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Stages rather than ages in the acquisition of movement structures: Data from sentence repetition and 27696 spontaneous clauses

Naama Friedmann, Tel Aviv University, Tel Aviv, Israel, naamafr@tauex.tau.ac.il

Julia Reznick, Tel Aviv University, Tel Aviv, Israel, julia.reznick@gmail.com

This study explored the order of acquisition of various types of syntactic-movement and embedding structures in Hebrew, using a sentence-repetition task, in which 60 children aged 2;2–3;10 repeated 80 sentences (with a total of 4800 sentences), and an analysis of the spontaneous speech of 61 children aged 1;6–6;1 (27,696 clauses: a group analysis of 56 children each with one sample, and a longitudinal analysis of 5 children). The sentence repetition task revealed a set order of acquisition of the various types of syntactic movement: A-movement is acquired first, then A-bar-movement, and finally movement of the verb to C. The analysis of spontaneous speech revealed the same order, and added several structures: A-movement of the object of unaccusative verbs to subject position appears first, together with simple SV sentences; then, wh-questions appear; then relative clauses and topicalization appear together with embedding of finite clauses, and lastly, V-to-C movement. Previous studies have shown that Hebrew speakers under age six have difficulty comprehending and producing sentences with A-bar-movement in which a lexically-restricted object crosses over a lexically-restricted subject. And indeed, whereas children produced A-bar structures very early (in the group samples, wh-questions appeared from age 1;6, relative-clauses and topicalization from age 2;6), until age 5;8 these structures never included a lexical DP crossing over another lexical DP. Both tasks indicated that the order of structure acquisition is fixed, creating Guttman scales between structures, but different children acquire the same structure at very different ages. It seems that whereas the syntactic path and the stages of structure acquisition along it are constant between children, each child walks this path in their own pace.

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1 Introduction

Young children at the early stages of language acquisition do not produce all syntactic structures existing in adult speech yet. Many studies explored the acquisition of various structures, but most of them studied the acquisition of a single structure. The current study was aimed to draw a broader picture of the relative order of acquisition of various structures in Hebrew, focusing on various movement structures and embedding. For this aim, we tested several types of syntactic structures together within the same children, and examined whether a consistent order of acquisition of the various structures can be identified across different children. We were also interested to find out whether specific ages can be assigned to the acquisition of each syntactic structure. We sought to explore the factors that determine which structures are acquired at each stage, and which structures are acquired together. Beyond the psycholinguistic contribution of learning what shapes stages of acquisition take, and what shapes stages of acquisition, such rich data can contribute to the identification of children who might be showing impaired acquisition of syntax and allow for early treatment.

We examined these questions using two complementing methodologies: a sentence repetition task and the analysis of spontaneous speech samples. Examining the acquisition of various types of syntactic structures both with a repetition task and in spontaneous speech allowed us to get a more complete and reliable picture of the linguistic abilities of children (Demuth 1996; Lust et al. 1996; Friedmann 2007). We examined a wide variety of syntactic structures within the productions of each child. The approach we use to unravel the order of acquisition of the various syntactic structures is the following: in repetition, we looked, for each of the 60 children, whether or not they master (i.e., repeat correctly consistently) each type of structure. Then, we used the Guttman scale (Guttman 1944) view and looked for a systematic order between structures that have been mastered. For instance, if we find that all children who already master A-bar-movement also already master A-movement, but not all children who master A-movement also master A-bar-movement, this would mean that A-movement is acquired before A-bar-movement. We entertained a similar approach for the analysis of the spontaneous speech samples. We analysed the spontaneous speech of 56 children in various ages. Each of the 56 children had a single sample, and we only included in the analysis large enough samples such that structures acquired will have a good probability of appearing in the sample. Then, we looked for a Guttman scale in much the same way we did for the repetition task. For each of the 56 children, we analysed the structures that already appeared in their sample, and looked for a hierarchy of acquisition of the various structures between children. For example, if we found that some children produce only wh-questions and some children produce wh-questions and relative clauses, but no child produced relative clauses but not wh-questions, we could conclude that wh-questions are acquired before relative clauses. This approach allowed us to track, step-by-step, the acquisition of the various structures with various types of syntactic movement and embedding, in a way that

is independent from age. We also assessed longitudinally the spontaneous speech of 5 additional children whose speech was recorded often and over a long period of time, which allowed us to examine the order of acquisition of the various structures within-child.

In our analyses we focused on structures with various types of syntactic movement, as well as embedding. Syntactic movement is an operation that moves a certain element from its position within a basic sentence to a different position, often altering the basic word order. For example, the sentence “Which season do you like?” is created from the basic order “You like which season” by movement of the phrase “which season” from its original post-verbal object position, to the beginning of the sentence. Syntactic movements differ in the type of element that moves (a phrase, such as a noun phrase, or a head – e.g., a verb) and in the landing site of the movement in the syntactic tree (an argument position in A-movement, a phrasal position that is not an argument position in A-bar-movement, and a head position in verb movement). These different properties may have different effects on acquisition.

We start with a short description of the main types of syntactic movement we explore in this study: A-movement, A-bar-movement, and verb movement and what is known about their acquisition (Sections 1.1–1.3). Next, clausal embedding – embedding structures without A-bar movement – will be presented (Section 1.4). Examining the acquisition of clausal embedding would allow us to examine whether the stages of acquisition are related to movement or to the tree structure, as finite clausal embedding does not involve movement but does involve the CP layer, the highest layer in the syntactic tree.

1.1 A-movement

A-movement is a short-distance movement of a noun phrase (henceforth – determiner phrase, DP).¹ Sentence structures derived by A-movement include sentences with unaccusative verbs in the order subject-verb (SV), verbal passive constructions, and raising constructions.

1.1.1 SV word order with unaccusative verbs

Unaccusative verbs are verbs that take only one internal argument. The DP occurring with an unaccusative verb is the theme in the sentence, for example: in the sentence “the leaf fell”, “the leaf” is not the agent of the act, rather the theme of it. The basic word order of sentences with unaccusatives is verb-subject, VS (*nafal ha-ale*, “fell the leaf”), that is – the order in which the DP is a complement to the verb. The subject-verb, SV order (*ha-ale nafal*, “the leaf fell _”),

¹ “A-movement” is short for “argument movement”, that is, a movement to an argument position – the specifier of VP or of IP. In fact all clauses include A-movement of the subject from VP-internal thematic position to the spec of IP. Here we abstract away from this kind of movement and focus on the visible ones, which occur with unaccusative verbs, and in raising and passive constructions.

is attained by movement of the DP from object position to subject position (Perlmutter 1978; Levin & Rappaport Hovav 1995). We refer to this movement, from object to subject position, as A-movement. In Hebrew, unlike in English, this movement is not obligatory with unaccusatives, so sentences can occur in both $V_{unacc}S$ and SV_{unacc} orders. See **Figure 1** for such an example for the basic order (**Figure 1a**), and the order after the A-movement of a DP from object to subject position (**Figure 1b**).² (**Figure 1b** also shows movement of the verb to I, in grey).

One of the most influential hypotheses on language acquisition literature is the Maturation of Syntax hypothesis by Borer & Wexler (1987). Based on children's difficulty with verbal passive, a structure that is also derived by A-movement, Borer and Wexler proposed that A-movement matures late in the acquisition process, hence children younger than five years cannot produce sentences with such movement (see also Hirsch & Wexler 2007, who proposed that A-movement matures only around age seven, based on a test of raising construction comprehension,

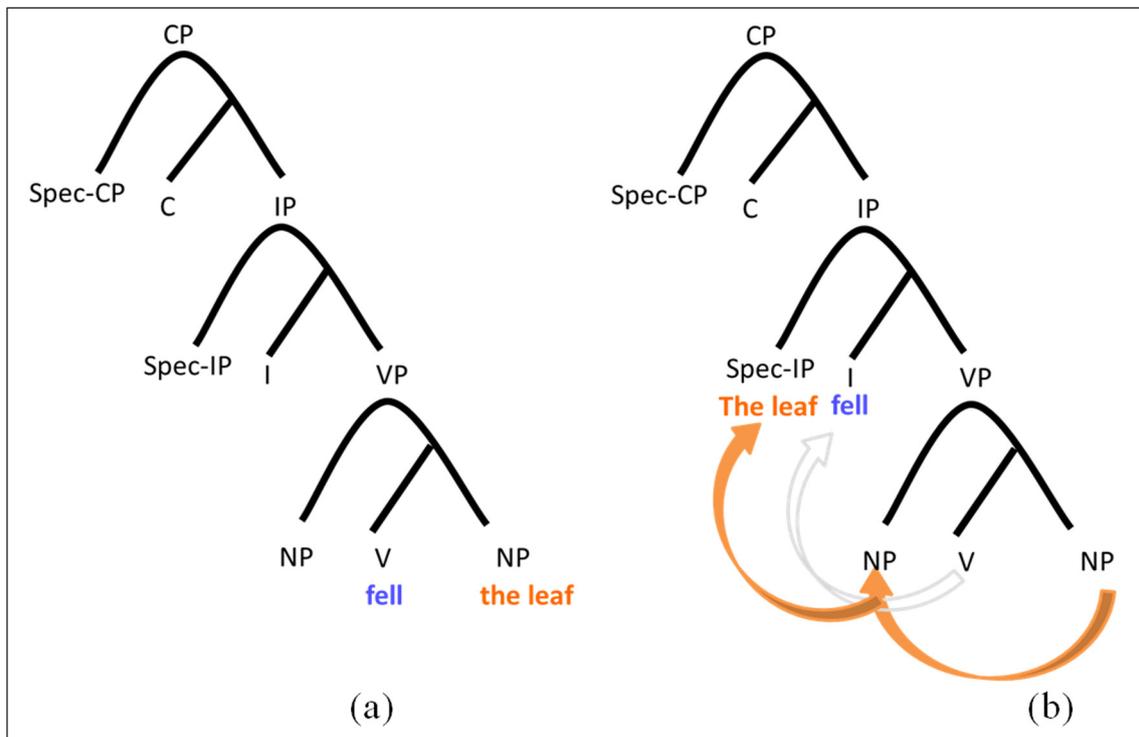


Figure 1: The syntactic trees of (a) the basic sentence in $V_{unacc}S$ order and (b) the sentence after A-movement, in SV_{unacc} order for the sentence *ha-ale nafal* “the-leaf fell”.

² Figure 1 portrays the movement of the DP to IP through Spec-VP, but it may, depending on theory, be a direct movement from object position to Spec-IP or a movement with an intermediate step in Spec-vP. For the current study, the differences between these analyses are less relevant.

administered to English-speaking children). Under this framework, Wexler and his collaborators argued that when young children produce sentences with an unaccusative verb in SV order, they are actually analysing these verbs as unergative verbs, that is, verbs in which the DP is base-generated in subject position and does not move there from object position (Babyonyshev et al. 2001 for Russian; Machida et al. 2004 for Japanese). Contrarily, many other findings from studies examining comprehension or production in a variety of languages (English, European Portuguese, French, Hebrew, Italian, and Japanese) demonstrate that young children do distinguish unaccusative verbs from other verbs, and analyse A-movement correctly (Pierce 1992a; Snyder et al. 1995; Sano et al. 2001; Adragão & Costa 2004; Lorusso et al. 2005; Friedmann 2007; Shimada & Sano 2007; Costa & Friedmann 2009; 2012; Friedmann & Costa 2011). Studies found that whereas it is difficult for young children to produce sentences in VS order with verbs other than unaccusative verbs (e.g., “jumped”, “laughed”) and they prefer producing these verbs in SV order (Pierce 1992a; Lorusso et al. 2005), they produce unaccusatives both in VS and in SV order before the age of three (Adragão & Costa 2004; Friedmann 2007; Costa & Friedmann 2009; 2012). Other studies found that children use correctly morpho-syntactic means that are unique to unaccusatives, like the possessive dative *li* (for-me) in Hebrew (Friedmann 2007), which is a marker of an internal argument (Borer & Grodzinsky 1986), and the auxiliary verb in Italian (different auxiliaries are used for unaccusative and non-unaccusative verbs, Burzio 1986), even before the age of three years (Guasti 2002).

1.1.2 Passives

An additional structure derived by A-movement is verbal passive. Verbal passives are derived by syntactic movement of the object to subject position (e.g., in the sentence “The teddy bear was hugged _ [by the boy]” the DP “the teddy bear” moved from its post-verbal position to the pre-verbal subject position). In some studies, some passive constructions have been reported to be difficult in the first stages of acquisition of English and German, and verbal passives (which include A-movement) are acquired later than adjectival passives, which do not include A-movement (Maratsos et al. 1985; Borer & Wexler 1987; Pierce 1992b; Israel et al. 2000; Abbot-Smith & Behrens 2006; Hirsch & Wexler 2007). Considering the evidence described above, according to which children do not have a general difficulty with A-movement, it seems that their difficulty with passive does not stem from late maturation of A-movement, and may be ascribed to other sources, unrelated to A-movement, such as a difficulty with *by*-phrases or with passive morphology. This is supported by studies that found that English- and Japanese-speaking children have no problem understanding and producing short passives without *by*-phrases or passive morphology (Fox & Grodzinsky 1998; Sano et al. 2001, see also Machida et al. 2004). A study of the acquisition of passive comprehension in 11 languages with different typologies (Armon-Lotem et al. 2016) found, in most languages examined, that at age 5, children

understand passives without a *by*-phrase at 80% and above success rate, better than passives with a *by*-phrase. In most of the 11 languages, five-year-olds were also able to understand passives with a *by*-phrase but in other languages, including Hebrew, passives with a *by*-phrase were still difficult (leading to reversed roles errors).

