RESEARCH

No case for Case in locality: Case does not help interpretation when intervention blocks A-bar chains

Naama Friedmann[1], Luigi Rizzi[2,3] and Adriana Belletti[2,3]
[1] Language and Brain Lab, Tel Aviv University, IL
[2] CISCL-DISPOC, University of Siena, IT
[3] Department of Linguistics, University of Geneva, CH
Corresponding author: Naama Friedmann (naamafr@post.tau.ac.il)

We discuss a robust yet at first sight surprising fact: individuals who have problems understanding sentences with object A-bar movement cannot use overt Case marking of the object to interpret these sentences and to associate the DPs with thematic roles. We tested the effect of overt Case marking of the object in typically developing Hebrew-speaking children by comparing their comprehension of *which* object questions with and without the object Case marker *et*, and found that there was no difference in comprehension between the two. A similar pattern was found in an adolescent with syntactic SLI. We then tested the comprehension of object topicalized structures in the order OVS, where the only element identifying these sentences as object-first sentences and distinguishing them from simple SVO sentences was the object marker. We tested this in three populations with object A-bar movement problems: individuals with agrammatism, adolescents with syntactic SLI, and orally-trained children with hearing impairment, as well as in analysis of previous data on typically-developing children acquiring Hebrew. All populations failed to understand the sentence, but did not consistently reverse the thematic roles of the two noun phrases. This suggests that they were sensitive to the presence of the Case marker but could not use it for interpretation. We argue that these findings immediately follow from the way intervention and locality are computed, under the featural Relativized Minimality approach. Case is not among the features triggering movement, therefore a Case difference is not taken into account in trying to build a movement chain across an intervener. As a result, the object chain cannot be built across the intervening subject in the relevant cases, and overt Case marking of the object cannot help rescue the structure. Thematic role assignment in complex movement configurations requires the building of movement chains; if chain formation fails, strategies based on overt morphological cues do not help. These results argue for a feature-selective approach to locality and for encapsulated syntactic computation of movement.

Keywords: language acquisition; aphasia; syntactic SLI; hearing impairment; syntactic impairment; syntax; Case; Wh movement; Hebrew; Relativized Minimality

1 Introduction

It is well known that children encounter difficulties in the comprehension and production of structures like Wh questions and relative clauses in which the object appears before the subject (*e.g., This is the peacock that the farmer chased; which peacock did the farmer chase?* Cf. Sheldon 1974; Tavakolian 1981; Correa 1982; 1995; Hamburger & Crain 1982; Roth 1984; Adams 1990; McKee et al. 1998; de Vincenzi et al. 1999; and more recently, see Belletti 2014; Belletti & Guasti 2015; Friedmann, Belletti & Rizzi 2009, and references therein). Within syntactic theory, the assumption is that in these structures the object moves from its canonical position as the complement of the verb to the beginning of the sentence, crossing the preverbal subject. Following standard terminology, we will refer to

this dependency as an *object A-bar chain*. In previous work we showed that the children's difficulty with these structures depends upon the feature similarity between the moved object and the subject that it crossed. Moreover, we showed that the system is selective in that not all features are relevant for the computation of similarity (Friedmann, Belletti & Rizzi 2009; Belletti et al. 2012; Costa et al. 2014). For example, when the object or the subject is not lexically specified, i.e., does not contain a noun – a property expressed by a nominal/N feature, children understand this structure better than when both the subject and the object are lexically specified. (E.g., they would understand better a question with a bare Wh element like *who* in **who** *did the farmer chase*?, than with a lexically restricted one: **which peacock** *did the farmer chase*?). According to this approach, children experience difficulties in configurations in which the relevant feature specification of the intervening subject is a subset of the specification of the moved object. In contrast, children can compute configurations of disjunction of relevant features.

In the course of the acquisition of syntax in typically developing children, a lexically restricted subject acts as an intervener, blocking the establishment of the object A-bar chain (with lexically restricted objects) in relative clauses and questions. In these structures, the proper assignment of thematic roles to the two noun phrases in the sentence appears to be problematic. We related this intervention effect to a family of intervention effects also found in adult grammars (built on Relativized Minimality, Rizzi 1990; 2004).[1] This generalization may also underlie the difficulty shown in certain syntactically-impaired populations, such as syntactic SLI (Friedmann, Yachini & Szterman 2015).

A natural question to ask is what can assist individuals with such difficulties in the processing of these intervention configurations. Some approaches suggest that any cue bearing on the proper assignment of the thematic roles may be used in the course of sentence comprehension (MacWhinney, Bates & Kliegl 1984; Bates & MacWhinney 1987). A grammar-based approach such as the one we proposed, on the other hand, predicts the effect to be selective (see also Grillo 2008; Guasti, Branchini & Arosio 2012; Contemori & Belletti 2014, and much related work; see also Cecchetto & Donati 2015 for a distinct approach but similar in significant respects). Only certain features participate in the computation of the A-bar dependency, whereas other features are not part of this process, even if they may be relevant at later stages of sentence interpretation. The idea is that the establishment of the dependency is encapsulated and modular, and is only based on the automatic computation of the relevant features. Hence, the prediction is that not all morphologically marked features can be used to help in the processing of the intervention configuration, even if they may be intuitively relevant.

One of the most straightforward morpho-syntactic features to consider in this respect is Case. Because Case typically identifies the object and the subject in languages with overt Case distinctions in many sentence structures, this information could be used to recover grammatical functions, and the thematic roles associated with them (e.g., in a sentence like *He kissed me*, beyond word order, the nominative pronoun designates the agent and the accusative pronoun designates the patient, and the same in more complex sentences derived by movement such as topicalized structure and Wh questions). On the other hand, since Case is not part of the computation of A-bar dependencies, because, as we will argue

---

[1] For the purposes of this article we adopt the following definition of RM: In a configuration like:

$$X… Z… Y$$

A local relation cannot be established between X and Y if
      i   Z structurally intervenes between X and Y
      ii   Z matches the specification of X in relevant morphosyntactic features
where relevant morphosyntactic features are features triggering syntactic movement (see Rizzi 1990; 2004; 2013; Starke 2001; Friedmann, Belletti & Rizzi 2009; Belletti et al. 2012, for different elaborations on the principle).

below, there are no Case-driven A'-dependencies, Case may not be allowed to infiltrate the syntactic process computing the dependency and therefore it cannot help in overcoming the difficulty with intervention configurations and in arriving at the proper interpretation.

This is the central question of this study.

We will address this question through the Hebrew object marker *et* (Berman 1978; Shlonsky 1997; Danon 2001; 2006). *et* is a structural marker of definite direct objects in Hebrew, with characteristics similar to preposition-like differential object markers in other languages (Manzini & Franco 2016, for recent discussion).[2]

2 Experiment 1: Comparison of Hebrew *which* object questions with and without the object Case marker

In order to examine whether children exploit the presence of the object marker to understand object A-bar dependencies, we took advantage of the optionality of *et* marking in *which* questions.[3] In a colloquial register, *et* before the *which* question element can be omitted. We tested the comprehension of *which* object questions with and without *et*. If children use *et* for comprehension, *et*-marked questions should be significantly better understood than *et*-less ones.

