maya heard that Iddo said that ?t/ it got a prize...

In both cases the relation between the head and the relativized subject position is relatively difficult to establish; hence, RPs are used by speakers and not traces. The embedded object position is characterized as bearing intermediate degree of accessibility; therefore, in this position accessibility theory predicts variance between traces and RPs. However, the results of the corpus study show that traces are preferred in this position as well. Ariel (1999) suggests that this is the result of grammaticalization processes rather than of accessibility.

Notice that because accessibility is hierarchical, it leads to an important prediction regarding the effect of RPs on acceptability; they are expected to affect acceptability in a graded manner, rather than being grammatical or ungrammatical. Also, in assuming the distribution of RPs to be derived from cognitive principles, this approach predicts similar acceptability patterns cross-linguistically. Therefore, in our study, we examine whether this characterization of RPs is suitable for Hebrew. Unlike English, Hebrew allows RPs in object relatives; therefore, RPs are expected to be acceptable to speakers in embedded and non-embedded object relatives, as well as improve the acceptability of islands.

2.2. Accounts that highlight similarities between RPs and traces

The second hypothesis to be considered here is that Hebrew has an additional RP type which is different from the one used in English (Erteschik-Shir, 1992). This analysis relies on the syntactic similarity of RPs to traces, both being bound from an A-bar position at LF. Despite this similarity, RP-relatives introduce a special interpretation, which is derived from their similarity to personal pronouns. Doron (1982) presents the contrast between trace relatives and RP relatives as a semantic difference. Trace-relatives (13a) have both a de-dicto and a de-re interpretation; in contrast, RP-relatives have only a de-re interpretation:

(13) a. Dani yimca et ha-iša_i še hu mexapes t_i (ibid., 49)
Dani will-find the woman_i that he seeks t_i

b. Dani yimca et ha-iša_i še hu mexapes ota_i (ibid., 50)
Dani will-find the woman_i that he seeks her_i

The interpretation of the relative clause in (13a) is that Dani is looking for a woman, for instance because he wants to get married, and he does not know this woman yet. The reference to the woman is ambiguous: on the de-re reading there is a particular woman that he is looking for, but for the de-dicto reading, it could even be the case that such a woman does not exist. In (13b) the reference is not ambiguous; Dani can only be looking for a specific woman, who is a real woman. This characterization of RPs as referring to a specific individual correctly predicts that RPs will not be used for non-specific antecedents (Sharvit, 1999):

- (14) a. Dani yimca et ma še hu mexapes t_i (ibid., ex 13)
 Dani will-find what that he seeks t_i
 b. ?? Dani yimca ma še hu mexapes oto;
 Dani will-find what that he seeks him_i

On the other hand, RPs are interpreted as bound variables, similar to wh-traces, as illustrated by the availability of a "multiple-individual" reading:

- (15) Ha-iša še kol gever hizmin ota hayta išto (ibid., 3)
 The woman that every man invited her was his-wife

This means that although there is an RP in (15), it is not interpreted as one particular woman, but rather as many women (wives): one for each man.

Along the same lines, Erteschik-Shir (1992) suggests that RPs used close to the head serve a pragmatic function. When the relative clause denotes a set of individuals, an RP will be used to induce reference if the antecedent has special discourse prominence, in contrast to the antecedent of a trace which is not required to be prominent in the discourse. Hence, out of the blue, (16a) is predicted to be preferred by speakers; however, in a context where there are two women, one of whom Nilly loves and another whom she dislikes, (16b) is predicted to be more acceptable. In this context, the contrast is expressed by stressing the verb *love* (*ohevet*):

- (16) a. šošana hi ha-iša_i še nilly ohevet t_i. (ibid. 13a)
 Shoshana is the woman_i that Nilly loves t_i.
 b. šošana hi ha-iša_i še nilly ohevet ota_i.
 Shoshana is the woman_i that Nilly loves her_i.