In Hebrew, verbal passives are rarely used (Berman & Sagi 1981; Berman 1997; Ayal-Smikt 2001; Jisa et al. 2002), and Hebrew-speaking children more commonly use arbitrary *pro* constructions, which maintain the argument structure of the transitive verb (*lakxu oti*, *pro*_{arb}-took_{pl} me '(they) took me'), and unaccusative verbs which only include one argument (Berman 1997).

1.1.3 Raising

Raising constructions are also derived by A-movement, of the subject of the embedded clause moving to the subject position of the main clause (Landau 2011; Danon 2015; Melnik 2017). Raising constructions may or may not include an experiencer argument (e.g., 'Silvia seems (to Anna) to be smart'). Not many studies examined the acquisition of raising constructions, and the ones that did (mainly testing English-speakers) portray an inconsistent picture. Hirsch & Wexler (2007) and Mateu (2020) report that young English-speaking children's production of raising constructions is minimal. As for comprehension, whereas Hirsch & Wexler (2007), Orfitelli (2012), and Mateu (2020) report that children do not understand these structures before the age of six/seven, Becker (2006) showed that children as young as 3–4 years old already succeed in understanding raising *seem* constructions without an overt experiencer. Froud et al. (2010) showed that 3–6 year olds do not have a general problem with raising constructions, but rather only in cases in which the A-movement crosses an experiencer DP: they understood raising sentences without an experiencer, but had difficulty understanding raising sentences with an experiencer (e.g., "Pooh seems to Piglet to be holding an umbrella"). This finding suggests that it is not A-movement that is difficult for young children, but possibly the crossing dependency.

Thus, most studies of the acquisition of A-movement indicate that even in early ages there is no difficulty acquiring A-movement itself, as sentences with unaccusative verbs in SV order and verbal passives without a *by*-phrase are acquired early and without difficulties. Some other properties of certain sentences with A-movement may be acquired later, such as verbal passives with a *by*-phrase, and possibly also raising structures with an experiencer.

1.2 A-bar-movement

A-bar-movement (A'-movement, or wh-movement) is a movement of a phrase to the specifier position of CP (Spec-CP, or a specifier position within the left periphery, Rizzi 1997). Sentences derived by this kind of movement in Hebrew, which we examine in this study, are topicalized sentences, relative clauses, and wh-questions.

1.2.1 Topicalization

The object of topicalized sentences moves from the VP-internal complement position to Spec-CP (Haegeman 1994). For example, as shown in **Figure 2**, the Hebrew sentence “ACC this girl, grandma drew” is derived by movement of the object, “this girl”, together with the accusative case marker, to the beginning of the sentence.

Only few studies examined the acquisition of topicalization. Studies of the production of topicalization structures in spontaneous speech reported age of emergence between 1;8 and 2;5 (European Portuguese: Soares 2003a; b; Adragão & Costa 2004; Japanese: Otsu 1994; German: Spinner & Grinstead 2006). Studies examining the comprehension of topicalized sentences found that European-Portuguese-speaking children aged 3;3–6;1 can understand OSV topicalization sentences well, but still struggle with OVS topicalization sentences (Adragão & Costa 2004). Sano (2004) tested 3–6 year old Japanese-speaking children, and found that even the youngest children understood topicalized sentences when the object was presented in a previous utterance as the topic of the discourse, but struggled greatly without this introduction. Biran & Ruigendijk (2015) found that Hebrew-speaking children aged 3–6 years performed at chance in the comprehension of OVS topicalized sentences.

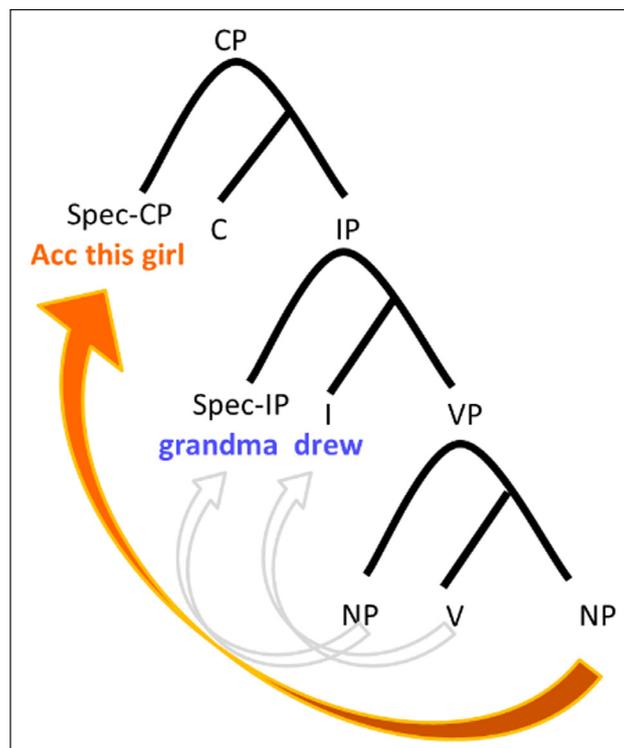


Figure 2: Topicalization: A-bar-movement of the object to the beginning of a sentence, to Spec-CP, for the sentence *et ha-yalda ha-zo safta ciyra* “acc the-girl the-this grandma drew”.

1.2.2 Relative clauses

Sentences containing a relative clause are derived by A-bar-movement of a DP from within the embedded clause to Spec-CP position of the main clause³ (as demonstrated in **Figure 3**). The movement in subject relatives is from the subject position of the embedded clause (e.g., “The grandma that _ kisses the girl”). The movement in object relatives is from the object position of the embedded clause (“The grandma that the girl kisses _”).

Two timelines for the acquisition of relative clauses can be seen in the literature: some studies report early acquisition of relative clauses, e.g., Armon-Lotem (2005) and Berman (1997) report that first relative clauses appear in the spontaneous speech of children acquiring Hebrew around

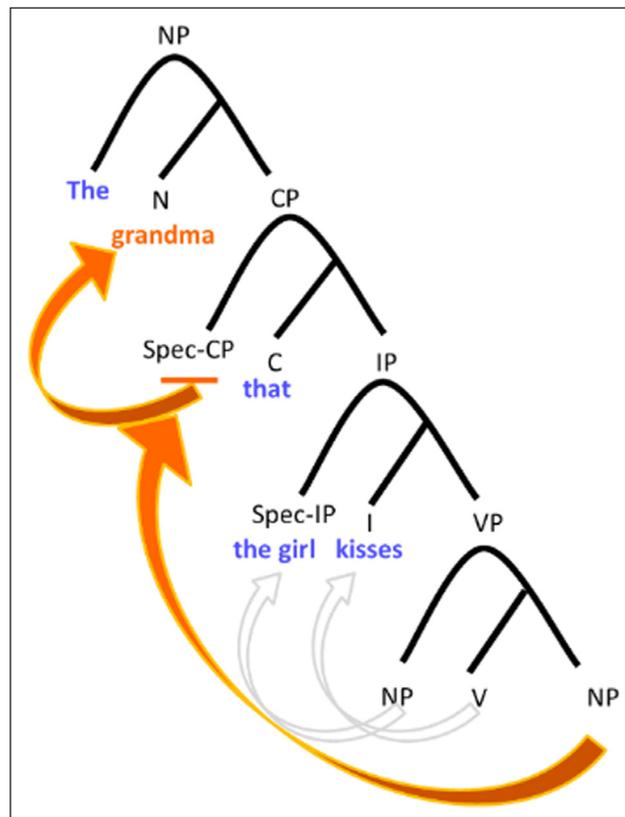


Figure 3: A-bar-movement of an object to the relative head position in an object relative clause for the phrase *ha-safta she-ha-yalda menašeket*, “The-grandma that-the-girl kisses”.

³ According to raising analyses, the relative head further moves from spec-CP to a position outside the CP (Vergnaud 1974; Kayne 1994; Bianchi 1999). According to other analyses, the element that moves is a null operator, and agreement (matching) takes place between the operator and the head of the relative clause (Williams 1980; see also Sauerland 2000, for a description and discussion of both analyses). Either way, both assume relative clauses are derived by A-bar-movement.

age 2–2;6, and mastered around age 4. Other studies refer to much later acquisition, around age 6 (e.g., McKee et al. 1998; Friedmann & Novogrodsky 2004; Günzberg-Kerbel et al. 2008; Friedmann et al. 2009). Additionally, whereas some studies refer to similarities in the acquisition of subject- and object relatives, others consistently report subject-object asymmetry in relative clauses and *wh*-questions (de Villiers et al. 1994; Correa 1995; Friedmann & Novogrodsky 2004; Arosio et al. 2009; Friedmann et al. 2009; Belletti & Contemori 2010; Biran & Ruigendijk 2015; Haddad-Hanna & Friedmann 2015).

These two differences, with respect to ages and with respect to subject-object asymmetry, we suggest, emerge from different studies exploring different types of relative clauses. As we will also show in our study below, whereas relative clauses are indeed acquired early, and with no subject-object asymmetry, a specific configuration is problematic for children until around age 6, which is a configuration derived by A-bar-movement of a lexically-restricted DP across an intervening lexically-restricted DP (Friedmann et al. 2009; Belletti et al. 2012; Rizzi 2018). These intervention constructions can be found in certain object relatives, topicalization structures, and *wh*-questions, and studies that test the comprehension and production of these structures with intervention configuration find late acquisition and subject-object asymmetry. Indeed, Friedmann et al. (2009), for example, showed that Hebrew-speaking children aged 3;6–5;0 understood well object relatives in which one of the DPs is not lexically restricted, not differently from subject relatives, and avoided this intervention configuration in their production of relative clauses. In contrast, the same children found it difficult to understand and produce object relatives (and object questions) that involved an intervention configuration. Therefore, relative clauses are acquired early and much before age 6, but only around age 6 is the intervention configuration mastered.

Additional approaches attributed the difficulty in relative clauses to partial construction of the syntactic tree in the early stages of acquisition (Radford 1990; Clahsen et al. 1993/4), and others attribute it to a more general complexity in the sentence and/or to pragmatic factors in the comprehension tasks (Sheldon 1974; Goodluck & Tavakolian 1982; Hamburger & Crain 1982; Correa 1995).

In studies examining the production of DP (“direct”) object relatives in infancy using structured elicitation tasks, it was reported that many early relative clauses include a resumptive pronoun, even in languages that do not allow them in adult language (Crain et al. 1990; McKee et al. 1998; Varlokosta & Armon-Lotem 1998; see also Armon-Lotem et al. 2006, for differences between relative clauses containing various resumptive pronouns, and Guasti & Cardinaletti 2003 for children acquiring Italian and French who do not tend to overuse resumptive pronouns). Friedmann et al. (2009), however, found no difference in comprehension of object relatives with and without resumptive pronouns. In Hebrew, a resumptive pronoun is obligatory in PP (“indirect”) object relatives (where it is a part of a prepositional phrase: *ze ha-yeled še-ha-yalda*

histakla al-av, “that’s the-boy that-the-girl looked at-him”), and optional in DP object relatives (*ze ha-yeled še-ha-yalda ra’ata [oto]*, “that’s the-boy that the-girl saw [him]”). According to some researchers, the dependency between the resumptive pronoun and the head of the relative clause is not derived through syntactic movement (Shlonsky 1992); others suggest that some resumptive pronouns are a syntactic last resort phenomena and others have phonological bases and are inserted in the phonological spellout stage (Rasin 2016).

1.2.3 Wh-questions

Wh-questions are derived by wh-movement, which is another instance of A-bar-movement. The wh-phrase moves to the beginning of the sentence, to Spec-CP (see **Figure 4**). The wh-phrase can move from subject position, creating a subject question (“Who _ built the building?”), or from object position, creating an object question (“What did the child build _?”), and so on.