2.1 Participants

The participants were 28 kindergarten typically-developing children aged 3;0–6;5. The group included a younger subgroup of 13 children aged 3;0–4;5, and an older subgroup of 15 children aged 4;6–6;5 (in the older group 12 children were aged 4;6–5;10, and three were aged 6;3–6;5). All children were monolingual Hebrew speakers without language impairments.

2.2 Methods

As part of a larger test that included 62 sentences, we included two conditions that allowed us to examine the effect of the presence of the object Case marker on the moved object. We compared *which* questions with the accusative Case marker like (1) with *which* questions without such Case marker like (2). Both questions appeared with the picture pair shown in Figure 1. The test included 11 object *which* questions with the Case marker and 6 object *which* questions without the Case marker. The task was a sentence-picture matching task. Children heard a question and were requested to point to the picture that matched the answer to this question.

(1)   Et   eize   pil   ha-arie martiv?
            ACC which elephant the-lion wets?

(2)   Eize   pil   ha-arie martiv?
            which elephant the-lion wets?

These sentences were compared to a control condition that included 9 subject *which* questions, using the same lexical items and pictures. (*eize pil martiv et ha-arie?* 'which elephant wets ACC the-lion?')

Each child was tested separately in a quiet room at home or in the kindergarten for 20–40 minutes (for the whole test). There was no time limit and the question was repeated as many times as the child requested. The children did not receive feedback that was

---

[2] The preposition-like markers of direct objects like the Hebrew *et* have their own peculiarities; but for the purpose of this paper, we assimilate *et* to an overt expression of Case in other languages.

[3] *Which* questions without *et* of the type we used here are accepted and easily comprehended by Hebrew speakers. For example, in a control group reported by Levy and Friedmann (2009), 10 adolescents with unimpaired language abilities (aged 12–13) performed 98% on the *et*-less *which* object questions.
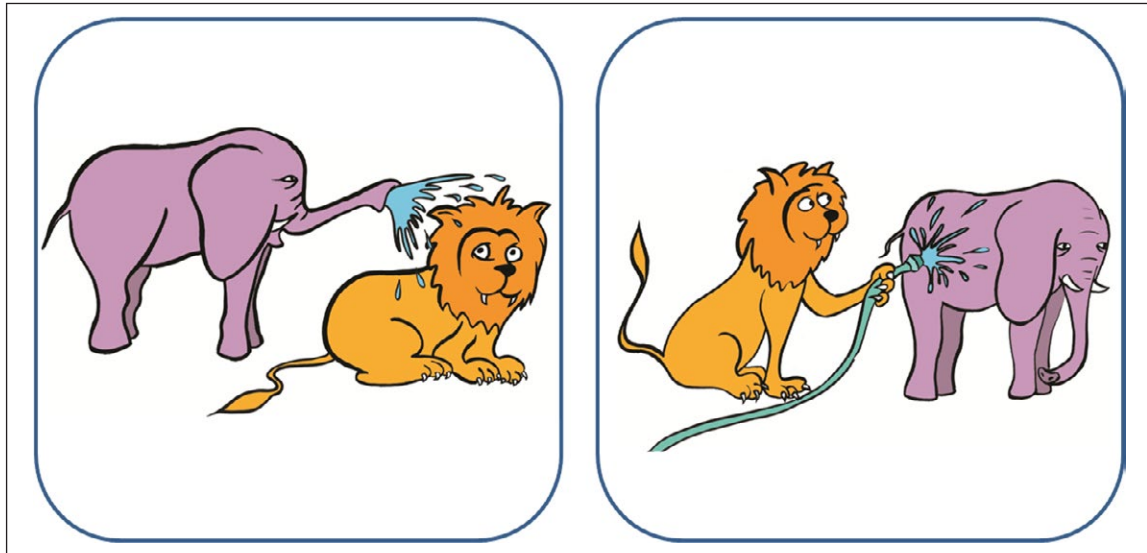
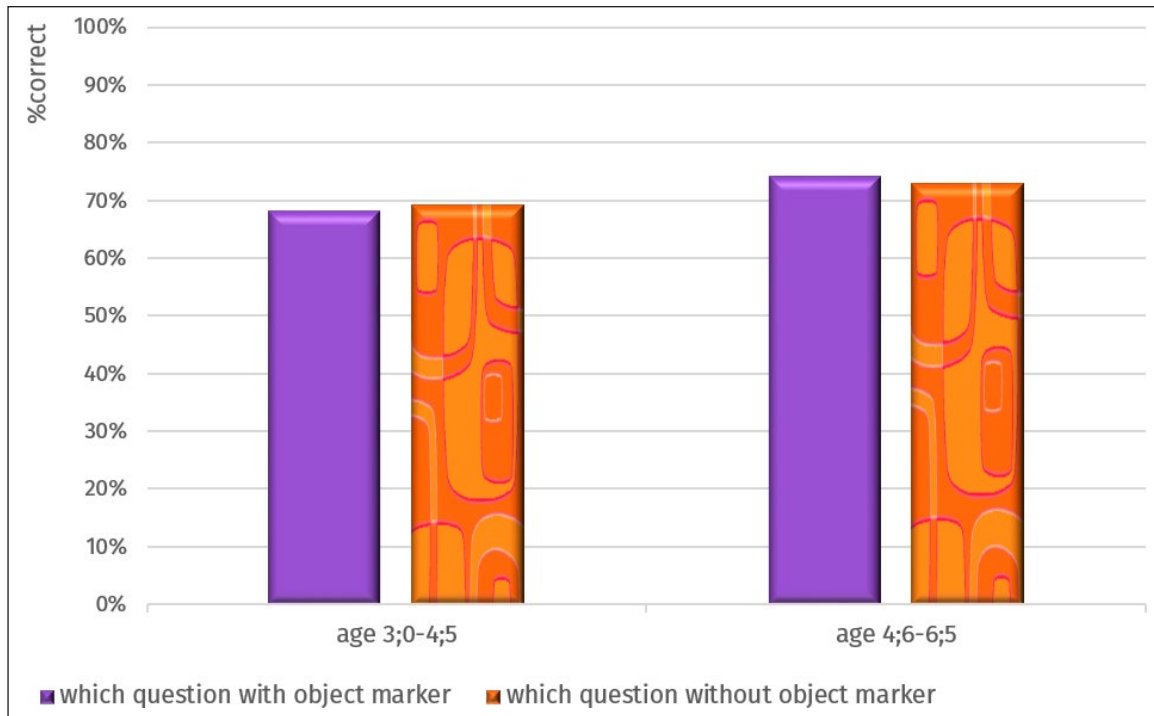**Figure 1:** An example for a picture pair used with questions (1) and (2).

Figure 2: Percentage correct performance on the *which* object questions with and without the object marker *et*.

contingent on whether they answered correctly or not, only general encouragement. All the children received a little gift after the session, to acknowledge their effort.

2.3 Results

The results indicated that the overt Case marking did not help in the interpretation of the *which* questions: as shown in Figure 2, the children found it difficult to interpret both types of questions with respect to the roles of the arguments and hence often pointed to the picture in which the roles were reversed. The two types of questions yielded an average of 71% correct performance, and did not differ significantly: the younger group (aged 3;0–4;5) performed 68% correct on questions without the Case marker (SD = 23%) and 69% correct for questions with the Case marker (SD = 14%),

with no significant difference between questions with and without the case marker, $t(12) = 0.23$, $p = 0.82$. The older group (aged 4;6–6;5) performed slightly better but still without difference between the questions with and without et, with 74% correct for questions without the Case marker (SD = 20%) and 73% correct for questions with the Case marker (SD = 18%), again with no significant difference between the two, $t(14) = 0.31$, $p = 0.76$.