This means that Focus in the relative clause introduces a set of alternatives, and the RP marks a specific selection of one entity from the focus set; therefore, these are called *restricted focus RPs*. Restricted-focus RPs are characterized as similar to traces, as both are required for grammatical purposes. Erteschik-Shir observes that Hebrew has another type of RPs, which do not require any context dependence. makes no such contribution to the interpretation. These are *distance RPs*, which are similar to the intrusive pronouns

used in English, and are expected to improve the acceptability of islands as well as of deeply embedded traces:

- (17) *šošana hi ha-?iša še dani siper še moše rixel še*
 Shoshana is the woman that Dani told that Moshe gossiped that
nili ohevet ota (ibid., 13b)
 Nili loves her

Erteschik-Shir claims that the contribution of the two types of RPs to interpretation is different: distance RPs are interpreted like traces, in the sense that they do not restrict interpretation; conversely, restricted focus RPs, are interpreted like pronouns, based on the characterization of the interpretation motivated above. However, in contrast to the processing model suggested by Erteschik-Shir, we contend that restricted focus RPs are processed like traces: the search of a head for the object position is satisfied by the RP, because of the special reference they require in a specific context. This processing of RPs is different from other pronouns, and it is derived from their syntactic property as bound from an A-bar position, and interpreted as bound variables at LF.

This account predicts similar processing effects for traces and restricted focus RPs. Therefore, restricted focus RPs are not expected to eliminate island violations, and their acceptability will be adversely affected by an additional embedding. To assure that RPs are interpreted with restricted focus, we presented all relatives following a specific context; therefore, RP-relatives are expected to be as acceptable as trace-relatives in island domains and at a distance, since differences in their interpretations were not assessed.

3. Experiments

We set out to compare the status of traces and RPs and their sensitivity to island and distance manipulations. To this end, we used an acceptability judgment task. Unlike grammaticality judgments, acceptability judgments are graded and not dichotomous. Acceptability judgment has been shown to be correlative with the grammatical status of the structure (Bard et al, 1996), but it reflects processing limitations as well. Therefore, in the experiments we considered processing restrictions which can affect acceptability of RPs in addition to the grammatical predictions. In experiment 1, we measure the effect of the type of referring expression (trace/RP) on acceptability of both object relatives and islands. In experiment 2, we measure the effect of distance (embedding) on the acceptability of traces and RPs in object relatives.

3.1 Experiment 1

This experiment measured the acceptability of traces and RPs in non-island object relative clauses as well as in island domains. Within non-island object relative clauses, both RPs and traces are expected to be acceptable. In the stimulus materials, these clauses were presented following a context; thus, if RPs are preferred for making specific reference, the context is expected to improve their acceptability (Erteschik-Shir, 1992). On the other hand, if the distribution of RPs follows principles of accessibility, the specificity of the antecedent is expected to yield the opposite effect, namely, trace-relatives are expected to be more acceptable (Ariel, 1999). In island domains, the manner of processing makes opposite predictions. If RPs are processed like pronouns, they are not expected to be sensitive to island domains; rather, they are expected to improve acceptability. On the other hand, if they are similar to traces, and require forming an A-bar dependency, then the presence of an island is expected to affect them in a manner similar to traces.

Method

Participants: 40 undergraduates participated in the study as part of the requirements in an introductory Linguistics course. Data from seven participants were excluded, since they were not native speakers of Hebrew (N=33).

Design and materials: Object relative type (non-island / island) and referring expression (trace/RP) were crossed in a 2x2 design (Table 1).

Condition	Example
Non-island, trace-relative	dina maskima lifgoš et ha-calemet še dan pagaš t Dina agrees to meet the photographer that Dan met t be-xeyfa be-mikre. in Haifa by chance.
Non-island, RP-relative	dina maskima lifgoš et ha-calemet še dan pagaš ota Dina agrees to meet the photographer that Dan met her be-xeyfa be-mikre. in Haifa by chance.
Island, trace-relative	dina maskima lifgoš et ha-calemet še ha- xaver Dina agrees to meet the photographer that the friend še pagaš t be-xeyfa nasa le-šam be-mikre. that met t in Haifa went there by chance.
Island, RP-relative	dina maskima lifgoš et ha-calemet še ha- xaver Dina agrees to meet the photographer that the friend še pagaš ota be-xeyfa nasa le-šam be-mikre. that met her in Haifa went there by chance.