In the beginning of the third year of their lives, and even earlier, children produce wh-questions, although at a young age many of their questions are frozen expressions (e.g., “what’s that?”) or ungrammatical (Thornton 1990; Thornton & Crain 1994; Dabrowska 2000; Guasti 2000;

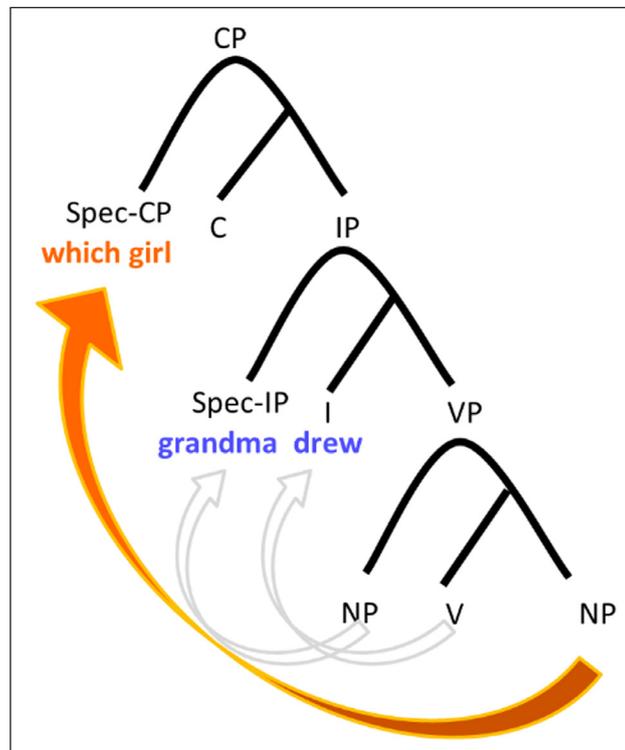


Figure 4: A-bar-movement of the object in a Hebrew object question *et eizo yalda safta ciyra?*, ACC which girl grandma drew? ‘Which girl did grandma draw?’

Hamann 2000; Soares 2003a; Armon-Lotem 1996; 2008). In an in-depth examination of the stages of acquisition of *wh*-questions in Hebrew, Armon-Lotem (1996; 2008) identified four stages distinguishable by the characteristics and morphology of verbs used, between the ages 1;6–3;0: verbless questions and formulaic questions; questions in the present tense with non-frozen verbs, inflected for gender and number; questions with inflected verbs in the present and past tense; adultlike questions.

In the spontaneous speech of young children, questions with the *wh*-elements *what*, *where*, and *who* appear at the average age 2;2–2;4 – before some adjunct *wh*-questions (*why* and *how*), which appear at 2;9–2;11. Lexically-restricted *wh*-questions (*which* and *whose*) are rare even at age 3;0 (Bloom et al. 1989; Rowland et al. 2003).

As for intervention and for the symmetry between subject and object structures, the picture resembles the one reported for relative clauses. *Wh*-questions are produced early, and subject- and object questions are acquired at the same time (Stromswold 1995 for English). However, the comprehension of object questions, specifically of *wh*-questions with intervention configurations, i.e., lexically-restricted object questions with *which* in which the two DPs are lexical (e.g., Which elephant did the-boy hug?), is acquired only around 5–6 years (Hebrew: Friedmann et al. 2009; Friedmann & Novogrodsky 2011; Friedmann & Szterman 2011; Palestinian Arabic: Haddad-Hanna & Friedmann 2015).

Errors in which the *wh*-phrase is left in its original position (e.g. “grandma cooked what?”) in languages where this structure is ungrammatical are very rare (Guasti 2000). Four-years-old English speakers are able to perform long distance movement in complex *wh*-questions, and even show sensitivity to syntactic barriers of different kinds (de Villiers et al. 2008).

The derivation of *wh*-questions in some languages involves movement of the auxiliary from I to C. It was found that children acquiring German, Italian, and Swedish perform this movement successfully. Young children acquiring English, in contrast, perform this movement inconsistently, or show difficulties in Do Support (Clahsen et al. 1993/4; Santelmann & Adger 1998; Guasti 2000; 2002; Rowland & Pine 2000), with marked difference in performing subject-aux inversion between *why*-questions (in which they show difficulties) and other *wh*-questions (in which they succeed, Thornton 2008).

1.3 Verb movement

So far, we have presented structures derived by movement of phrases. Another kind of syntactic movement is head movement in which the element that moves is a verb. One kind of verb movement is movement of a verb to I, required for inflection. Another kind, which we explore in the current study, is movement of the verb to C (we will use the notation V-C below), placing the verb in the second position in the sentence, often before the subject (see **Figure 5**). Verb

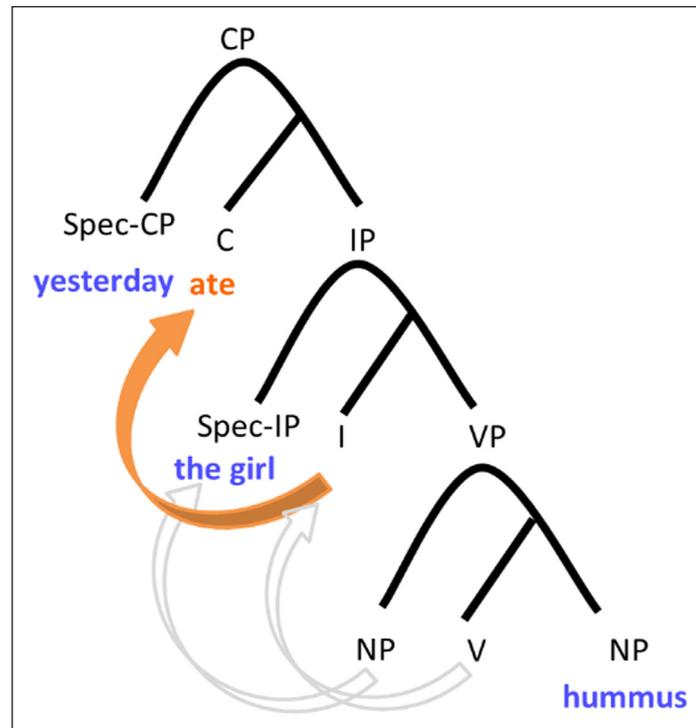


Figure 5: Verb movement to the second position in the sentence for the sentence *etmol axla ha-yalda xummus* “yesterday ate the-girl hummus”.

movement to the second position in the sentence, to C, is obligatory in some languages (e.g., main clauses in German), and optional and stylistic in other languages (e.g., Hebrew, where most sentences can be produced either with movement of the verb to C [*etmol axla ha-yalda xummus*, yesterday ate the-girl hummus] or without [*etmol ha-yalda axla xummus*, yesterday the-girl ate hummus]). In Hebrew, verb movement to the second position is typically triggered by some element (e.g., temporal adverbs, prepositional phrases, objects, wh-elements, Shlonsky & Doron 1992; Shlonsky 1997) in the first position of the sentence (Spec-CP), attracting the verb towards itself (like the word ‘yesterday’, attracting the verb ‘ate’ in the example above). In Hebrew, V-C is stylistic and appears mainly in literature (including children books and songs, as well as for adults) and in formal contexts, so such sentences are very frequent in children’s books and songs (Zuckerman 2001, for example, reported that 75% of the sentences in children’s books included V-C; Friedmann & Novogrodsky 2004, counted 6074 sentences in children’s books and second grade textbooks, and found that 19.4% of the sentences included verb movement to second position, see also Szterman & Friedmann 2020). In literary narratives, V-C may occur with no trigger, and then the verb may appear first in the sentence.

Many findings point to the existence of the IP node in young children’s grammar and to their ability to move verbs to this node (Clahsen & Penke 1992; Déprez & Pierce 1993; Friedemann

1993/4; 2000; Guasti 1993/4; Costa & Friedmann 2009; 2012; Belletti & Guasti 2015). In some languages with residual V2 or subject-aux inversion such as English, Portuguese, and Hebrew, verb movement to C is acquired later than verb movement to I (Déprez & Pierce 1993; Soares 2003a; Costa & Friedmann 2009; 2012), and later than in languages with obligatory V2 in main sentences, in which V2 is not only stylistic and does not only refer to a specific register. In obligatory V2 languages, the acquisition of V2 was found to be relatively early (Meisel 1992; Clahsen et al. 1993/4; Poeppel & Wexler 1993; van Kampen 2010). In German, for example, already at the age of 2;2.5 years, verbs that are correctly inflected are produced in the V2 position in 85% of cases (Clahsen et al. 1993/4). In Dutch, too, V2 acquisition is reported to occur at an early age (2;5, van Kampen 2010). (However, it may still be that the early V2 sentences with an inflected verb appeared after a subject in spec IP, so it is not necessarily the case that these early V2 sentences involve movement to CP, see Clahsen et al. 1993/4 for discussion).

1.4 Clausal embedding

A different structure that involves the highest layers of the syntactic tree but does not involve A-bar movement is clausal embedding (sentential complements and adverbial clauses). Finite clauses can be embedded to a verb (e.g., “I think that the first rain is wonderful”), or to a noun (“The thought that it will rain tonight made me happy”). (Embedding to a noun may also involve a relative clause, which we have already discussed in the A-bar section, here we focus only on embedding without A-bar movement.) Embedded clauses may be declarative or interrogative, and they may be complements of verbs or they may be adjuncts, functioning as a type of modifier or adjunct of the matrix clause. Additionally, clauses complementing verbs may be finite (“I hope that it will rain”) or nonfinite (“I want to eat hummus”).

In children’s spontaneous speech the first complement clauses appear around the age of two years. Embedded nonfinite clauses precede finite ones (Diessel 2004; Owen & Leonard 2006; Berman 2018; Berman & Lustigman 2020), with the first nonfinite embedding restricted to a limited number of early quasi-modals and aspectual verbs (Armon-Lotem 2005; Bloom et al. 1989).

In English, the first adverbial clauses to appear are those marked by *because*, *so*, and *when*, followed by conditional *if*-clauses. Adjunct temporal clauses (*while*, *since*, *after* and *before*) appear later (Diessel 2004). Similar orders have been reported for Hebrew (Kaplan 1983; Dromi & Berman 1986) and French (Sekali 2012). Some studies found that complement clauses are the first embedding structures to appear in children’s language, and are observed as early as two years old (Kaplan 1983; Bloom et al. 1989; Berman 1997; Ayal-Smikt 2001; Lustigman & Berman 2016). Contradicting results were found with respect to whether embedded declaratives precede (Bowerman 1979; Diessel 2004) or follow (Kaplan 1983) embedded interrogatives.

Summarizing the review of the various movement and embedding structures, studies provide abundant information on the acquisition of various syntactic structures. Alongside the abundance of findings about specific structures, knowledge on the order of acquisition of these structures in relation to one another is still scarce. In this study, we tested the order of acquisition in Hebrew of various structures derived by various kinds of syntactic movement, for each participant: structures with A-movement, structures with A-bar-movement, and structures with verb movement to C. We also examined the relation between structures derived by movement and structures including embedding without movement and simple sentences. A further question we explored here related to when, in the course of acquisition of A-bar structures children master A-bar structures with intervention configuration, in which one lexical DP crosses another. We examined whether intervention configuration, which affects the comprehension and production in structured tasks, also has an effect on spontaneous speech. For this aim we compared subject- and object A-bar structures and compared the production of object A-bar structures with and without an intervening subject. Finally, within each structure we also examined whether different types of subjects (full DP, pronouns), and different types of verbs (transitive, unergative, unaccusative) affect the order of acquisition of their containing structures. We also used the extensive analysis to learn about the various types of structures and their order of acquisition (e.g., types of embedded clauses, types of relative clauses, types of wh-questions). We explored our research question using a sentence repetition task and an analysis of children's spontaneous speech.

2 The sentence repetition task

2.1 Method

2.1.1 Participants

The participants were 60 Hebrew-speaking children aged 2;2–3;10 ($M = 3;0$, $SD = 0;5$, their age distribution can be seen in **Figure 7**). None of the children had a report of a neurological condition, of language disorders, or of hearing loss.

2.1.2 Materials

The experiment included 80 sentences of eight types, 10 sentences of each type.⁴ The sentences belonged to four categories: simple sentences in SV order (with a transitive verb or an intransitive verb); sentences with A-movement (sentences with an unaccusative verb in SV order); sentences with A-bar-movement (subject relatives, object relatives, topicalization, all including two lexical DPs); sentences with V-C: VS sentences with a transitive or an unergative verb. All target sentences included four words (counting prepositions, embedding markers and case markers with the words they attach to). The average number of syllables per sentence in the different

⁴ The experiment originally included 10 additional sentences, with unaccusatives in AVS order (*etmol nišbar ha-bakbuk*, 'yesterday broke the-bottle'), but this structure was not included in the analysis presented here as it was not clear whether these are structures with verb movement to C or structures without movement in which the DP remains *in situ*.

constructions was 10 ($M = 9.6\text{--}10.9$ in each condition). The sentences were presented in random order. Simple SV sentences, sentences with unaccusatives, and sentences with V-C all started with a temporal adverb (*etmol*, yesterday), to license verb movement to the second position, and for uniformity of the elements in sentences with or without V-C. The sentences with movement were matched to the simple SV sentences in the words used and in order, and minimally differed from them in the relevant movement structure. This allowed for a comparison of sentences with and without movement, and also allowed for examining whether difficulties in repeating a sentence with movement resulted from a general difficulty in repetition (due to attention, memory or another reason, in which case the matched SV sentences would be affected as well) or to a specific structure that has not been mastered yet.