This relatively low performance did not result from difficulty in understanding the task, the lexical items, or the pictures. This can be seen in their very good performance on the parallel subject *which* questions, with the same lexical items and pictures, which was 92.5% correct (M = 88.0%, SD = 12.4% in the younger group; M = 96.3%, SD = 6.9% in the older group). This performance was significantly higher than both the *which* object questions with et, $t(27) = 7.34$, $p < .0001$, d = 2.82; and the *which* object questions without et, $t(27) = 5.64$, $p < .0001$, d = 2.17.

These results, obtained from children without syntactic problems, are consistent with data from previous studies on children with syntactic impairment. Levy and Friedmann (2009) tested Gal, an adolescent with syntactic SLI who had difficulties understanding object relatives, topicalized structures, and *which* object questions. They compared his comprehension of *which* object questions in Hebrew with and without et, and, similarly to our current finding, reported that his performance on both the object questions with et and on the object questions without et was at chance, and there was no significant difference between the two (Levy & Friedmann 2009, Table 6).

The results of Experiment 1 are consistent with the hypothesis that Case is not taken into account in the computation of the object A-bar chain, and therefore, the difference in Case between the two DPs does not relieve the intervention effect. However, the problem with Case could be more basic: it could be that the children of the relevant age groups are not yet sensitive to the presence and properties of the Case marker *et tout court*.

However, there is straightforward evidence that this is not the case and that in fact Hebrew-speaking children do master et from a very early age. The evidence is provided in Reznick and Friedmann (in press), reporting data from sentence repetition and spontaneous production in early ages showing that Hebrew-speaking children use et correctly already in their very first sentences that include a definite object. In sentence repetition of 60 children aged 2;2–3;10, out of 360 target sentences of the orders SVO and Adverb-VSO that included a definite object and therefore included the object marker et, all 360 sentence were repeated with the object marker, and no object marker was omitted. (These children made many other structural errors and omitted other sentence components at this stage, indicating that the repetition task is sensitive to the structures that have not been acquired yet; in this task et was among the structural properties that all of them had already acquired; see also Friedmann & Lavi 2006.) Similarly, Reznick and Friedmann analyzed spontaneous speech data from 56 children aged 1;6 to 6;1. The spontaneous speech also indicated that children use this marker properly, and from very early on: they neither underuse it, nor do they use et in incorrect positions, before a non-object DP or before an indefinite object. Out of 6400 utterances analyzed, there were only 5 instances of et used before an indefinite object, and 4 instances of objects that appeared with the definite article but without et.

3 Experiment 2: Case markers are detected but are not used in thematic role computation – OVS topicalization in syntactically-impaired populations

In Experiment 1 we tested the role of Case in the comprehension of Wh questions, and only in typically developing children who are in the process of acquiring syntax. In Experiment 2 we tested the effect of Case on the comprehension of object topicalization, another structure in which the object precedes the subject. We tested topicalization structures

that involve movement of the object to the beginning of the sentence, into the CP domain, and movement of the verb to second position (Shlonsky & Doron 1992; Shlonsky 1997; Friedmann 2013), ending up with the order *et*-object – verb – subject, OVS. This allowed us to test an A-bar movement structure that is, on the surface, minimally different from the SVO structure. OVS and SVO (as shown in examples (3) and (4) below) only differ in the position of the object case marker *et.*

We also broadened the investigation to other populations who have syntactic impairments: school-aged children with hearing impairment from birth, adults with agrammatic aphasia, and adolescents with syntactic SLI. All three populations show difficulties in the comprehension and production of structures that involve A-bar movement, although not necessarily of the same type as the one witnessed in children acquiring language (Grodzinsky 1989; 2000; Friedmann 2001; 2006; Friedmann, Gvion & Novogrodsky 2006; Szterman & Friedmann 2006; 2011; Friedmann, Szterman & Haddad-Hanna 2010; Friedmann & Haddad-Hanna 2014). However, like the typically-developing children, all three populations fail to establish A-bar chains. Therefore, it is interesting to examine whether, once they fail to establish the object chain, they can use Case information to interpret the sentence.

For the topicalization comprehension assessment in the three populations reported below we used the sentence-picture matching task described in Experiment 1, this time with topicalized OVS sentences (see example (3)) compared with simple SVO sentences (example (4)), both presented with the picture shown in Figure 1.

(3)   object topicalization with V-to-C (et-O V S)
          Et   ha pil   ha-ze   martiv   ha-arie.
          ACC the-elephant the-this wets   the-lion
          'This elephant, the lion wets.

(4)   simple SVO (S V et-O)
           Ha-arie martiv et ha-pil   ha-ze.
           the-lion wets ACC the-elephant the-this
           'The lion wets this elephant.'

The two main questions that this experiment asked were a) whether the participants understand OVS sentences and b) whether, when they fail to understand these sentences, they perform below chance level. The rationale here was that if the participants are not sensitive to the presence of the marker *et*, we would expect OVS sentences to be interpreted with reversed thematic roles, as SVO. This consistent reversal would manifest itself as below-chance performance.

3.1 Hearing impairment

Many children with hearing impairment show syntactic difficulties in the comprehension and production of Wh movement structures (Quigley, Smith & Wilbur 1974; Quigley, Wilbur & Montanelli 1974; de Villiers 1988; de villiers et al 1994; Berent 1996; Friedmann & Szterman 2006; 2011; Friedmann & Haddad-Hanna 2014). This probably results from the fact that they did not receive enough language input during the first year of life, as this difficulty mainly characterises those hearing impaired children who received hearing devices late and did not use sign language. Therefore this is a population that is relevant for examining the effect of Case on comprehension.

3.1.1 Participants

The participants were 18 children with hearing impairment from birth who had hearing aids or cochlear implants fitted only after they were 8 months old. All of them commu-

Hearing impaired participant	Topicalization OVS	Simple SVO
AD	15	20
SA	1	20
XA	6	20
YU	10	20
MO	20	19
AL	8	19
OD	17	20
SK	0	20
SI	10	19
LI	17	20
IN	18	18
DV	10	20
MR	17	20
DA	12	20
GA	14	19
MA	18	20
MK	13	19
DM	12	20
Number of participants who performed significantly poorer on OVS than on SVO	12	–
Number of participants at or above chance	16	18
Number of participants below chance	2	0

Table 1: Correct performance out of 20 sentences in each condition, per each of the 18 participants with hearing impairment.

nicated in Hebrew, and did not use sign language. They were aged 8;11–11;3 when we tested them.[4] Each of these participants had difficulties in the comprehension and production of sentences derived by A-bar movement: object relative clauses and *which* object questions (Friedmann & Szterman 2006; 2011; Szterman & Friedmann 2014).

3.1.2 Results

The results, summarized in Table 1, indicated that the children with hearing impairment performed relatively poorly on the topicalized OVS sentences (M = 60.6%), performance that was significantly below their performance on the SVO sentences (which was M = 98.1%), ($t(17) = 5.39$, $p < .0001$), yet almost none of them performed below chance on these structures (16 out of the 18 participants were not below chance). This indicates that the children with hearing impairment were sensitive to the presence of the object marker, otherwise they would have interpreted the OVS structures as SVO with systematic below-chance performance. The finding that they performed at chance thus indicates that the Case information was detected, but did not help the children to build the appropriate dependency and hence to properly comprehend the structures.