Table 1. Conditions and examples experiment 1

Each of the 4 conditions was instantiated by 10 items. The sentences were presented in written format following a short context. Each context was followed by six examples sentences (4 test sentences and 2 fillers). 8 randomized lists were constructed to balance for order effects. The full set of stimuli consisted of 10 contexts and a total of 60 stimulus sentences.

Procedure: Prior to presentation of the stimulus sentences, participants were presented with 10 short written contexts, each introducing one salient entity (see Appendix A for a full example). Each context was then followed by six sentences for evaluation. Participants were asked to read each context carefully, and evaluate the following sentences relative to the specific circumstances introduced in the context. The judgment task was to rate the acceptability of each sentence in the given context on a 5 point numeric rating scale. All sentences contained a restrictive relative clause with a referring expression (trace/RP) referring to one entity by contrastive focus. It took participants around 15-25 minutes to evaluate all sentences.

Results

A 'mixed model' analysis (Anderson, 1958) was conducted to measure the effect of clause type (relative/island) and referring expression (trace/RP) on acceptability. Mean acceptability ratings are presented in Figure 1A, and the distribution of participants' responses is presented in Figure 1B.

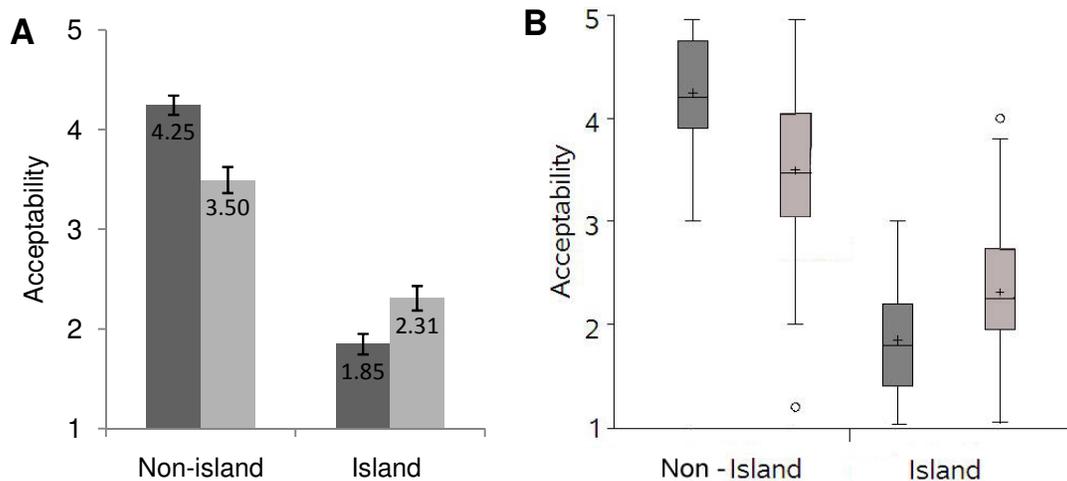


Figure 1. Effect of clause type on the acceptability of traces and pronouns. A. Mean acceptability ratings for traces (light gray) and RPs (dark gray). Error bars denote standard error of the mean. **B.** Distribution of individual acceptability ratings around the mean (marked +) and median (marked as a crossing-line in each box). Whiskers show the range of responses (minimum to maximum), boxes represent the inter-quartile range of responses (25% to 75%).

We found a significant main effect for clause type (non-island / island) on acceptability $F(1,187)=352.6$, $p<0.001$; as expected, islands were rated lower than non-islands. Furthermore, the choice of referring expression has a differential effect on the above clause types, and the interaction of factors is significant $F(1,187)=40.36$, $p<0.001$. Sentences with traces were rated significantly higher than those with pronouns in non-islands $t(187)=5.57$, $p<0.001$ (Tukey-Kramer Adjustment); conversely, inside islands, RPs were rated significantly higher than traces $t(187)=3.41$, $p<0.01$ (Tukey-Kramer Adjustment).