Beyond the comparison between structures, this task also allowed us to compare different kinds of verbs in sentences with otherwise identical structure. To make sentences with various verb types as similar as possible, the last word in sentences with transitives was the complement and in parallel sentences with unergatives or unaccusatives, the last word was an adjunct (prepositional place/time/manner phrase, **Table 1**). Examples of the target sentences are presented in **Table 1**.

Sentences without syntactic movement	
S-V _{transitive}	<i>etmol ha-yeled bana migdal</i> yesterday the-boy built tower
S-V _{unergative}	<i>etmol ima yašna b-a-mita</i> yesterday mom slept in-the-bed
Sentences with A-movement	
S-V _{unaccusative}	<i>etmol ha-kadur hitgalgel b-a-gina</i> yesterday the-ball rolled in-the-garden
Sentences with A-bar-movement	
Subject relative	<i>ze ha-yeled še-kibel et ha-pras</i> this the-boy that-received ACC the-prize
Object relative	<i>ze ha-perax še-ha-yeled kataf</i> this the-flower that-the-boy picked
Topicalization	<i>et ha-kova ha-ze ha-yalda ibda</i> ACC the-hat the-this the-girl lost
Sentences with verb movement to C	
V _{transitive} -S	<i>etmol bana ha-yeled migdal</i> yesterday built the-boy tower
V _{unergative} -S	<i>etmol kafac ha-šoter b-a-gina</i> yesterday jumped the-policeman in-the-garden

Table 1: Examples of target sentences in the repetition task.

2.1.3 Procedure

Each child was tested individually in their familiar environment, with no time limitation. The experimenter, Hedva Lavi, introduced the children to a shy doll of a cow that does not speak to adults. The children were asked to repeat the sentences that the experimenter said for the doll, as accurately as they can, so the doll can enjoy the game too. When needed, breaks were taken during the session. For some of the children, the task was run in two to three sessions, one or two days apart. Each session with a child took between 20 and 25 minutes, including the time allotted for acquaintance, getting to know the experimenter and her shy puppet. The research was approved by an ethics committee at Tel-Aviv University, and the participants' parents signed a consent form.

2.1.4 Error analysis

If a child produced multiple sentences in one repetition attempt, we counted their last response.

We classified responses as completely accurate repetitions; repetitions with structural errors; and repetitions with lexical errors. Structural errors involved a change in the structure of the sentence: changing VS to SV order, or changing the thematic roles in the sentence (by reversing the subject and object DPs), omission of the verb, the subject, the object, a whole clause, case markers, and embedding markers, and change of the sentence structure to a different structure (typically a complex to a simple structure). Lexical errors were substitutions of a word with one that does not appear in the target sentence (95% of the substitutions were substitutions of a temporal adverb, the rest were subject and preposition substitutions), or omission of adverbs. We counted repetitions without a structural error (even if they included a lexical error) as correct.

2.2 Results

We start the analysis of the results by presenting the comparison between sentences with movement and their minimal pair sentences without movement, after which we examine whether there are structures with similar acquisition patterns. Then, we present the order of acquisition of various types of syntactic movement and the effect of age on the performance of the children. Lastly, we describe the types of errors made in the repetition attempts. (A short report of the main findings were reported in Friedmann & Lavi 2006).

2.2.1 Differences between structures with and without movement

The correct repetition of the 60 children in each of the structures is summarized in **Figure 6**.

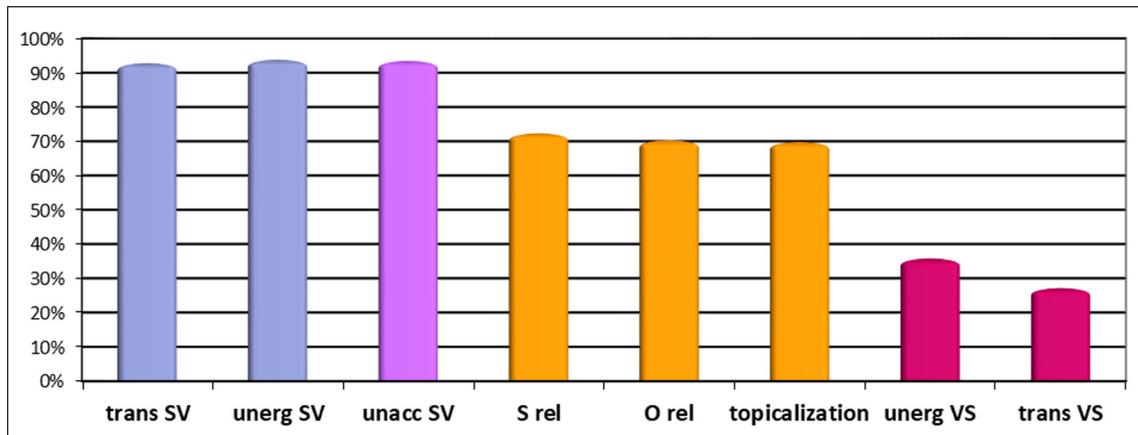


Figure 6: The rate of structurally correct repetitions for each structure.

We start by comparing structures with and without movement, using minimal pairs of a basic sentence, and the sentence derived from it through one movement.⁵ In general, sentences without movement were repeated correctly significantly more often (93%) than sentences with movement (61%), $t(59) = 7.08$, $p < .001$ (throughout the study we used an α level of 0.05 to determine significance). $SV_{\text{transitive}}$ sentences without V-C were repeated significantly better (92.8%) than the corresponding $VS_{\text{transitive}}$ sentences with V-C (27.2%), $t(59) = 13.50$, $p < .001$. $SV_{\text{unergative}}$ sentences without V-C were repeated significantly better (93.3%) than the corresponding $V_{\text{unergative}}S$ sentences with V-C (35.8%), $t(59) = 11.32$, $p < .001$. The repetition of $SV_{\text{transitive}}$ sentences (92.9%) was significantly better than that of sentences with A-bar-movement: subject relatives (72.3%), object relatives (70.3%), and topicalization (69.8%), $t(59) \geq 4.54$, $p < .001$. Thus, in all comparisons between minimal pairs of sentences with A-bar-movement or V-C movement and the parallel structures without movement, the correct repetition was significantly better for the structure without movement. In contrast, A-movement from object position was not different from SV sentences without such movement: no difference was found between $SV_{\text{unaccusative}}$ and $SV_{\text{unergative}}$ sentences, $t(59) = 0.25$, $p = .81$.

⁵ Here and throughout, we referred to sentences **without** A-bar-movement, V-C movement, and A-movement of the unaccusative object to subject position as “sentences without movement”, abstracting away from movement from VP internal subject position and from movement of the verb to I.

2.2.2 Structures with similar acquisition patterns

Next, we compared sentences in each group of sentences involving the same type of movement: sentences without movement, sentences with A-bar-movement, and sentences with V-C (A-movement was not included in this analysis, as there was only one kind of structure with A-movement). No significant difference was found between sentences without movement that included transitives or unergatives (93% and 94% average, respectively), $t(59) = 0.63$, $p = .22$. No significant differences were found between the various kinds of A-bar-movement (72% subject relatives, 70% object relatives, 70% topicalization), $F(2,118) = 0.30$, $p = .75$. Regarding structures with V-C, performance was low for both sentences with transitive and with unergative verbs, but the VS sentences in which the unergative verb moved were repeated better (36%) than sentences in which it was a transitive verb that moved (27%), $t(59) = 2.30$, $p = .01$.

To examine the internal consistency of structures with each kind of movement, Cronbach's alpha coefficients were calculated. It was found that each kind of movement (or lack thereof) is characterized by high internal consistency: SV sentences without movement yielded a Cronbach's alpha of 0.90; the three A-bar-movement structures yielded Cronbach's alpha of 0.88; and the two structures with V-C movement yielded a Cronbach's alpha of 0.82. In light of this, we could perform analyses with the rate of a kind of movement including different structures derived by the same movement.

To assess the organization of the various kinds of structures we performed a factor analysis and a correlation matrix. Three factors were found: no movement (S-V_{transitive}-O, S-V_{unergative}), A-bar-movement (subject relatives, object relatives, topicalization), and V-C movement (V_{transitive}-S-O, V_{unergative}-S) (Table 2).

As shown in Table 2, the analysis of the children's performance in repetition displays internal consistency and organization of the types of structures that agrees completely with the linguistic classification of types of syntactic movement, a finding supporting the psychological reality of this classification. Alongside the internal consistency of each kind of movement, a significant difference was found between the three movement types, $F(2,118) = 111.76$, $p < .001$. The rates of correct repetitions for the three types of structures were significantly different: there were significantly more correct repetitions of structures with A-movement (94%) than structures with A-bar-movement (71%), $t(59) = 5.98$, $p < .0001$; there were significantly more correct repetitions of structures with A-movement (94%), than there were of structures with V-C (32%), $t(59) = 14.34$, $p < .0001$; and there were significantly more correct repetitions of structures with A-bar-movement (71%), than structures with V-C (32%), $t(59) = 9.15$, $p < .0001$.

2.2.3 Order of acquisition of various movement types

Next, we examined whether it is possible to identify a fixed order of acquisition of the various structures. Based on the internal consistency findings, we combined the various structures in

Structures	No movement	A-bar-movement	V-C movement
S-V _{transitive} -O	.97	.39	.24
S-V _{unergative}	.83	.28	.23
Object relative	.37	.92	.48
Subject relative	.26	.89	.48
Topicalization	.39	.76	.53
V _{transitive} -S-O	.23	.47	.89
V _{unergative} -S	.22	.47	.78

Table 2: Factor analysis for examination of the structures' organization in sentence repetition.

each of the types of movement. The results, organized by movement types, are summarized in **Figures 7a** and **7b**, where each child is presented in a row. We defined mastery of a movement type as repetition that was at least 80% correct. Movement types that each child already mastered are colored blue in the figures. In **Figure 7a** the rows are ordered by age. As the reader can see, the age of a child does not predict mastering of the various structures: for example, a 2;3 year old child was able to repeat all structures, whereas a 3;7 year old child could only successfully repeat one type of movement – A-movement.

The seemingly chaotic results in **Figure 7a**, however, become perfectly organized if instead of by age, we order the children by the movement structures they have already mastered, as in **Figure 7b**. For this purpose, we tested whether the findings follow a Guttman scale. In questions conforming to a Guttman scale, one may, from success in an item that is higher in the scale, infer success in all items ranked below it (Guttman 1944; 1950). For example, success in solving a hard question on a test indicates success solving simpler questions (for example, success in addition of four-digit numbers indicates the examinee will succeed in addition of two-digit numbers). Applying this approach to the acquisition of syntactic structures, we examined whether we can discover a hierarchy of structures: Do children who master a certain structure necessarily also master another structure?

Indeed, we discovered that the acquisition of syntactic movements in Hebrew forms a perfect Guttman scale. When rearranging the children by the movement types they master (i.e., repeated successfully at least 80% of the sentences) as in **Figure 7b**, rather than by age (as in **Figure 7a**),