3.2 Agrammatic aphasia

We ran the same task with seven adults who had agrammatic aphasia following brain damage. They were 5 men and 2 women, aged 18–67 (for more background details see Appendix A). They were all native speakers of Hebrew. They were diagnosed with agram-

---

[4] These children were tested by Ronit Szterman as part of her MA and PhD studies, and are described in detail in Szterman (2003; 2016).

Agrammatic participant	Topicalization OVS	Simple SVO
LH	44% (11/25)	88% (22/25)
AL	58% (15/26)	100% (33/33)
SZ	46% (12/26)	80% (20/25)
GR	35% (9/26)	95% (20/21)
RN	52% (26/50)	90% (45/50)
AE	40% (6/15)	80% (12/15)
RA	61% (11/18)	100% (26/26)

Table 2: Percentage correct performance (and number correct responses out of total number of sentences in each condition), for each participant with agrammatic aphasia.

matic aphasia by experienced speech-language pathologists and a neurolinguist, on the basis of the Hebrew versions of the Western Aphasia Battery (WAB; Kertesz 1982; Hebrew version by Soroker 1997) and the Psycholinguistic Assessments of Language Processing in Aphasia (PALPA; Kay, Lesser & Coltheart 1992; Hebrew version by Gil & Edelstein 2001). The analysis of their spontaneous speech as well as their performance on an extensive test battery of syntactic abilities in production (BAFLA; Friedmann 1998) indicated that they all had characteristic agrammatic speech. They had ungrammatical production of complex sentences and Wh-questions, no ability to produce embedded sentences and relative clauses, and no ability to produce subject and object questions and subject- and object relatives. The design was the same as above, but the pictures were black and white, and the number of items was larger, and slightly varied between participants (between 30 and 100 sentences) according to how many sessions we could have with each of them, and how long they were able to sit with us in each session.

3.2.1 Results

The results of the agrammatic patients show exactly the same pattern as the one just reported for the hearing impaired children: the agrammatic participants performed poorly on the topicalized OVS sentences (M = 47.9%), performance that was significantly below their performance on the SVO sentences (M = 90.5%), ($t(6)$ = 13.06, p < .0001); yet, none of them performed below chance on these structures (GR was close to below-chance level, but not significantly different from chance using binomial test). Once again, this shows sensitivity to the presence of the Case marker on the object, but inability to use this morphological indication to properly interpret the sentence. Table 2 summarizes the performance of the individuals with agrammatism on these two structures. These data are in line with Friedmann and Shapiro's (2003) study on agrammatic aphasia where the patients showed difficulty in the interpretation of OVS and still they were not below chance. (See a discussion of this point in Friedmann & Shapiro 2003: 294.)

3.3 Syntactic SLI
3.3.1 Participants

The third syntactically-impaired population we tested were adolescents with developmental syntactic impairment, syntactic SLI. The participants were three girls aged 11;7–12;1, all in 6th grade, all native speakers of Hebrew. They complained about difficulties in school and their teachers and parents reported "reading comprehension difficulties" in texts. One of them also commented that when someone explains something, all her friends understand and she does not. We ran an extensive battery of syntactic comprehension and production (BAMBI; Friedmann & Novogrodsky 2002), where it became evident that each of these girls fails to produce object relatives, fails to understand object

Participant with syntactic SLI	Topicalization OVS	Simple SVO
SR	10/18	11/11
SN	5/10	10/10
DG	9/16	10/10

Table 3: Correct performance per each of the three girls with syntactic SLI.
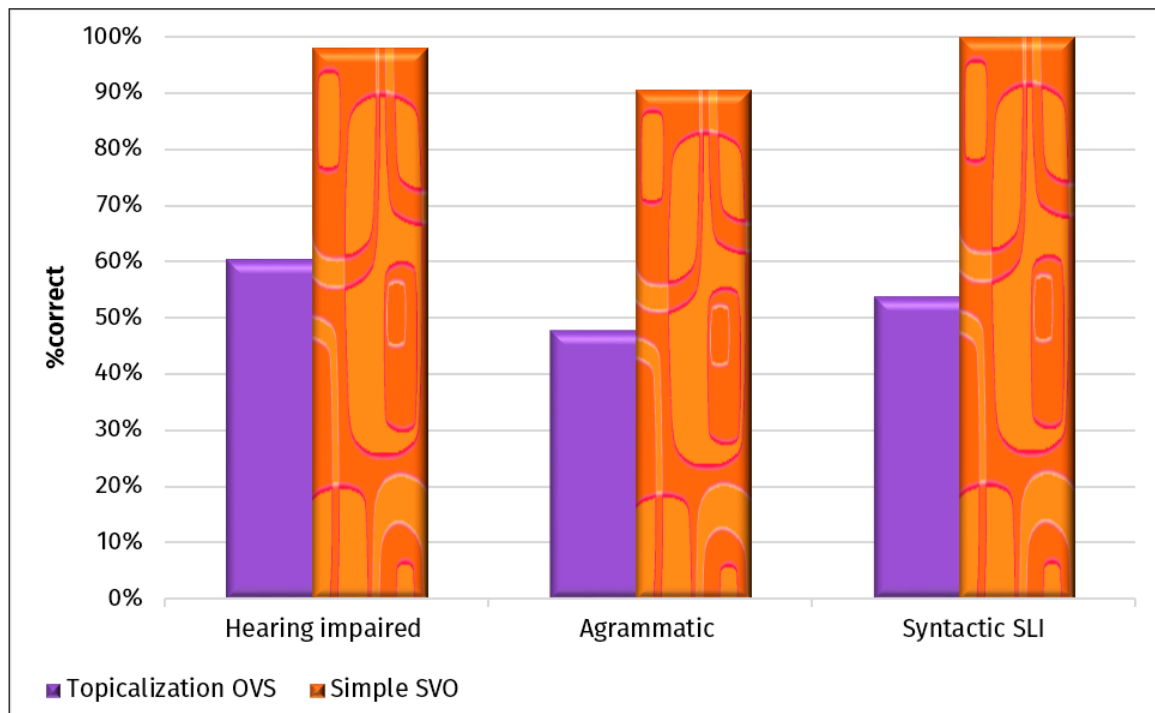

Figure 3: Percentage correct performance on the object topicalized OVS sentences and the simple SVO sentences in the three syntactically-impaired populations in Experiment 2.

relative clauses and *which* object questions in tasks of sentence-picture matching as well as oral and written sentence paraphrasing), and finds it difficult to repeat sentences derived by Wh-movement.

3.3.2 Results

The results, summarized in Table 3, indicated that the adolescents with syntactic SLI performed poorly on the topicalized OVS sentences (50–56.3% correct, M = 53.9%), and significantly below their performance on the SVO sentences (which was 100% correct for all of them), for each of the participants, $\chi^2 > 5.98$, $p < = .01$, yet none of them performed below chance on these structures (using binomial test). This indicates that the adolescents with syntactic SLI, like the other A-bar impaired populations, were sensitive to the presence of the object marker but could not use it for comprehension (see a summary of the performance of all three populations with syntactic impairment in Figure 3).