Discussion

Despite the use of preceding context, RPs were rated lower than wh-traces within non-island object relatives. This result contrasts with the prediction of semantic and pragmatic analyses of RPs. Nevertheless, it is possible that acceptability ratings are not sensitive to the different interpretations assigned by the participants to trace-relatives and RP-relatives. Moreover, the mean rating of RP-relatives is relatively high (3.5), in contrast to RPs in a similar position in English, which are unacceptable (Alexopoulou and Keller, 2002). The acceptability of RP-relatives in Hebrew is not predicted by processing accounts, which predict RPs to be used as memory-aides only. On the other hand, such high acceptability of RP-relatives is in line with grammatical analyses which predict them to be as acceptable as trace-relatives (Doron, 1982; Borer, 1984; Shlonsky, 1992; Erteschik-Shir, 1992). The higher acceptability of trace-relatives is predicted by the cognitive principle of accessibility (Ariel, 1999). Since the antecedent of the relativized position is salient in the preceding discourse, making it highly accessible, the highest referring expression on the accessibility hierarchy (trace) is preferred. This means that by looking only at grammatical considerations we get half the picture; processing restrictions should also be taken into account in analyzing linguistic phenomena. Furthermore, by using a gradient measure of judgment, we get a real picture of the preference of speakers for the two object relative alternates.

In clauses with islands, RP-relatives were rated higher than trace-relatives. This improvement is expected by a last resort approach to RPs; however, the results show that the improvement is negligible, as islands with RPs are still rated very low (2.3). The improved rating is predicted by the syntactic approach (Shlonsky, 1992) and the cognitive approach (Ariel, 1999). In an island domain, the antecedent is less accessible, and therefore accessibility theory correctly predicts that the referring expression preferred is an RP and not trace. Nevertheless, the effect of the island domain on the

acceptability of RPs contradicts the view of RPs as a last resort, because the RPs are expected to improve the acceptability of islands, making it grammatical. Therefore, this effect supports the analysis of RPs as similar to traces. The lack of improvement in the acceptability of RPs in islands suggests to us that the effect of island constraints should be extended to include RPs. In attempting to parse an island, the configuration did not allow the wh-phrase to form a dependency, neither with trace nor RP in the object position. These RPs are thus different from distance-RPs, as predicted by Erteschik-Shir (1992).

Taken together, the results of this experiment suggest that RPs are similar to traces in their processing. If these RPs were similar to distance-RPs, which are processed like pronouns, we would expect them to be rated low in object relatives, and high in islands. Conversely, if they are bound by a deleted RP copy in [spec,CP], which needs to find its overt RP in object position (similarly to the search of a wh-Op for a trace), then we expect them to be acceptable in object relatives, and unacceptable in islands.

These results raise the question whether there is a context in which RPs will be more acceptable than traces. One candidate factor is distance (Alexopoulou and Keller, 2002). In experiment 2, we compared traces and RPs at a short and long distance from the relative head, both within the 2CPs limits of working memory (Dickey, 1996; Gibson, 1998). Based on processing studies of RPs in English, it is expected that distance will improve the acceptability of RPs.

3.2 Experiment 2

We compared the acceptability of traces and RPs at two levels of embedding: when the referring expression is in the same CP as the head of the relative clause (1CP) and when it is further embedded (2CPs). The results of experiment 1 show that context does not make RPs more acceptable than traces. Therefore, in this experiment we test the prediction of accessibility theory that distance (embedding) will increase the acceptability of RPs. Embedding of the relative clause makes the antecedent for the referring expression less accessible; therefore, in comparison to the 1CP condition, RPs are expected to be more acceptable in the 2CP condition. This effect has been observed in English (Dickey, 1996; Alexopoulou and Keller, 2002) and is expected to create an even stronger effect in Hebrew, which allows RPs even in non-embedded contexts.

Method

Participants: 107 undergraduates were recruited from EFL classes. Data from 19 participants were excluded since they were not native speakers of Hebrew. Data from another 16 participants were also excluded because they rated ungrammatical sentences higher than grammatical ones. (N=72)

Design and materials: The factors of distance (1CP/2CPs) and referring expression (trace/ RP) were crossed in a 2x2 design (Table 2). Each of the 4 conditions was instantiated by 12 items. The conditions were distributed in a Latin square design, and the sentences were presented following a short context, such that each context was followed by a single stimulus sentence. Each of the 12 lists contained 12 examples for evaluation (4 test and 8 fillers), yielding a total of 144 stimulus sentences.