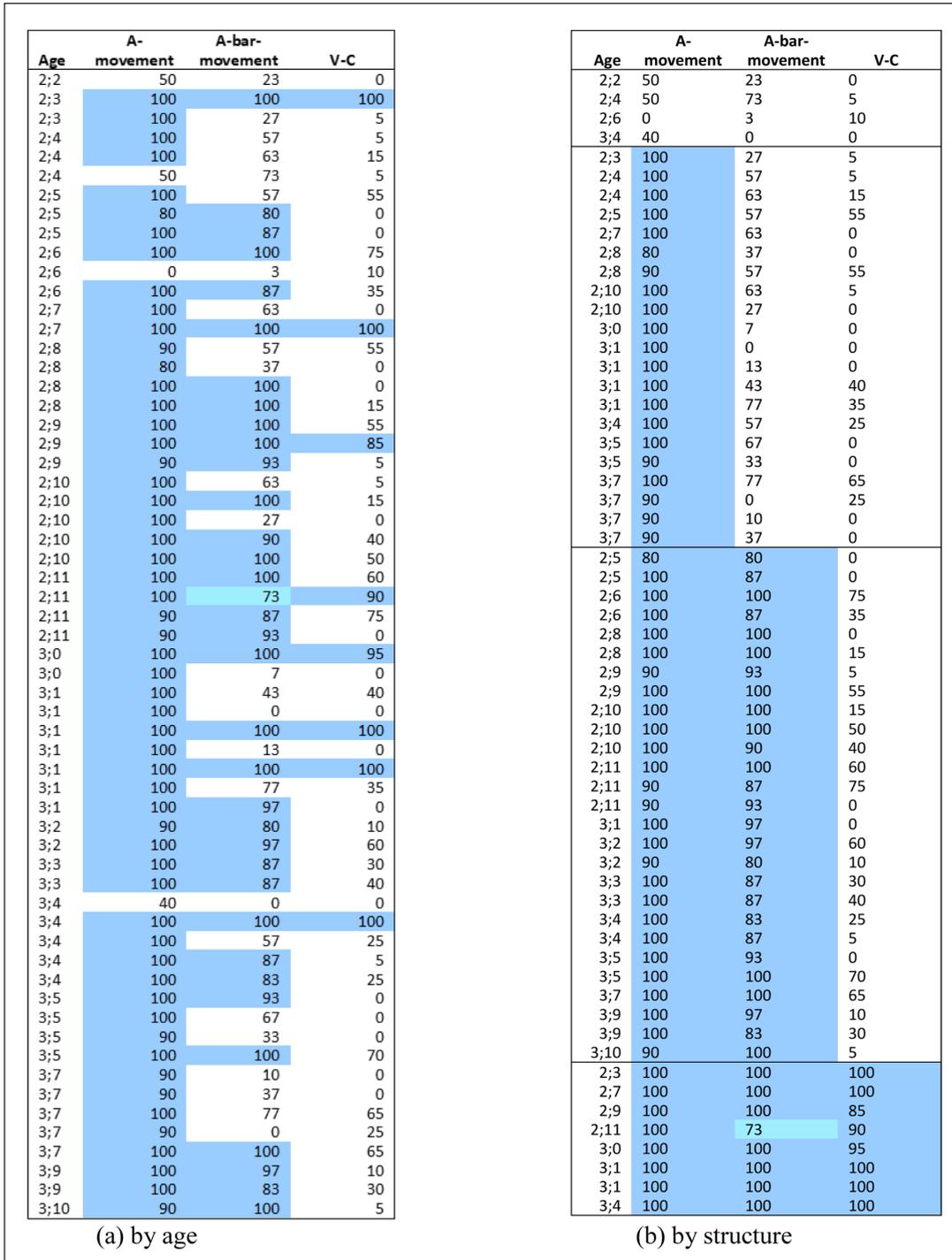


Figure 7: Patterns of success in repeating the three movement types (%correct). Blue cells indicate a structure that the child repeated at least 80% correctly. (a): The 60 participants are arranged by age. (b): The same data as (a), presented by the stage of movement acquisition: Guttman scale of the various movements.

the Guttman scale and the order of acquisition of movements in Hebrew are immediately visible: for each child, if they master V-C, they master A-bar-movement and A-movement, and if they master A-bar-movement, then they master A-movement.

This Guttman scale can be translated into an order of acquisition of the various movement structures: first, mastery of SV with unaccusatives is established, and only (but not all) children mastering this structure can successfully repeat structures including A-bar-movement which, in turn, constitute a necessary prerequisite for the emergence of V-C movement (**Figure 7b**). No Guttman scale was found between simple SV sentences and sentences with A-movement, suggesting that they are acquired together.

We found four profiles, describable by the movements a child has mastered, based on a criterion according to which successful repetition of 80% or more of a certain kind of structure is considered success in repetition and indicates that the structure has been mastered (**Figure 8**):

- a. 2 children could not repeat (did not reach 80% correct) any of the structures (not even simple SV).
- b. 23 children could only repeat simple sentences and/or sentences with A-movement (18 could repeat both, 3 could only repeat sentences with A-movement, and 2 could only repeat simple sentences).⁶

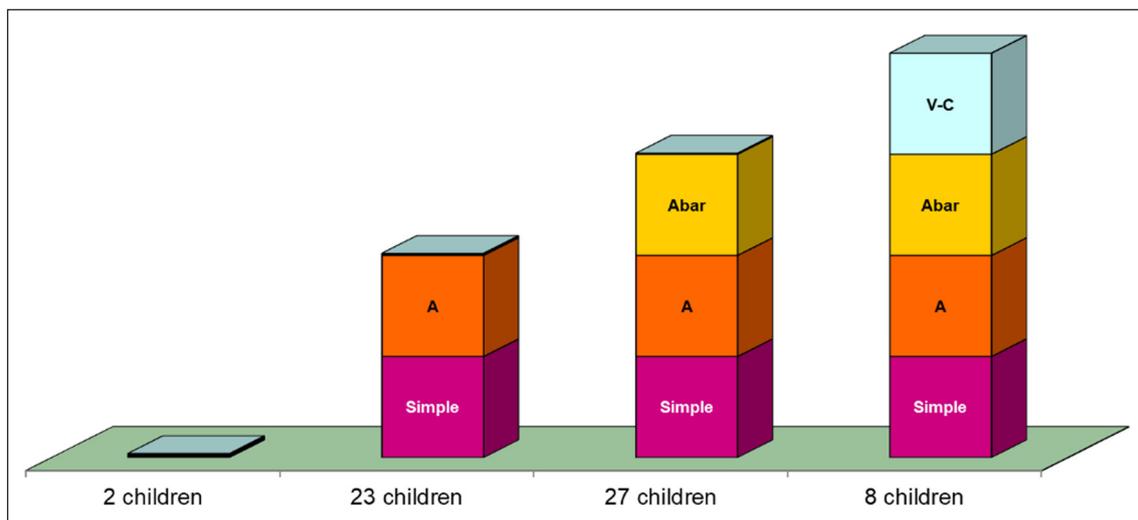


Figure 8: Order of acquisition of various kinds of movement emerging from the repetition task.

⁶ Notice that Figure 7 contains only the movement structures, so the repetition of simple SV sentences is not included in the Figure – the 2 children who repeated only SV correctly are therefore represented in the top 4 children in the Figure.

- c. 27 children could repeat simple sentences, sentences with A-movement, and sentences with A-bar-movement,⁷ but could not repeat sentences with V-C.
- d. 8 children could repeat simple sentences, sentences with A-movement, sentences with A-bar-movement, and sentences with V-C.

Namely, out of the 60 participants, 56 children acquired A-movement, 35 children acquired A-bar-movement (in addition to A-movement) and 8 children acquired V-C (in addition to A-and A-bar-movement). A remarkable property of the children's repetitions is that they displayed a perfect Guttman scale – there were no children who mastered a late movement and not a prior movement. For instance, no child successfully repeated A-bar-movement but could not repeat A-movement.

2.2.4 Age effect

To examine whether age has an effect on the acquisition of the various structures within the age range tested, we used Pearson correlations between the age of a participant and the rate of correct repetitions of the various structures, and point biserial correlations that determine correlations between the continuous variable of age and the binary variable of performance, with two values defined for it: “success” – 80% correct repetition or more, and “failure” – less than 80% correct repetitions.

Age did not correlate with any of the movement structures ($p > .80$). It only correlated with the success rate of repeating simple structures without movement, $r_{pb} = 0.27$, $p = .04$, $r_{pb} = 0.31$, $p = .02$. The correlation between age and simple structures was caused by the six children younger than 2;4. Calculating correlation without these children no longer yielded a correlation with age even for simple structures. In conclusion, age was not a good predictor for the mastery of complex syntactic structures in this age range (2;2–3;10).

2.2.5 Error types

2.2.5.1 Structural errors – errors in word order

The structural errors in the repetition of sentences with V-C mainly involved repeating the sentence in SV instead of VS order. This accounted for 406 of the errors in the repetition of $VS_{\text{transitive}}$ and for 361 of the errors in the repetition of $VS_{\text{unergative}}$. The other direction, of producing VS order instead of SV was extremely rare: it occurred a total of 4 times in the repetition of SVO sentences, once in the repetition of topicalization sentences, and never in any of the other structures.

⁷ We counted a girl who successfully repeated object relatives 80% of the time, but only 70% of the subject relatives and topicalization as a child who acquired A-bar-movement, because she showed mastery of at least one of these structures, and was close to mastery in the other two (73% in Figure 7).

In the repetition of topicalization and relative clauses, the participants mainly changed the structure of the target sentence into a sentence that does not involve movement, e.g., by changing the sentence into a simple SVO sentence, or omitting the relative clause. (See 2.2.5.2 for other kinds of omission in the repetition of relatives and topicalization structures).

2.2.5.2 Structural errors –omissions of subjects, verbs, case markers, and embedding markers

There were no omissions of the case marker *et* out of the 180 target simple SVO sentences that included a definite DP object. This indicates that children master the case marker in simple sentences from a very young age. In contrast, the difficulty in topicalization and relatives affected the repetition of the object with its case marker: out of 600 subject relatives with a definite object, there were 29 omissions of the case marker *et* (5%) and 11 omissions of the case marker along with omission of the definite article *ha-* (2%), even though the object immediately follows the verb just like in SVO sentences. In topicalization structures, where the object DP moves to the beginning of the sentence with its case marker, there were 55/600 case marker omissions.

The relative marker *še-*, ‘that’, was omitted (as an only error) in 23% (139/600) of the subject relatives, and in 6% (34/600) of the object relatives.

Omissions of subjects and verbs were rare (only 2% subject omissions and 1.1% verb omissions out of all 4800 sentences repeated).

2.2.5.3 Omissions of complements and temporal adverbs and their relation to stage of acquisition

The task was built to allow comparison between sentences comprised of the same words, differing only in structure. As a result, if there were, for example, differences between the rates of complement omissions in ‘yesterday the-boy built tower’ and ‘yesterday built the-boy tower’, we could conclude that the omission was not due to a lexical difficulty, nor a memory issue, but rather a syntactic difficulty in V-C.

The children omitted significantly more complements and temporal adverbs when they repeated target sentences V-C with transitive verbs (AVSO) than when they repeated the parallel sentences without V-C (ASVO), $p < .0001$, for complements, and $p = .02$, for temporal adverbs. They omitted significantly more complements and temporal adverbs in unsuccessful attempts to repeat sentences with V-C (uttering a sentence in SV order instead), than in successful repetitions of these sentences, $p \leq .02$ for the two comparisons ($p < .0001$ for adverb omissions in V-C sentences with unergative verbs). When the repetition of sentences with V-C maintained the correct word order, there were only few complement omissions, not more than in repetition of sentences without V-C.

Another type of observation regards the set of structures a child has already acquired, and its relation to omission rates. Firstly, children who had acquired V-C movement rarely made

complement and temporal adverb omissions in repetition of sentences with V-C. They omitted significantly fewer complements and temporal adjuncts than children who had not yet acquired V-C ($p = .01$, for complements, $p < .0001$ for adverbs).

Omission of temporal adverbs in the beginning of the sentence showed a close relation to the acquisition of A-bar-movement and to the acquisition of V-C. Children who acquired A-bar-movement made significantly fewer omissions of temporal adverbs in the beginning of the sentence than children who have not yet acquired this movement, $\chi^2 = 157.1$, $p < .0001$, with significant negative correlation between the acquisition of A-bar-movement and omission of temporal adverbs heading a sentence, $r = -.54$, $p < .0001$ (except for four children, the children who acquired A-bar-movement omitted at most five temporal adjuncts). A significant negative correlation was also found between correct repetition of V-C and omission of temporal adverbs, $r = -.31$, $p = .02$ (none of the children who acquired V-C omitted more than two temporal adverbs in the whole task). This finding is not surprising considering the position of a verb that had been moved to second position, of the DP that underwent A-bar-movement, and of temporal adverbs (of the kind we used): they all move to the CP layer. When this layer had already been fully acquired and allows V-C and A-bar-movement, a temporal adjunct can also be situated in it.

2.3 Interim summary: The repetition task

The repetition task tested the ability of 60 Hebrew-speaking children aged 2;2–3;10 to repeat simple sentences, sentences with A-movement, sentences with A-bar-movement, and sentences with V-C movement. A fixed order was found in acquisition of the various types of movement: A-movement is acquired first (together with simple SV sentences), then A-bar-movement, and lastly V-C is acquired. For each of the 60 children it was found that if V-C had been acquired, A-movement and A-bar-movement have also been acquired, and if A-bar-movement had been acquired, so was A-movement. It was found that age is not a predictor for children's success rates in the repetition of one structure or another, at least not in the age range we tested, between two to four years old.

A similar order was found for older Hebrew-speaking children aged 5–6. In a sentence repetition study by Friedmann et al. (2010), most 5–6 year olds had already mastered most types of syntactic movement by this age (that is, they correctly repeated them), the children who had not yet acquired some movement showed the exact same order we found here. Out of 35 children, the vast majority, 28 children, could already repeat all types of movement – A-movement, A-bar-movement, and V-C. The seven children who could not yet repeat all the structures obeyed the same Guttmann scale found in the repetition task with younger children: three children could repeat sentences with A-movement but could not repeat sentences with A-bar-movement or V-C. Four children could repeat A-movement and A-bar-movement, but could not repeat sentences with V-C.

The findings also suggest a close relation between omissions in repetition and the syntactic stage the child has reached: children omitted significantly more elements (e.g., complements, case markers, adverbs) when they have not acquired the relevant structure yet.