3.4 Typically-developing children (Biran & Ruigendijk 2015)

Overall, our results share similarity to those presented in a recent study by Biran and Ruigendijk (2015) for typically developing children. Biran and Ruigendijk tested the comprehension of OVS topicalized sentences in Hebrew-speaking children aged 3–6 years. They found, similar to our results on the impaired populations, that the children performed 50% correct on these sentences. Namely, the group performed at chance (see their Table 4 on page 227). In an analysis of Biran and Ruigendijk's individual data that they

kindly allowed us to use, this held also for the individual participants: almost none of the children (only 2 of 34 children aged 3;0–6;0) performed below chance on these sentences. This indicates, again, that the children were sensitive to the presence of the object marker so that they did not interpret the sentence as SVO, reversing the thematic roles.

3.5 Possible implications for treatment

In conclusion, as we showed for various structures and various populations, the presence of *et* is not exploited for the proper assignment of thematic roles as the A-bar object chain is not properly constructed. It would be interesting to explore the possibility of explicitly teaching individuals with A-bar impairment to pay attention to presence of the object marker so that when they fail to understand the sentence on the basis of the syntactic computation, they can use the object marker as an external indication to identify the object. In this way, even if the interpretation does not come out automatically, because their ability to construct the A-bar movement chain is impaired, still they would be able to figure out the roles of the arguments in the sentence.

4 Discussion

The data from language acquisition as well as from three different populations with syntactic impairments indicate that overt Case marking of the object does not help individuals who have difficulties in understanding object A-bar dependencies. Even when Case is overtly marked on the object, as with Hebrew *et*, they still find it difficult to associate the proper thematic roles with the two noun phrases, and therefore, they do not understand these sentences. In Experiment 1 we tested young children's comprehension of object *Which* questions with and without the object Case marking, at a stage in which they still fail to understand these questions. We found that the presence of the Case marker did not improve comprehension of these questions. We found the same pattern also in a previous study of an adolescent with syntactic SLI who failed to understand sentences with object A-bar dependencies, where Levy and Friedmann (2009) reported that his comprehension of object Wh questions with and without object marker was identical. In Experiment 2, we tested the comprehension of object topicalized sentences in the order OVS in three populations with impairment in object A-bar dependencies, object relatives, Wh-questions, and topicalization structures: individuals with agrammatic aphasia, adolescents with syntactic SLI, and orally-trained children with hearing impairment. We found that these individuals failed to understand the sentences with object topicalization, but did not perform below chance on these structures, indicating that they were sensitive to the presence of the object marker, but could not use it for sentence interpretation. A similar pattern was found in our analysis of data from Biran and Ruigendijk (2015) on typically developing Hebrew-speaking children: the children failed to understand OVS sentences but did not consistently reverse the interpretation.

  These results bear on the general issue of what causes the difficulty with object A'-dependencies in children and syntactically-impaired populations. An intuitive characterization of the problem would be that the difficulty arises from the similarity of the moved object and of the intervening subject in the complex configuration created by movement: the more similar they are, the harder the structure. However, much recent work (see Introduction) suggests that this intuitive idea should be qualified. Not all kinds of similarity make these configurations harder and not all kinds of dissimilarity make them easier: the effect is selective and mediated by the grammar. In this article we have addressed the potential role of Case (dis)similarity.

  In contrast to the expectation of general cue-based accounts, even though Case could count as a straightforward cue for identifying the object, hence differentiating it from the subject and thus helping in the assignment of the thematic roles to the noun phrases in

the sentence, our results clearly indicate that this is not what happens. This is in line with results from previous studies in Romanian and German. Romanian has the object marker *pe*, which is roughly of the same kind as the Hebrew *et*. Bentea (2016) was able to show that *pe* is not used to improve the comprehension of object relatives with a preverbal subject in the relative clause: 4;0–6;10 year old Romanian-speaking children performed 60% correct on such object relatives with *pe*, and 57% correct on the parallel structures without *pe* (Bentea 2016: 80).[5] This is parallel to the results of Experiment 1 presented here for Hebrew. In German, Biran and Ruigendijk (2015) have shown that Case morphology does not help in the comprehension of *which* object questions. They tested children's comprehension of German object questions, which display the order 'Object-ACC Verb Subject-NOM', so that only the Case marking on the DPs indicates that the structure is an object, rather than a subject, question (the two DPs matched in number): children aged 3–6 years were only 51% correct on these questions. Namely, similar to our results, they were sensitive to the presence of Case marking, as is shown by the fact that they did not perform below chance, but could not use Case for the proper assignment of thematic roles.

We suggest, in line with the grammar-based approach we assume here, that because Case is not part of the computation of A-bar dependencies, Case distinctions cannot be taken into account in mitigating and eventually overcoming the difficulty with locality caused by intervention of a lexically restricted subject. The difference in Case could have made the two DPs different, and could have relieved intervention had Case been a feature that enters the computation of similarity. However, Case is not a relevant feature, so that Case dissimilarity cannot relieve intervention. Consequently, the children and the syntactically impaired populations analyzed cannot establish the object dependency chain, and therefore cannot properly interpret the structure.

But why aren't Case distinctions relevant, especially given that they could provide a straightforward way to identify the object and hence, its theme role? The idea is that only features that are attractors of phrasal movement are used in the computation of intervention, and hence only these features can be used to overcome locality violations. Case, however, is not an attracting feature for movement. In standard minimalist analyses, Case does play a role in making the goal active and available to be attracted to the subject position. This is the situation in sentences with passives, unaccusatives, and in raising structures, and more generally, in the raising of the external argument to the EPP position. Importantly, however, in the A-system, Case participates in the attraction only as a property of the goal (it makes the goal active; Chomsky 1995; 2000), but it is not a property of the attracting probe. This is the technical implementation of the straightforward observation that Case is a property of the nominal system, not of the finite verbal inflection system. We suggest that what determines if a feature is relevant for the computation of intervention is that this feature can operate as attractor on the probe. This is what distinguishes Case, for example, from phi features: whereas Case is only a property of the goal, phi features are active on the probe and trigger movement from there.[6]

That Case is not a feature that participates in attraction in A-bar movement is directly suggested by the fact that cross-linguistically there are no movement processes to the left periphery affecting either only accusative-Case marked or only nominative-Case-marked phrases, and there are no positions in the left periphery that attract only a certain Case-bearing element. E.g., we do not see left peripheral positions that only host

---

[5] These percentages are based on a calculation of the results done the same way we did, through picture selection. These Romanian structures are immediately comparable to the Wh-object questions analyzed for Hebrew in Experiment 1, which also involve a preverbal subject. On the role of Case in Romanian object relatives with a post-verbal subject see Bentea (2016).