Condition	Example
1CP, trace	dina maskima lifgoš et ha-calemet še dan pagaš t Dina agrees to meet the photographer that Dan met t be-xeyfa be-mikre. in Haifa by chance.
1CP, RP	dina maskima lifgoš et ha-calemet še dan pagaš ota Dina agrees to meet the photographer that Dan met her be-xeyfa be-mikre. in Haifa by chance.
2CPs, trace	dina maskima lifgoš et ha-calemet še tal siper še Dina agrees to meet the photographer that Tal said that dan pagaš t be-xeyfa be-mikre. Dan met t in Haifa by chance.
2CPs, RP	dina maskima lifgoš et ha-calemet še tal siper še Dina agrees to meet the photographer that Tal said that dan pagaš ota be-xeyfa be-mikre. Dan met her in Haifa by chance.

Table 2. Conditions and examples experiment 2

Procedure: The same contexts used in experiment 1 were employed in this experiment with a new set of participants. Each context was followed by one sentence for evaluation. It took participants about 20 minutes to complete their judgments on a 5 point numeric scale.

Results

A 'non-linear mixed model' (Yang, 2006) analysis was conducted to measure the effect of distance (1CP/2CPs) and choice of referring expression (trace/RP) on acceptability.

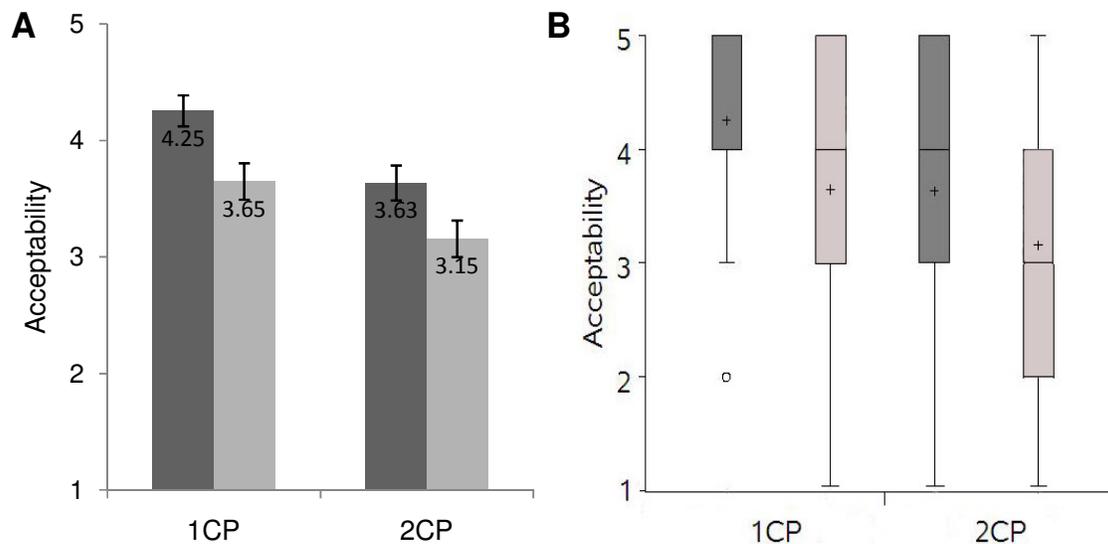


Figure 2. Effect of distance on the acceptability of traces and RPs. **A.** Mean acceptability ratings for traces (light gray) and RPs (dark gray). Error bars denote standard error of the mean. **B.** Distribution of individual acceptability ratings around the mean (marked +) and median (marked as a crossing-line in each box). Whiskers show the range of responses (minimum to maximum), boxes represent the inter-quartile range of responses (25% to 75%).

We found a main effect for distance showing higher acceptability ratings for shorter compared to longer distance, for both traces and RPs ($t_1(71)=4.52$, $p<0.001$). We also found a main effect of referring expression, with traces rated higher than RPs, for both distances ($t_1(71)=-4.29$, $p<0.001$). There was no significant interaction between distance and type of referring expression ($t_1(71)=-1.23$, $p=0.22$)

Discussion

The crucial result of this experiment shows that distant RPs are less acceptable than RPs close to the head. This is unexpected by any processing/cognitive account. Such a negative effect of distance is expected of traces but not of RPs. This result supports our analysis of RP-relatives on a par with traces, and contrasts with an analysis of RPs as pronouns. Studies of pronoun processing found that discourse prominence (for instance topichood) is more crucial than distance (Clifton and Ferreira, 1987). Thus, if RPs are considered similar to pronouns, distance is not predicted to affect their search for an antecedent. We take this result to indicate that Hebrew RPs are different from

English distance-RPs (or intrusive pronouns), because they do not improve acceptability of embedded traces.