3 Analysis of spontaneous speech

We further examined the order of acquisition of the various types of syntactic movement using analysis of spontaneous speech of children in various acquisition stages, by looking for all the structures of interest within the samples of each child, and exploring when each of the various syntactic structures appears in the speech samples. The basic rationale was that if we see children who produce only structure A, and children who produce structures A and B, but no children who produce only structure B without A, we can conclude that structure A is acquired before structure B. This approach allows for the estimation of order of acquisition without relying on age. In addition, for each structure, we also looked for the age in which it first appears in the samples, and the age from which on most children already produce it.

3.1 Method

3.1.1 Participants and samples

The analysis of spontaneous speech included language samples of 61 children: for analyses at the group level, we analysed samples of 56 children, one sample per child, and for identification of processes over time at the individual level, we analysed longitudinal data of 5 more children (reported below in Section 3.3). The sources of the samples were Bibi (2003), Davidson (2002), samples gathered as part of studies by Dromi et al. (Dromi et al. 1997; 1999; Tur-Kaspa & Dromi 2001), and Berman's samples from CHILDES (MacWhinney 1991; Berman 2004a; b).

We counted the clauses in each sample, defining a clause as a structure involving predication of any kind – verbal, nominal, or adjectival. As seen in **Table 3**, the samples of the 20 youngest

Age group	Number of children	Number of clauses in the sample	Average number of clauses in the sample (SD)	Total number of clauses
1;6–2;3	20	3–108	47 (26)	931
2;5–3;3	18	94–200	143 (38)	2,580
3;5–6;1	18	86–200	161 (35)	2,889
Total	56	3–200	114 (61)	6,400

Table 3: Group level: Description of the samples.

children contained a relatively small number of clauses. To assure that the scarcity of clauses among young children is a consequence of the stage of language development they are in, and not of lack of opportunities to produce clauses, we included samples of young children with 50 or fewer clauses only if their interactions involved at least 100 turns, took place in the child's familiar environment (their home) and their interlocutors were first-degree relatives. The range of number of turns in samples with 50 clauses or less was 103–189 turns ($M = 148$, $SD = 33$). For samples that included many clauses, we analysed the first 200 clauses, to create comparable sample size among the children.

3.1.2 The structures analysed

Each sample was tested for the presence of the following structures: simple structures in SV order, structures with A-movement, structures with A-bar-movement, embedding structures (no A-bar-movement), and structures with V-C. **Table 4** summarizes all the structures for which we looked in each sample. For each of these structures, we tested whether they appear as a grammatical sentence at least once in a sample. Unlike the repetition task, in which it may be that a child properly repeated a sentence phonologically without having acquired the structure yet, we assumed that in spontaneous speech, if a child produces a structure correctly on their own volition and initiation, this indicates that the structure is part of their grammar. We did not count sentences that appeared as part of an exact repetition of the interlocutor's words or a recitation. The analysis included only autonomous structures. Fragments that are context-supported clauses (e.g., van Riemsdijk 1978; Lustigman 2016; Shen 2018) were not included in our analyses, and neither were sentences that could not be unambiguously classified to one of the categories.

For simple SV structures we analysed separately sentences with a lexical DP subject and sentences with a pronoun subject (this allowed us later to examine whether the use of pronoun subjects in A-bar structures was related to the intervention configuration or to a general preference for pronoun subjects). Within sentences in subject-verb order, we also distinguished between sentences with unergative and sentences with transitive verbs. Simple sentences in SV order, structures with A-movement, and sentences with V-C were coded only when they included an overt subject, to allow for a classification of SV and VS orders.

For sentences with unaccusatives we distinguished between lexical subjects and subjects that are pronoun, a deictic term (*ze*, 'this'), a proper name, or a kinship term such as "grandma" or "dad" (below we call all these subjects *prodenakin* subject), because of their different distributions in Hebrew: lexical DP can precede or follow the unaccusative verb, *prodenakins* can only precede it.⁸

⁸ The verbs *ba* 'came' and *higia* 'arrived' were not included in the analyses, since it was not clear in some of the sentences whether they were functioning as unaccusative or unergative verbs.

Sentences without syntactic movement	simple sentences	SV _{trans} O	lexical subject
			pronoun subject
		SV _{unerg}	lexical subject
			pronoun subject
	V _{unacc} S	lexical subject	
		*pronoun/proper name/kinship term	
	V _{passive} S		
Sentences with A-movement	SV _{unacc}	lexical subject	
		pronoun subject	
	SV _{passive}		
	raising	<i>seem</i> raising	
Sentences with A-bar-movement	relatives	subject relatives	correct
			*with a resumptive
		object relatives	DP object relatives without a resumptive pronoun
			DP object relatives with a resumptive pronoun
			PP relatives with a resumptive pronoun
			*PP relatives without a resumptive pronoun
		relative clauses with a pronoun head	subject
			object
		existential relative (<i>še-yesh</i> , that one has)	
		topicalization	
wh-questions	object VP		unaccusative
			agentive
	subject		which
			who
	object		which
			who
	adjunct		
Yes/no questions	yes/no questions	root questions	
Embedding without movement	verb embedding (finite clause, with a verbal or a DP/AP predicate)	embedded declarative (<i>še-</i> , that)	
		embedded wh-question	
		embedded yes/no (<i>im</i> , if)	
		direct speech (embedded quotation)	
	noun embedding		
verb embedding – nonfinite			
Sentences with V-C movement	V _{trans} SO	with a trigger	‘do’, ‘was’
			lexical verbs
		without a trigger, in a storytelling context	
V _{unerg} S	with a trigger		
	without a trigger, in a storytelling context		

Table 4: The types of structures analysed in the samples.

For relative clauses and questions, we coded the element that moved (subject, DP object, PP object, adjunct). For questions, we also analysed separately object questions that are answered by a verb phrase (e.g., *ma ata ose*, what you do ‘what are you doing?’). We analysed separately wh-questions and yes/no questions (which do not involve A-bar movement), and root and embedded questions.

For relative clauses, we also coded whether the structure included a resumptive pronoun, and for object relatives we also considered relatives with an arbitrary pro subject. In the analysis of topicalization structures we included sentences in which a complement (if it was a definite DP, with the case marking *et*), a prepositional complement, or an adjunct moved to the beginning of the sentence, in sentences with a finite main verb. We took a conservative approach, so that if we were not sure whether there had been movement in a sentence, we did not regard it as a topicalization structure, so sentences that start with an adverbial like *kaxa* ‘like this’ or *šam* ‘there’ were not analysed as instances of topicalization.

For the analysis of intervention configurations, we further checked for each of the relative clauses, questions, and topicalization whether two full (lexical) DPs are realized in the sentence, or whether at least one of the DPs was non-lexical (e.g., a pronoun at the head of a relative clause, a pronoun in the embedded subject position, or a free relative clause, with a wh-element as its head). For this analysis we also coded separately lexically-restricted questions (*which*-questions) and bare questions (*who*-questions) in subject and object questions, because the lexically-restricted, but not bare wh-morphemes, create intervention structures of the type that have been shown to be difficult in comprehension.

In the analysis of embedding without A-bar movement we considered the various types of clausal embedding (embedding to a verb or embedding to a noun, embedded declaratives, embedded wh-questions and embedded yes/no questions, finite and nonfinite embedded clauses, complement and adjunct clauses).

V-C structures were classified into sentences with a trigger in Spec-CP and occurrences in the context of telling a story (so called “narrative V1”), the two options for V-C in Hebrew.

3.2 Results: Spontaneous speech samples of 56 children

Similarly to the repetition task, the analysis of spontaneous speech yielded a very clear Guttman scale between various types of movement and embedding. We start by presenting findings regarding the order of emergence of the various structures, then we examine the relation between age and the emergence of each structure, and finally we present a structure-by structure analysis of the data.

3.2.1 The order of emergence of various types of movement and embedding

The sentence production pattern of 56 children can be ascribed to one of the following five profiles (Figures 9 and 10):

1. None of the structures – (no SV, no A, A-bar, V-C movement, no embedding).
2. Simple SV sentences and/or structures with A-movement. As we report in detail below - there was no Guttman scale between these structures.
3. Simple SV sentences, structures with A-movement, and wh-questions.⁹
4. Simple SV sentences, structures with A-movement, wh-questions, other structures with A-bar-movement (relatives clauses and/or topicalization), and finite clausal embedding without A-bar movement.
5. Simple SV sentences, structures with A-movement, structures with A-bar-movement, clausal embedding without movement, and V-C with lexical verbs.

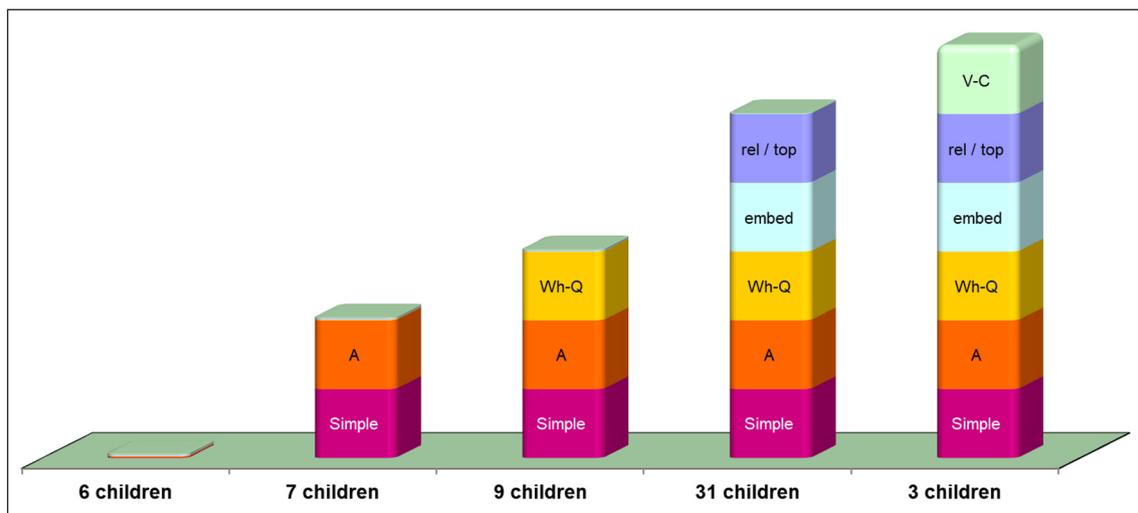


Figure 9: The different profiles of acquisition in the samples.

⁹ Two of these children seem to be part of this profile – they produced simple structures and structures with A-bar-movement, but we could not determine whether they had acquired A-movement since they did not produce any unaccusative verb in the samples. Another child who was included in this stage did not produce a simple SV structure, but he did produce an object question that included SV with a transitive verb.

AGE	SV simple	SV unacc.	VS unacc.	Wh question	Relative clause	Topicalization	Embedding	V-C
23		No unacc V	No unacc V					
23		No unacc V	No unacc V					
23		No unacc V	No unacc V					
24		No unacc V	No unacc V					
24		No unacc V	No unacc V					
25			✓					
22	✓	No unacc V	No unacc V					
22	✓		✓					
23	✓	No unacc V	No unacc V					
26	✓	✓						
27	✓	No unacc V	No unacc V					
35	✓	✓	✓					
38	✓	✓	✓					
18	✓	No unacc V	No unacc V	✓				
20	✓	No unacc V	No unacc V	✓				
22	✓	✓		✓				
23	✓	✓		✓				
23	✓	✓		✓				✓ do
24	✓	✓	✓	✓				✓ do
24	✓	✓		✓				
25	✓	✓	✓	✓				✓ do
26		✓	✓	✓				✓ do
29	✓	✓	✓	✓			✓	
30	✓	✓	✓	✓	✓		✓	
30	✓	✓		✓		✓		
32	✓	✓		✓	✓		✓	
33	✓	✓	✓	✓		✓	✓	
35	✓	✓		✓			✓	
35	✓	✓	✓	✓	✓		✓	
35	✓	✓		✓			✓	
36	✓	✓	✓	✓	✓		✓	
36	✓	✓		✓	✓		✓	
37	✓	✓	✓	✓		✓	✓	
37	✓	✓		✓	✓	✓	✓	
39	✓	✓	✓	✓	✓		✓	
39	✓	✓	✓	✓		✓	✓	
39	✓	✓	✓	✓	✓		✓	
41	✓	✓	✓	✓		✓	✓	
43	✓	✓	✓	✓	✓		✓	
48	✓	✓	✓	✓	✓		✓	
51	✓	✓	✓	✓		✓	✓	
53	✓	✓	✓	✓	✓	✓	✓	
57	✓	✓		✓	✓		✓	
58	✓	✓		✓	✓	✓	✓	
58	✓	✓	✓	✓	✓		✓	
59	✓	✓	✓	✓	✓	✓	✓	
61	✓	✓		✓	✓	✓	✓	
62	✓	✓		✓	✓		✓	
63	✓	✓	✓	✓	✓		✓	
64	✓	✓		✓	✓	✓	✓	
68	✓	✓	✓	✓		✓	✓	
70	✓	✓	✓	✓	✓	✓	✓	
67	✓	✓	✓	✓	✓		✓	✓
68	✓	✓		✓	✓	✓	✓	✓
73	✓	✓	✓	✓	✓	✓	✓	✓

Figure 10: Production profiles of various types of movement and embedding, from which it is possible to draw the order of appearance of these structures. Ages are given in months. Blue cell: the structure appeared in the child’s sample. Unshaded empty cell: no grammatical sentence appeared of this structure. Grey shaded cell: The sample did not include unaccusative verbs.