[6] This is precisely the status of the gender feature in Hebrew, which was found to alleviate intervention effects in the comprehension of object relatives (Belletti et al. 2012).
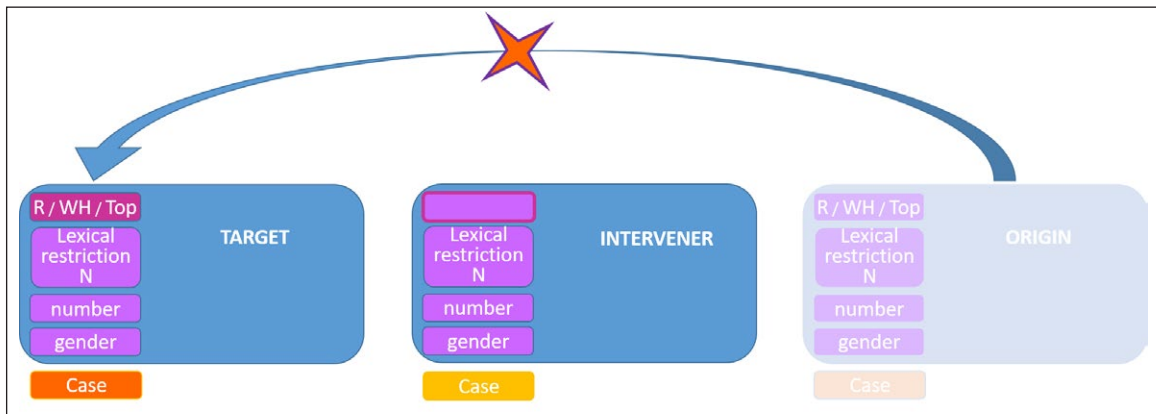
Figure 4: Only the features attracting movement, listed within the blue boxes, are taken into account in the computation of the A-bar moved object chain.

accusative-Case-marked phrases and other positions that only host nominatives. Case, in this respect, differs from other morphosyntactic specifications such as the presence of a lexical restriction, for example, which modulates the landing sites of Wh-movement (Munaro 1999; Friedmann, Belletti & Rizzi 2009).

A grammatical approach to intervention based on Relativized Minimality is inherently selective, in that it leads one to expect that only the morphosyntactic features participating in the local relation under scrutiny will be taken into account in the computation of locality. Because a movement relation is involved in the structures we examined, only features triggering movement are expected to be taken into account, see the structure in (5) and Figure 4.

(5)　　　Wh-Acc/Object marker ………..DP(Nom) …………. < Wh-Acc/Object marker >

Because Case is not an attracting feature (on any probe), it should not be part of the computation of locality in A-bar movement. Consequently, Case cannot relieve intervention. Once the construction of the object A-bar movement chain is blocked, a thematic role cannot be syntactically assigned to an element in the left periphery. Importantly, in a grammar-based account, it is natural to assume that the construction of the dependency is a pre-requisite for the assignment of the thematic role to the moved elements. Therefore, an element in the left periphery not connected by a well-formed movement chain to a clause-internal thematic position cannot receive a thematic role. If the pre-requisite has not been met, no overt morphological information can be of help any longer. The sharp featural selectivity is thus a characteristic of the grammar-based approach adopted here, distinguishing it from similarity-based approaches assuming a less structured, grammatically unqualified, notion of similarity. For elaboration on this point see Belletti and Rizzi (2013).[7,8]

---

[7] A-bar object chains can be properly constructed also across an intervening lexically restricted subject by unimpaired adults. Our approach is compatible with the possibility that, for adults, overt Case marking of the object could facilitate the parsing of object A-bar dependencies. This has been shown to happen for instance in the disambiguation by Case of object Wh-questions in German speaking adults (Meng & Bader 2000). In the approach we have presented here, once the intervention configuration is properly mastered, and hence the object A-bar chain is constructed, the necessary prerequisite to interpret the sentence is met. It is consistent with our approach that other overt indications (including Case) be used to optimize the interpretation of the sentence with the association of the correct role to the different nominal arguments.

[8] The underlying difficulty in understanding sentences with object A-bar chains may be different in the different populations we tested. Current evidence suggests that whereas TD children, as well as children with syntactic SLI may be subject to intervention due to immature feature calculation (see Friedmann, Belletti &

The finding that young children, as well as individuals with hearing impairment, individuals with agrammatism, and children with Syntactic SLI, do not exploit the presence of the Case marker for interpretation although this could be an easy way for them to understand the sentence, joins other overt indications for interpretation that they could resort to, but don't. Another such example comes from object relatives and Wh questions where the object crosses the preverbal subject. In principle, in these structures they could identify the subject through its position adjacent to the verb, therefore receiving its role directly from the verb. In this situation they could use their knowledge of the verb argument structure, and once the subject is identified as the agent, they could infer that the thematic role of the other argument is the remaining role, the theme. However, these populations do not use this kind of inference. We suggest that this is another instantiation of a strategy that cannot be made appeal to once the object chain cannot anyway be constructed. Namely, comprehension that has failed due to a violation of locality cannot be rescued by inferential reasoning.

The evidence presented in this article and the interpretation just developed are in line with the general viewpoint according to which the computation of syntactic dependencies is modular, automatic, encapsulated and selectively guided by relevant morphosyntactic features.

Abbreviations
ACC = accusative, CP = complementizer phrase, EPP = *Extended Projection Principle,* NOM = nominative, OVS = object-verb-subject, SD = standard deviation, SLI = Specific Language Impairment, SVO = subject-verb-object.

Additional Files
The additional files for this article can be found as follows:

- **Additional file 1**: Main demographic characteristics of the individuals with agrammatism. http://doi.org/10.5334/gjgl.165.s1

Competing Interests
The authors have no competing interests to declare.

Rizzi 2009; Friedmann, Yachini & Szterman 2015), individuals with agrammatic aphasia may fail to construct the chain because of a deficit in building the syntactic tree up to CP (Friedmann & Grodzinsky 1997; Friedmann 2001; 2006), over and above whatever intervention problems may be found in this particular population. Children with hearing impairment may form a heterogeneous group, with some children having a deficit in Wh-movement, like SLI children, and others with a tree-building deficit that is similar to that seen in agrammatism (Szterman & Friedmann 2014; 2015), for this population too, it might be that the CP deficit occur in addition to an intervention deficit. Our suggestion regarding Case not being part of feature calculation is therefore more directly relevant to TD and SySLI children, whose deficit may exclusively lie in feature calculation and locality; instead, the idea that morphological cues cannot be used for the assignment of thematic roles when the building of a well-formed chain is impaired is relevant to all four populations.

References

Adams, Catherine. 1990. Syntactic comprehension in children with expressive language impairment. *British Journal of Disorders of Communication* 25. 149–171. DOI: http://dx.doi.org/10.3109/13682829009011971

Bates, Elizabeth & Brian MacWhinney. 1987. Competition, variation, and language learning. In Brian MacWhinney (ed.), *Mechanisms of language acquisition*. Hillsdale, NJ: Erlbaum.

Belletti, Adriana. 2014. Notes on passive object relatives. In Peter Svenonius (ed.), *Functional structure from top to toe,* 97–114. New York: Oxford University Press. DOI: http://dx.doi.org/10.1093/acprof:oso/9780199740390.003.0004

Belletti, Adriana & Luigi Rizzi. 2013. Intervention in grammar and processing. In Carlo Cecchetto & Ivano Caponigro (eds.) *From Grammar to meaning: The spontaneous logicality of language*, 294–311. Cambridge: Cambridge University Press. DOI: http://dx.doi.org/10.1017/cbo9781139519328.015

Belletti, Adriana & Maria-Teresa Guasti. 2015. *The acquisition of Italian. Morphosyntax and its interfaces in different modes of acquisition*. John Benjamins Publishing Company, Language Acquisition and Language Disorders series.