A second result is that ICP RP-relatives were rated lower than trace relatives, replicating the results of experiment 1. This result is predicted by the cognitive principle of memory accessibility, as discussed above. Third, embedded traces were rated lower than trace-relatives. The negative effect of distance on the acceptability of traces is expected by the processing model of traces, and supported by the similar results of Alexopoulou and Keller (2002); since the antecedent is further away, processing the dependency induces a memory cost, which lowers acceptability. This effect is not expected from the syntactic properties of relatives, and not predicted by any of the grammatical analyses (Shlonsky, 1992; Borer, 1984). Thus, processing considerations affect the acceptability of sentences in addition to the grammatical rules generating them. Finally, embedded traces were rated higher than embedded RPs. This is again predicted by accessibility theory, because traces are preferred for discourse-salient antecedents. Notice that this result contrasts with the results of Alexopoulou and Keller (2002) for English, where embedded RPs were more acceptable than traces.

4. Conclusion

Relative clauses are generally considered to be derived by *wh*-movement, leaving a trace in the relativized position (Chomsky, 1981). This implies the sensitivity of this structure to grammatical constraints, like islands, on the one hand, and to processing constraints, like embedding, on the other hand. In Hebrew, object relatives can be derived with a *wh*-trace or with an RP. The question we set out to test is why a language should allow these competing derivations, and what the role of RP-relatives is.

We have shown that RP-relatives are in fact more similar to trace-relatives than was initially assumed. Although RPs are not derived grammatically by *wh*-movement, their interpretation as bound variables at LF makes them sensitive to processing constraints which are applied to traces. The results show that in non-islands RP-relatives are less acceptable than trace-relatives, but they are not completely unacceptable. This observation supports the analysis of RPs close to the head as serving a pragmatic role, like restricted focus RPs. Although the effect of context is not clear, the measure of acceptability cannot evaluate the interpretation that speakers assign the RP-relatives; therefore, the lower acceptability does not rule out the possibility that RP-relatives are more appropriate for certain contexts.

By presenting speakers with examples and systematically considering their quantitative ratings, this study complements the theoretical analyses of object relatives, which have assumed the grammaticality of both trace-relatives and RP-relatives. Nevertheless, despite the effect of processing constraints on the performance of native speakers, the results clearly support the hypothesis that RP-relatives serve a grammatical function, and are more similar to traces than to personal pronouns.