These findings allow us to identify an order in the appearance of the various structures in the young children's spontaneous speech: simple structures with no (order-changing) movement and structures with A-movement appear first, following these, structures with A-bar-movement appear– first represented only by wh-questions, and then (finite) sentential complements appear, together with relative clauses and topicalization, and finally verb movement to C (with lexical verbs) appears. The order of acquisition that arises from the analysis of young children's spontaneous speech is identical to the order that arose in the repetition task.

3.2.2 Age effect

The analysis of acquisition of the various structures by age indicated that different children proceed through the acquisition of syntactic structures at different paces. Similarly to the findings in the repetition task, although there is a very clear order of acquisition of structures for all children, manifesting a Guttman scale between the various types of structures, these structures are acquired at different ages for different children. As seen in **Figures 7, 10 and 11**, each stage includes children in very different ages, and children in the same age belong to different stages of acquisition. Children who did not produce any structures were the youngest (up to 2;1 years old), but there were young children who produced a variety of structures. Similarly, children who produced all movements and embedding were older, but there were older children who still could not produce all structures.

Age had no effect, apart from the peripheries – each structure has a youngest age in which it can be found, before which no child produced it (an age we termed “emergence age”), and for a large part of the structures we could identify a “stabilization age” from which on it appears in 80% or more of the samples, thus most children older than it have already acquired it. The main point here is that a stage during which children acquire a specific structure may span over several years, from the age of emergence (in at least one child's speech) to the age stabilization (in which most children already produce it). Within this range the variance between children is tremendous, and very few correlations with age can be seen, as shown in **Tables 5 and 6**.

Table 5 summarizes the following factors regarding each of the different structures: first age of emergence in the samples, age from which on the structure stabilizes, the percentage of samples containing the structure from the stabilization age on, and the rate of samples that include the structure within the acquisition range (as a measure of independence from age). Appearance rates of structures with an unaccusative verb were calculated out of the number of samples that included at least one unaccusative verb (46 samples).

Movement type	Structure	Age of emergence (1 st appearance)	Age of stabilization, %children who produced the structure from this age on	% of samples that include the structure within the acquisition range (between emergence and stabilization)
Simple sentences	SV _{unerg/trans}	1;6	88% from 1;6 (100% from 2;3)	Emergence = stabilization
Nonfinite embedding	Nonfinite embedding	1;6	87% from 1;11 (100% from 2;3)	11%
A movement	SV _{unacc}	1;10	96% from 1;10	Emergence = stabilization
A-bar-movement	Wh question	1;6	92% from 2;5	45%
	Topicalization	2;6	(75% from 4;0)	50%
	Relative clause	2;6	88% from 3;7	39%
Finite embedded clause	Finite embedding (No A-bar movement)	2;5	89% from 2;5 100% from 3;3	73%
V-C (with a lexical verb)	V _{unerg/trans} S	5;7	no stabilization before 6;1	-

Table 5: For each structure: Age of emergence, age of stabilization (the age from which at least 80% of the children produced this structure), appearance rates from age of stabilization on, and % of samples that include the structure within the acquisition range.

Age	Wh question	Relative	Topicalization	Embedding	V-C
1;6					
1;8					
1;10					
1;10					
1;11					
1;11					
1;11					
1;11					do
1;11					
2;0					
2;0					
2;0					do
2;0					
2;1					
2;1					do
2;2					
2;2					do
2;3					
2;5					
2;6					
2;6					
2;6					
2;8					
2;9					
2;11					
2;11					
2;11					
2;11					
3;0					
3;0					
3;1					
3;1					
3;2					
3;3					
3;3					
3;3					
3;5					
3;7					
4;0					
4;3					
4;5					
4;9					
4;10					
4;10					
4;11					
5;1					
5;2					
5;3					
5;4					
5;7					
5;8					
5;8					
5;10					
6;1					

Figure 11: Acquisition ranges of the main structures (from age of emergence to the structure’s stabilization). Light-blue cell: the structure appeared in the child’s sample. White cell: the structure did not appear. Black windows frame the range of ages of appearance until stabilization.

3.2.3 Detailed analysis by structure

3.2.3.1 Simple structures in SV order

49 of the samples included a sentence with a transitive or an unergative verb in SV order, with no significant difference between SV structures with a transitive verb (79%, 44/56 of the samples) and with an unergative verb (86%, 48/56), $\chi^2 = 0.97$, $p = .32$. We refer below to sentences in S-V order both with unergative and with transitive verbs as SV sentences. (see example 1, all the examples are taken from the samples, the age of the child who produced them appears in parentheses).

(1) **SV unergative**

Pronoun subject: *hu boxe* (2;6)
 he cries
 ‘He is crying.’

Full DP subject: *ha-yeladim boxim* (3;0)
 the-children cry.PL
 ‘The children are crying.’

SV transitive

Pronoun subject: *ani roce t-a-mašrokit* (3;3)
 I want acc-the-whistle
 ‘I want the whistle.’

Full DP subject: *ha-naxaš našax ota* (3;3)
 the-snake bit her
 ‘The snake bit her.’

Type of subject. No significant difference was found between a pronoun subject (82%, 46/56) and a lexical DP subject (79%, 44/56), $\chi^2 = 0.23$, $p = .63$ in simple SV sentences.

Age. Simple SV structures with an explicit subject appeared in most of the samples. They emerged (both SV_{trans} and SV_{unerg}) at age 1;6 (Table 5), and from age 2;3 they appeared in 100% of the samples.

3.2.3.2 Structures with A-movement

We looked in the samples for three types of structures with A-movement: sentences with an unaccusative verb in SV order, verbal passive constructions in SV order, and (*seem*) raising constructions. SV sentences with an unaccusative verb were produced by 44 of the children. In contrast, none of the children produced a grammatical passive, and only a single raising construction was produced, by a 5;7 year old child who produced a single raising construction.¹⁰

¹⁰ The sentence was *ze nira li yoter naxon lul le-tinok*, it seems to-me more accurately playpen for-baby. Even this sentence raises the question whether it really includes raising of “it” that refers to a specific object or whether it is a pleonastic “it”.

That is, A-movement was represented almost exclusively by sentences with an unaccusative in SV order (see example 2).

- (2) **SV unaccusative** *tarnegolet neelma* (3;3)
 hen disappeared.FEM
 ‘A hen disappeared.’

Comparison between sentences with an unaccusative verb in VS and SV order. Sentences with an unaccusative verb appeared in SV order in 96% of the samples in which an unaccusative verb appeared (44/46), a rate significantly higher than that of VS order (59%, 27/46), $p < .05$. The structures with unaccusatives occurred in one of the following profiles: 19 children produced structures with unaccusatives exclusively in SV order (41%); 25 children produced structures with unaccusatives in both orders – SV and VS (54%); and only two children produced structures with unaccusative in VS order only (4%). Were these the younger children who showed a pattern of producing unaccusatives in VS order only? The data shows that this is not the case. Out of 11 children under the age of two, three produced unaccusatives only in SV order, and one produced unaccusatives only in VS order. This indicates that there is no early stage at which the children produce unaccusative in VS order only and not in SV order, which could have served as testimony to a stage in which A-movement of an unaccusative verb’s complement had not yet been acquired.

Type of subject. In Hebrew, pronouns/deictic terms/proper names/kinship terms (which we call “prodenakin” for short) can appear with unaccusatives only in SV order (e.g., *hu nafal*, he fell, but not **nafal hu* *fell he, *saba nafal*, grandpa fell, but not **nafal saba*, *fell grandpa), whereas full (non-kinship) lexical DPs can appear both before and after the unaccusative verb (e.g., *ha-iparon nafal*, the-pencil fell-down, and *nafal ha-iparon*, fell-down the-pencil). Lexical DP subjects appear in 48% of the samples (22/46) in SV order and in 57% of the samples (26/46) in VS order, with no significant difference between the orders, $\chi^2 = 0.7$, $p = .40$. In 28% of the samples (13/46) a lexical DP subject appeared in both orders (SV and VS). In contrast, a prodenakin subject almost exclusively preceded the unaccusative verb, as it does in adult Hebrew. Prodenakin subjects appeared in SV order in 39 of the samples (85%), and only twice in VS order. The difference between SV and VS with a prodenakin subject was significant, $p < .001$.¹¹ Thus, whereas lexical DP subjects appeared before and after unaccusatives at similar rates, prodenakins appeared almost exclusively before an unaccusative, as in adult language. This suggests that from the beginning of using unaccusatives, children know the rules that dictate that a pronoun/deictic/proper name/kinship term can appear only before an unaccusative verb.

¹¹ There was an additional sentence produced by a 6;1 year old child in which a proper name subject appeared after the unaccusative verb (*nafla ya’el be-yaxad im ha-kise*, fell Yael together with the-chair), but it was part of a story she told, and so it seems to be an acceptable case of V-C. This child also produced sentences with V-C with unergatives and transitives.

Possessive dative. From age 2;5, many children produced unaccusatives in both VS and SV order with a possessive dative (PD), which is a marker of internal arguments. Of the 36 children over the age of 2;5 who produced an unaccusative verb in SV/VS order, 18 also produced it with a possessive dative – 13 produced them in the order V-PD-S, 2 produced PD-V-S, and 10 produced S-V-PD (including some children who produced the PD in several orders).

Age. From the first sample that included an unaccusative verb, which was of a child aged 1;10, SV structures with an unaccusative appeared, and from this age on appeared in 96% of the samples.

VS order with unaccusative and unergative verbs: Children can tell the difference. A significant and theoretically important difference was found when we compared the children's production of VS sentences with unergative verbs to the production of VS sentences with unaccusative verbs. Whereas many of the children produced VS sentences with unaccusatives (59%, 27/46), almost none of them produced VS sentences with unergative verbs (5%, 3/56), a difference that was significant, $p < .0001$. This finding indicates that the children distinguish unaccusatives from unergatives and that they analyse the VS order differently with unaccusatives, for which this order is the base-generated one and does not involve movement, and with unergatives, for which this order is derived by verb movement to C.

In conclusion, A-movement, apart from one production, was presented only by SV sentences with unaccusatives, which children started producing very early. Unaccusative verbs appear in the children's spontaneous speech both in SV and in VS order, and there is no stage at which children produce unaccusatives only in VS and not in SV order. The difference in the rates of production of VS structures with unergatives and unaccusatives further indicates that children distinguish the two kinds of verbs and their argument structures from an early age.

3.2.3.3 Structures with A-bar-movement: Questions, topicalization and relative, clauses

Comparison between various structures derived by A-bar-movement. Wh-questions, relative clauses, and topicalization are all derived by the same type of movement – A-bar-movement. One of the most important findings of the spontaneous speech analysis is that the structures derived by A-bar-movement are not acquired together. Wh-questions were the first of the A-bar structures to appear in the children's spontaneous speech. Taking a chronological age approach for a moment, of the 21 youngest children, aged 1;6 to 2;5, ten, including the youngest child, aged 1;6, had already produced a wh-question, but none had produced relatives nor topicalization, which only start to emerge from age 2;6.

As in the previous structures, we concentrated on a Guttman scale approach: to identify the order of emergence of the three kinds of A-bar-structures we checked which one appears as a sole A-bar-structure, without the others. We found that wh-questions were the type of

A-bar-structure that appeared alone the most, as compared to the other structures: in 21% of the samples (12/56) a wh-question appeared with no other A-bar-structure, and in 54% of the samples (30/56) a wh-question appeared along with another A-bar-structure. Only in one sample (2%) no wh-question appeared, but another type of structure derived by A-bar-movement appeared. This pattern points to a clear acquisition order: wh-questions are acquired before relatives and topicalization. No Guttman scale relation was found for relative clauses and topicalization: there were 9 samples with topicalization and no relative clauses, 10 with relative clauses and no topicalization, and 12 samples in which they both appeared.

Questions

Of the 56 children, 42 (75%) produced at least one kind of wh-question (3).

(3) Object question-what	<i>ma ani axin l-ax?</i> what I prepare.FUT for-you.FEM? 'What will I prepare for you?'	(1;10)
Object VP question	<i>ma at osa l-i?</i> what you.FEM do to-me? 'What are you doing to me?'	(1;6)
Subject question	<i>mi boxe?</i> who cries? 'Who is crying?'	(1;6)
Adjunct <i>where</i> question	<i>efo tinok boxe?</i> where baby cries? 'Where is a baby crying?'	(1;8)
Yes/no question	<i>ata oxel?</i> you.MAS eat? 'Are you eating?'	(2;0)

Types of questions. Several types of wh-questions appeared, in similar rates: subject questions (39%, 22/56), object questions (45%, 25/56), adjunct questions (52%, 29/56) and object questions about a verbal phrase (43%, 24/56–21 samples with a question about agentive VP *what did X do?*, and 6 with a question about an unaccusative- *what happened to-X/here?*). See examples in (3), and see Appendix A for the distribution of the various types of questions that appeared in the samples. Bare questions (e.g., *who*, *what*) occurred significantly more often (75%, 42/56) than lexically-restricted (*eize* 'which') questions, which appeared as a question with a main verb only once, $p < .0001$.