Belletti, Adriana, Naama Friedmann, Dominique Brunato & Luigi Rizzi. 2012. Does gender make a difference? Comparing the effect of gender on children's comprehension of relative clauses in Hebrew and Italian. *Lingua* 122. 1053–1069. DOI: http://dx.doi.org/10.1016/j.lingua.2012.02.007

Bentea, Anamaria. 2016. *Intervention effects in language acquisition: The comprehension of A-bar dependencies in French and Romanian*. Geneva: University of Geneva unpublished dissertation.

Berent, Gerald P. 1996. Learnability constraints on deaf learners' acquisition of English wh-questions. *Journal of Speech and Hearing Research* 39. 625–643. DOI: http://dx.doi.org/10.1044/jshr.3903.625

Berman, Ruth Aronson. 1978. *Modern Hebrew structure*. Tel-Aviv: University Publishing Projects.

Biran, Michal & Esther Ruigendijk. 2015. Do case and gender information assist sentence comprehension and repetition for German-and Hebrew-speaking children? *Lingua* 164. 215–238. DOI: http://dx.doi.org/10.1016/j.lingua.2015.06.012

Cecchetto, Carlo & Caterina Donati. 2015. *(Re)Labeling*. Cambridge, MA: MIT Press. DOI: http://dx.doi.org/10.7551/mitpress/9780262028721.001.0001

Chomsky, Noam. 1995. *The minimalist program*. Cambridge, MA: MIT Press.

Chomsky, Noam. 2000. Minimalist inquiries. Roger Martin, David Michaels & Juan Uriagereka (eds.), *Step by step: Essays on minimalist syntax in honor of Howard Lasnik*, 89–155. Cambridge, MA: MIT Press.

Contemori, Carla & Adriana Belletti. 2014. Relatives and passive object relatives in Italian-speaking children and adults: Intervention in production and comprehension. *Applied Psycholinguistics* 35(6). 1021–1053. DOI: http://dx.doi.org/10.1017/S0142716412000689

Correa, Leticia M. 1982. Strategies in the acquisition of relative clauses. In Jean Aitchison & Nigel Harvey (eds.), *Working Papers of the London Psycholinguistic Research Group* 4, 37–49.

Correa, Letícia M. Sicuro. 1995. An alternative assessment of children's comprehension of relative clauses. *Journal of Psycholinguistic Research* 24. 183–203. DOI: http://dx.doi.org/10.1007/BF02145355

Costa, João, Naama Friedmann, Carolina Silva & Maya Yachini. 2014. The boy that the chef cooked: Acquisition of PP relatives in European Portuguese and Hebrew. *Lingua* 150. 386–409. DOI: http://dx.doi.org/10.1016/j.lingua.2014.08.005

Danon, Gabi. 2001. Syntactic definiteness in the grammar of Modern Hebrew. *Linguistics* 39. 1071–1116. DOI: http://dx.doi.org/10.1515/ling.2001.042

Danon, Gabi. 2006. Caseless nominals and the projection of DP. *Natural Language and Linguistic Theory* 24. 977–1008. DOI: http://dx.doi.org/10.1007/s11049-006-9005-6

de Villiers, Jill G, Peter A. de Villiers & Esme Hoban. 1994. The central problem of functional categories in the English syntax of oral deaf children. In Helen Tager-Flusberg (ed.), *Constraints on language acquisition: Studies of atypical children*, 9–47. Hillsdale, NJ: Erlbaum.

de Villiers, Peter A. 1988. Assessing English syntax in hearing-impaired children: Elicited production in pragmatically motivated situations. In Richard R. Kretschmer & Laura W. Kretschmer (eds.), *Communication assessment of hearing-impaired children: From conversation to classroom* (The journal of Academy of Rehabilitative Audiology 21), 41–72.

De Vincenzi, Marica, Lisa S. Arduino, Laura Ciccarelli & Remo Job. 1999. Parsing strategies in children comprehension of interrogative sentences. In Sebastiano Bagnara (ed.), *Proceedings of European Conference on Cognitive Science,* 301–308. Rome: Istituto di Psicologia del CNR.

Friedmann, Naama. 1998. *BAFLA: Friedmann battery for agrammatism*. Tel Aviv: Tel Aviv University.

Friedmann, Naama. 2001. Agrammatism and the psychological reality of the syntactic tree. *Journal of Psycholinguistic Research* 30. 71–90. DOI: http://dx.doi.org/10.1023/A:1005256224207

Friedmann, Naama. 2006. Speech production in Broca's agrammatic aphasia: Syntactic tree pruning. In Yosef Grodzinsky & Katrin Amunts (eds.), *Broca's region*. New York: Oxford University Press. DOI: http://dx.doi.org/10.1093/acprof:oso/9780195177640.003.0005

Friedmann, Naama. 2013. Verb movement to C: From agrammatic aphasia to syntactic analysis. In Lisa Lai-Shen Cheng & Norbert Corver (eds.), *Diagnosing syntax* (Oxford Studies in Theoretical Linguistics), 75–86. Oxford: Oxford University press. DOI: http://dx.doi.org/10.1093/acprof:oso/9780199602490.003.0004

Friedmann, Naama, Adriana Belletti & Luigi Rizzi. 2009. Relativized relatives: Types of intervention in the acquisition of A-bar dependencies. *Lingua* 119. 67–88. DOI: http://dx.doi.org/10.1016/j.lingua.2008.09.002

Friedmann, Naama, Aviah Gvion & Rama Novogrodsky. 2006. Syntactic movement in agrammatism and S-SLI: Two different impairments. In Adriana Belletti, Elisa Bennati, Cristiano Chesi, Elisa Di Domenico & Ida Ferrari (eds.), *Language acquisition and development*. Cambridge: Cambridge Scholars Press.

Friedmann, Naama & Hedva Lavi. 2006. On the order of acquisition of A-movement, Wh-movement and V-C movement. In Adriana Belletti, Elisa Bennati, Cristiano Chesi, Elisa Di Domenico & Ida Ferrari (eds.), *Language acquisition and development,* 211–217. Newcastle: Cambridge Scholars Press.

Friedmann, Naama & Lewis P. Shapiro. 2003. Agrammatic comprehension of simple active sentences with moved constituents: Hebrew OSV and OVS structures. *Journal of Speech Language and Hearing Research* 46. 288–297. DOI: http://dx.doi.org/10.1044/1092-4388(2003/023)

Friedmann, Naama & Manar Haddad-Hanna. 2014. The comprehension of sentences derived by syntactic movement in Palestinian Arabic-speaking children with hearing

impairment. *Applied psycholinguistics* 35. 473–513. DOI: http://dx.doi.org/10.1017/S0142716412000483

Friedmann, Naama, Maya Yachini & Ronit Szterman. 2015. Relatively easy relatives: Children with syntactic SLI avoid intervention. In Elisa Di Domenico, Cornelia Hamann & Simona Matteini (eds.), Structures, strategies and beyond. Studies in honour of Adriana Belletti, 303–320. Amsterdam: John Benjamins, Linguistik Aktuell series.