5. References

- Anderson, Theodore W. (1958) *Introduction to Multivariate Statistical Analysis*, New York: Wiley.
- Ariel, Mira (1990) *Accessing Noun-Phrase Antecedents*, London: Routledge.
- Ariel, Mira (1999) "Cognitive Universals and Language Conventions: The Case of Resumptive Pronouns", *Studies in Language* 23(2), 217-269.
- Alexopoulou, Theodora and Keller, Frank (2002) "Resumption and locality: a cross-linguistic experimental study", Mary Andronis, Erin Debenport, Anne Pycha, and Keiko Yoshimura (eds.), *Papers from the 38th Meeting of the Chicago Linguistic Society*, Vol. 1, 1–14.
- Bard, Ellen G., Robertson, Dan and Antonella Sorace (1996) "Magnitude Estimation of Linguistic Acceptability", *Language* 72(1), 32–68.
- Bever, Thomas G. and McElree, Brian (1988) "Empty Categories Access Their Antecedents During Comprehension", *Linguistic Inquiry* 19, 34-43.
- Borer, Hagit (1984) "Restrictive Relatives in Modern Hebrew", *Natural Language and Linguistic Theory* 2, 219-260.
- Chomsky (1981) *Lectures on government and binding*, Dordrecht: Foris.
- Clifton, C. and Ferreira F. (1987) "Discourse structure and anaphora; Some experimental Results", in M. Coltheart (ed.), *Attention and performance XX: The Psychology of Reading*, Hillsdale, NJ: Erlbaum, 635-654.
- Dickey, Michael Walsh (1996) "Constraint on the processor and the distribution of presumptive pronouns", *University of Massachusetts Occasional Papers in Linguistics* 19, 157–192.
- Doron, Edit (1982) "On the Syntax and Semantics of Resumptive Pronouns" *Texas Linguistic Forum* 19, 1-48.
- Erteschik-Shir Nomi (1992) "Resumptive Pronouns in Islands" in H. Goodluck and M. Rochemont, (eds.) *Island Constraints: Theory, Acquisition and Processing*, Dordrecht, Kluwer, 89-108.
- Friedmann, N., Novogrodsky, R. Szterman, R. and Preminger, O. (2008) "Resumptive pronouns as a last resort when movement is impaired: Relative clauses in hearing impairment" in S. Armon-Lotem, G. Danon and S. Rothstein, (eds.), *Current Issues in Generative Hebrew Linguistics*, Amsterdam, The Netherlands: John Benjamins, 267–290.
- Gibson, Edward (1998) "Linguistic complexity: Locality of syntactic dependencies", *Cognition* 68, 1–76.
- Kayne, Richard S. (1983) "Connectedness", *Linguistic Inquiry* 14, 223-250.
- Safir, Ken (1986) "Relative clauses in a theory of binding and levels", *Linguistic Inquiry* 17, 663-689.
- Sharvit, Yael (1999) "Resumptive Pronouns in Relative Clauses" *Natural Language and Linguistic Theory* 17, 587-612.

- Shlonsky, Ur (1992) "Resumptive Pronouns as a Last Resort" *Linguistic Inquiry* 23(3), 443-468.
- Varlokosta, Spyridoula and Armon-Lotem, Sharon (1998) "Resumptives and Wh-Movement in the Acquisition of Relative Clauses in Modern Greek and Hebrew", *BUCLD 22*: 737-746.
- Yang, Bin (2006) "Analyzing Ordinal Repeated Measures Data Using SAS", available at: <http://www.lexjansen.com/pharmasug/2006/statisticspharmacokinetics/sp08.pdf>

Appendix A: Example of a context

Tal and Talya meet to discuss a couple getting married: Dan and Dina. Talya, a great friend of the groom, Dan, is telling	טל וטליה נפגשים לשיחה, על זוג חברים שמתחתן: דן ודינה. טליה, חברה טובה של החתן דן, מספרת
Talya: "Dan made some inquiries about photographers in Tel Aviv, but they are all expensive, and sound like film producers. He was so disappointed that he didn't even bother to meet them."	טליה: "דן בירר לגבי כמה צלמים בתל אביב, אבל כולם יקרים ונשמעים יותר כמו מפיקי סרטים. הוא היה כל כך מאוכזב שאפילו לא טרח לפגוש אותם."
Tal Replies: "I heard that there are more moderate agencies, simply not in Tel Aviv. Perhaps (they) should try looking in other places."	עונה טל: "שמעתי שיש משרדי צילום יותר צנועים, פשוט לא בתל אביב. אולי כדאי לחפש גם בעוד מקומות."
Talya: "(It's) funny that you say that, because this is what happened. Two days ago, he visited friends in Haifa, and by coincidence met a photographer who is working there. He went to her studio, and was really impressed with her."	טליה: "מצחיק שאתה אומר, כי זה מה שקרה. לפני יומיים, הוא ביקר חברים בחיפה, ופגש במקרה צלמת שעובדת שם. הוא הלך לסטודיו שלה, וממש התרשם ממנה."
Tal: "(It's) lucky that in Haifa and not in Afula. Do you think Dina will drive to Haifa merely to meet this photographer?"	טל: "מוזל שבחיפה ולא בעפולה. נראה לך שדינה תיסע עד חיפה רק כדי לפגוש את הצלמת הזאת?"
Talya: "Dina actually told me that She's going to meet this photographer, because Dan met with her and not with any of the photographers in Tel Aviv."	טליה: "דינה דווקא אמרה לי שהיא נוסעת לפגוש את הצלמת, בגלל שדן נפגש איתה ולא עם אף צלם בתל אביב."