Friedmann, Naama & Rama Novogrodsky. 2002. BAMBI: Battery for assessment of syntactic abilities in children. Tel Aviv: Tel Aviv University

Friedmann, Naama & Ronit Szterman. 2006. Syntactic movement in orally-trained children with hearing impairment. *Journal of Deaf Studies and Deaf Education* 11. 56–75. DOI: http://dx.doi.org/10.1093/deafed/enj002

Friedmann, Naama & Ronit Szterman. 2011. The comprehension and production of Wh questions in children with hearing impairment. *Journal of Deaf Studies and Deaf Education* 16. 212–235. DOI: http://dx.doi.org/10.1093/deafed/enq052

Friedmann, Naama, Ronit Szterman & Manar Haddad-Hanna. 2010. The comprehension of relative clauses and Wh-questions in Hebrew and Palestinian Arabic hearing impairment. In Ana Castro, João Costa, Maria Lobo & Fernanda Pratas (eds.), *Language acquisition and development: Generative approaches to language acquisition 2009.* Cambridge: Cambridge Scholars Press/CSP.

Friedmann, Naama & Yosef Grodzinsky. 1997. Tense and agreement in agrammatic production: Pruning the syntactic tree. *Brain and Language* 56. 397–425. DOI: http://dx.doi.org/10.1006/brln.1997.1795

Gil, Mali & Ceela Edelstein. 2001. *Hebrew version of the PALPA.* Ra'anana: Loewenstein Hospital Rehabilitation Center.

Grillo, Nino. 2008. *Generalized minimality: Syntactic underspecification in Broca's aphasia.* Utrecht: University of Utrecht, LOT dissertation.

Grodzinsky, Yosef. 1989. Agrammatic comprehension of relative clauses. *Brain and Language* 37. 480–499. DOI: http://dx.doi.org/10.1016/0093-934X(89)90031-X

Grodzinsky, Yosef. 2000. The neurology of syntax: Language use without Broca's area. *Behavioral and Brain Sciences* 23. 1–71. DOI: http://dx.doi.org/10.1017/S0140525X00002399

Guasti, Maria-Teresa, Chiara Branchini & Fabrizio Arosio. 2012. Interference in the production of Italian subject and object wh-questions. *Applied Psycholinguistics* 33(1). 185–223. DOI: http://dx.doi.org/10.1017/S0142716411000324

Hamburger, Henry & Stephen Crain. 1982. Relative acquisition. In Stan A. Kuczaj II (ed.), *Language development: Syntax and semantics*. Hillsdale, NJ: Erlbaum.

Kay, Janice, Ruth Lesser & Max Coltheart. 1992. *PALPA: Psycholinguistic Assessments of Language Processing in Aphasia.* Hove: Erlbaum.

Kertesz, Andrew. 1982. *Western aphasia battery.* Orlando, FL: Grune & Stratton.

Levy, Hagar & Naama Friedmann. 2009. Treatment of syntactic movement in syntactic SLI: A case study. *First Language* 29. 15–50. DOI: http://dx.doi.org/10.1177/0142723708097815

MacWhinney, Brian, Elizabeth Bates & Reinhold Kliegl. 1984. Cue validity and sentence interpretation in English, German, and Italian. *Journal of Verbal Learning and Verbal Behavior* 23(2). 127–150. DOI: http://dx.doi.org/10.1016/S0022-5371(84)90093-8

Manzini, Rita M. & Ludovico Franco. 2016. Goal and DOM datives. *Natural Language and Linguistic Theory* 34. 197–240. DOI: http://dx.doi.org/10.1007/s11049-015-9303-y

McKee, Cecile, Dana McDaniel & Jesse Snedeker. 1998. Relative children say. *Journal of Psycholinguistic Research* 27. 573–596. DOI: http://dx.doi.org/10.1023/A:1024901029643

Meng, Michael & Markus Bader. 2000. Modes of disambiguation and garden path strength: An investigation of subject object ambiguities in German. *Language and Speech*, 43, 43–74. DOI: http://dx.doi.org/10.1177/00238309000430010201

Munaro, Nicola. (1999). *Sintagmi interrogativi nei dialetti italiani settentrionali*. Padua: Unipress.

Quigley, Stephen Patrick, N. L. Smith & Ronnie Bring Wilbur. 1974a. Comprehension of relativized sentences by deaf students. *Journal of Speech and Hearing Research* 17. 325–341. DOI: http://dx.doi.org/10.1044/jshr.1703.325

Quigley, Stephen Patrick, Ronnie B. Wilbur & Dale S. Montanelli. 1974b. Question formation in the language of deaf students. *Journal of Speech and Hearing Research* 17. 699–713. DOI: http://dx.doi.org/10.1044/jshr.1704.699

Reznick, Julia & Naama Friedmann. in press. The order of acquisition of various movement types in Hebrew. *Language and Brain* 11.

Rizzi, Luigi. 1990. *Relativized minimality*. Cambridge, MA: MIT Press.

Rizzi, Luigi. 2004. Locality and left periphery. In Adriana Belletti (ed.), *Structures and beyond*: *The cartography of syntactic structures*, Vol. 3. Oxford-New York: Oxford University Press.

Rizzi, Luigi. 2013. Locality. *Lingua* 130. 169–186. DOI: http://dx.doi.org/10.1016/j.lingua.2012.12.002

Roth, Froma P. 1984. Accelerating language learning in young children. *Journal of Child Language* 11. 89–107. DOI: http://dx.doi.org/10.1017/S0305000900005602

Sheldon, Amy. 1974. The role of parallel function in the acquisition of relative clauses in English. *Journal of Verbal Learning and Verbal Behavior* 13. 272–281. DOI: http://dx.doi.org/10.1016/S0022-5371(74)80064-2

Shlonsky, Ur. 1997. *Clause structure and word order in Hebrew and Arabic*. New York: Oxford University Press.

Shlonsky, Ur & Edit Doron. (1992). Verb second in Hebrew. In *Proceedings of the West Coast Conference on Formal Linguistics* 10, 431–446. Stanford, CA: Stanford University, Stanford Linguistics Association.

Soroker, Nachum. 1997. *Hebrew western aphasia battery*. Ra'anana: Loewenstein Hospital Rehabilitation Center.

Starke, Michal. 2001. *Move dissolves into Merge: A theory of locality*. Geneva: University of Geneva unpublished dissertation.

Szterman, Ronit. 2003. *The syntactic impairment in children with hearing loss and its connection to the children's ability to read and comprehend reading*. Tel Aviv: Tel Aviv University unpublished MA thesis.

Szterman, Ronit. 2016. *The syntactic impairment in children with hearing loss, its relation to difficulties in reading and an empirical examination of treatment*. Tel Aviv: Tel Aviv University unpublished dissertation.

Szterman, Ronit & Naama Friedmann. 2014. Relative clause reading in hearing impairment: Different profiles of syntactic impairment. *Frontiers in Psychology: Language Sciences* 5(1229). 1–16. DOI: http://dx.doi.org/10.3389/fpsyg.2014.01229

Szterman, Ronit & Naama Friedmann. 2015. Insights into the syntactic deficit of children with hearing impairment from a sentence repetition task. In Cornelia Hamann & Esther Ruigendijk (eds.), *Language acquisition and development: Generative approaches to language acquisition*, 492–505. Newcastle: Cambridge Scholars Publishing.

Tavakolian, Susan L. 1981. The conjoined-clause analysis of relative clauses. In Susan L. Tavakolian (ed.), *Language acquisition and linguistic theory*, 167–187. Cambridge, MA: MIT Press.