Subject and object questions appear simultaneously. In 18% (10/56) of the samples only subject questions appeared, and in 18% (10/56) of the samples only object questions appeared. The two kinds of questions appeared together in 21% (12/56) of the samples.

Yes/no questions, questions without A-bar movement, appeared in 66%, 37/56 of the samples, a rate that did not differ from that of wh-questions, $\chi^2 = 1.4, p = .24$.

Age. Wh-questions appeared in the language samples of the youngest children, including the youngest child who was one-and-a-half years old. Wh-questions appeared in most samples (81% of the samples that included any type of verb). From age 2;0 they appeared in 86% of the samples that included a verb, and from age 2;5 all children except three had already produced wh-questions (Appendix A). All types of wh-questions – subject, object, adjunct, and verbal phrase, appeared in samples of young children under the age of two (1;6, 1;10, 1;8, 1;6, respectively).

Topicalization

Topicalization structures appeared in 38% of the samples (21/56). Eighteen of these samples included an overt DP subject; 17 of these involved the topicalization of a DP object (example 4), and in one a PP adjunct was topicalized (recall that we did not include in this analyses preposed adverbials).

- (4) *nešika hu noten l-a* (2;6)
 kiss he gives to-her
 ‘A kiss he is giving her.’

Age. The first topicalization structure appeared at age 2;6, and from age 4;0 it appeared in 75% of the samples.

Relative clauses

The first grammatical, adultlike relative clause was produced by a 2;6 year old child. Two additional children aged 2;8 and 2;11 produced a relative clause. Then, a relative clause explosion strikes at around age 3;1, and relative clauses of various types appear. From age 4;5, all 14 children apart from one produced some type of relative clause in the samples (see Appendix B for the different kinds of relative clauses in the samples, and (5) for examples for relative clauses the children produced).

- (5) **Subject relative** *ze ha-iš še-šar* (2;8)
 This-is the-man that-sings
 ‘This is the man who sings.’
- Object relative** *ani ekax od cura še-ani roce* (3;1)
 I take.FUT another shape that-I want
 ‘I will take another shape that I want.’

Subject and object relatives. No Guttman scale could be identified between subject- and object relatives: 7 children produced only subject relatives, 3 produced only object relatives, and 11

produced both. As we shall see later (Section 3.3), the longitudinal data from children documented continuously also shows no consistent precedence for subject over object or vice versa. In the samples of 3 of the longitudinally-sampled children included object relatives preceded subject relatives, whereas the other two produced subject relatives before object relatives.

Subject relatives appeared in 32% of the samples (18/56) and object relatives appeared in 25% of the samples (14/56), with no significant difference between the two kinds of relative clauses, $\chi^2 = 0.7$, $p = .40$. Even when looking separately at relative clauses with a lexical head and relative clauses headed by a demonstrative pronoun, the similarity between subject and object relatives remains. (With a lexical head: subject relatives – 32%, object relatives – 21%, $\chi^2 = 2$, $p = .16$; with a pronoun head: subject relatives – 9%, object relatives – 13%, $\chi^2 = 0.37$, $p = .54$). DP object relatives also did not differ from PP object relatives (11 and 6 of the samples, respectively, $\chi^2 = 1.73$, $p = .19$).

The relative head. Relative clauses with a pronoun head appeared in 14% of the samples (8/56) – more than a third of the samples in which any relative clause appeared. Subject relatives headed by a pronoun appeared in 5 samples, and object relatives headed by a pronoun appeared in 7 samples. Subject relatives headed by a lexical DP appeared in 18 samples, significantly more than subject relatives headed by a pronoun, $\chi^2 = 9.25$, $p = .002$. No significant difference was found between object relatives headed by a pronoun or a lexical DP, $\chi^2 = 1.58$, $p = .21$. All PP object relatives were headed by a lexical DP. All children who produced a relative clause headed by a pronoun also produced a relative with a lexical head.

Arbitrary pro in PP object relatives. A DP object relative with an arbitrary pro subject appeared in the samples of four children: three produced them with a pronoun head (*ma* ‘what’, *mašehu* ‘something’) and one with a lexical head.

Resumptive pronouns. In Hebrew, resumptive pronouns are ungrammatical in the trace position in subject relatives, optional in DP object relatives, and obligatory in PP object relatives. Studies that used structured tasks to elicit object relatives found that children tended to produce DP object relatives with a resumptive pronoun. Spontaneous speech paints a different picture: only two of the 56 children produced their DP object relatives with a resumptive pronoun, one of them produced an object relative without a resumptive pronoun as well. There were, then, significantly more DP object relatives without a resumptive pronoun than DP object relatives with a resumptive pronoun, $p = .03$. Grammatical PP object relatives, with a resumptive pronoun, appeared in 7 of the samples, and only once without the obligatory resumptive pronoun.

Seven children produced subject relatives with a resumptive pronoun in the embedded subject position, which is ungrammatical in adult Hebrew (e.g., **hine ha-beygale ha-arox še-hu haya aba*, ‘here is the-bagel the-long that-he was father’), 5 of them also produced a grammatical subject relative without a resumptive pronoun; 13 other children produced only grammatical subject relatives, without a resumptive pronoun. It is interesting to note that all the earliest subject relatives, uttered by children aged 2;6–3;3, were correctly produced without a resumptive pronoun.

No intervention configuration in the A-bar-structures

Beyond the order of acquisition, possibly the most important result is that even though children produced many A-bar-structures, none of these structures included an intervention configuration in which a lexical DP crosses over another lexical DP (Friedmann et al. 2009) (with the exception of a single sentence of a single girl aged 5;8).

In all **object questions**, apart from one, the moved wh-element was not lexically restricted (e.g., *et mi* ‘ACC-who’, or *ma* ‘what’, see example 3). The one lexically-restricted question that appeared was an object question, uttered by a 5;8 year old child, but it did not include a crossing movement since the subject was a *pro* (null pronoun: *eize tinok nasim po levad?* which baby put.1st. PL.FUT here alone? ‘which baby should we leave here alone?’). It is interesting to note that of the 42 children who produced wh-questions, 11 also produced *which* + DP questions (grammatical in the null-copula Hebrew). They just refrained from using it in object questions.

Similarly, none of the **object relatives** included movement of a lexical DP over a lexical DP subject. All object relatives with a lexical head had a pronoun, a *pro*, or arbitrary *pro* as a subject, and the rest of the object relatives were free object relatives – they had a non-lexical head (see example 6). On the other hand, out of the 18 samples that included subject relatives, 61% (11/18) contained subject relatives with two lexical DPs. This indicates that children do not refrain in general from two full DPs in the sentence, they only refrain from 2 DPs in intervention configuration. Additionally, in most relatives and topicalization in which the DP that moved was full, the subject over which the object crossed was a pronoun. Can one say that this is caused by the children producing sentences only with a pronoun subject? Not at all. When looking at the simple sentences in SV order, all children who had produced a relative or embedded clause, except one, produced a simple sentence with a lexical DP subject.

- | | | | |
|-----|--|--|--------|
| (6) | Object relative
(pronoun subject) | <i>al ha-naxaš ha-zoti še- at maxzika ot-o</i> | (3;3) |
| | | on the-snake the-this that-you.FEM.SG hold him | |
| | | ‘On this snake that you are holding.’ | |
| | Free object relative | <i>efšar la-sim po ma še-(arbpro)-rocim</i> | (4;9) |
| | | possible to-put here what that-want.PL.3SG | |
| | | ‘one can put here whatever they want.’ | |
| | Object relative (pro subject) | <i>hine ha-gorilla še-macat</i> | (4;9) |
| | | here the-gorilla that-found.FEM.2SG | |
| | | ‘Here is the gorilla that you found.’ | |
| | Object relative (pronoun subject) | <i>nesaxek be-xayot še-ani ohev</i> | (5;10) |
| | | play.1PL.FUT with-animals that-I like | |
| | | ‘We will play with animals that I like.’ | |

The same was seen in **topicalization** structures: except for one sentence, none of the topicalization structures included a lexical DP crossing over another lexical DP (see example 4 above). Of the

17 topicalization structures that were produced in which a DP object was preposed across an overt subject, there were 10 sentences with two pronouns, and 6 sentences with one lexical DP (the moved object or the subject) and one pronoun. There was only one DP topicalization structure with two lexical DPs, produced by a girl aged 5;8.

3.2.3.4 Clausal embedding

Here and throughout the article, we use the terms “sentential embedding”, “clausal embedding”, or “embedded clauses” to refer to *finite* embedded clauses that are not derived by A-bar movement – i.e., without relative clauses. (When we discuss nonfinite embedded clauses below, we specify that we refer to nonfinite clauses). Such embedded clauses, embedded to a verb or a noun, appeared in 57% of the samples (32/56). They emerge at age 2;5, stabilizing at age 3;3 (from which point embedding appears in 100% of the samples).

The acquisition of embedded clauses relative to root declaratives and questions. Embedded clauses, both declarative and interrogative, are acquired later than the parallel root sentences, as indicated by the Guttman scale created between them. Root declarative sentences appeared without embedded declaratives in 23 samples (41%) and together with embedded declaratives in 27 samples (48%), whereas embedded declaratives never appeared alone, without root declaratives. The same can be seen for questions: root questions appeared without embedded interrogatives in 27 samples (48%), together with embedded interrogatives in 17 samples (30%), whereas there were no samples with embedded interrogatives without root questions.

This creates, then, a very clear Guttman scale, with root structures acquired before embedded ones – root declaratives before embedded declaratives, and root questions before embedded questions.

Types of embedding structures. Embedded declarative and embedded interrogative were produced by the same number of children (both by 48% of the children, 27 of the 56 samples) (example 7). Embedded declaratives appeared as verb complements in 25 samples (always with the embedding marker *še-*, ‘that’) and in 23 samples as adjunct clauses/sentential adverbials (e.g., because, when). Embedded interrogatives included embedded wh-questions (45%, 25/56 samples), and embedded yes/no questions (*im*, ‘if’, 7%, 4/56 samples).

The data indicate that declarative and interrogative verb-complement embedding are acquired together: there were 5 samples with only declarative embedding, 5 samples with only interrogative embedding, and 22 samples with both. They also emerged at the same age (2;5) and stabilized at the same age (3;3).

(7) Declarative sentential embedding

hi tagid le-safta še-(pro)-tavi le-xa oxel (4;10)
 she tell.FUT to-grandma that-bring.3SG.FEM.FUT to-you.MAS food
 ‘She will tell grandma to bring you food’

Embedded wh-question

ani lo yodaat matai hu yivaled l-a (4;5)

I not know.FEM when he born.FUT to-her
 ‘I don’t know when she will give birth to him.’

Embedded yes/no question (whether)

bo nir’ee im ze dome le-xa (2;11)

let’s see.1PL.FUT if this resembles to-you
 ‘Let’s see if it looks like you.’

Embedded quotation

hi amra l-o axar-kax : “mi ata?” (5;10)

she said to-him later : “who you?”
 ‘She told him later on: “Who are you?”’

Sentential embedding to a verb appeared in 57% of the samples (32/56), significantly more than sentential complements of nouns (not a relative clause), which appeared in only 5% of the samples (3/56), $p < .0001$. Adverbial (adjunct) clauses were produced by 23 children, starting at age 2;6 (one month after complement clauses, which emerged at age 2;5). Each of the children who produced an adverbial embedded clause also produced a complement clause, but not vice versa. The various embedding structures each of the children produced are summarized in Appendix C.

Direct and indirect speech: Whereas indirect speech, i.e., a finite clause embedded to a saying verb (*amarti le-ima še-ani elex la*, said.1st.SG to-mom that-I leave.FUT to-her ‘I said to mom that I would leave her’) involves embedding with an embedding marker (*še-*) and often also a change in personal pronouns, direct speech (embedded quotation) does not include an embedding marker (or pronoun change) (*ve-Caspion ša’al: lama at boxa?*, and-Caspion asked: why you cry?). Nevertheless, direct and indirect speech appeared in similar rates (25% and 20%, respectively, $\chi^2 = 0.46$, $p = .50$), and no Guttman-scale precedence was found between them: direct speech appeared alone in 9 of the samples, indirect speech appeared alone in 6 of the samples, and the two structures together in 5 of the samples.

Finite and nonfinite embedded clauses. Nonfinite clauses embedded to a modal verb appeared already at age 1;6, and from age 2;3 this structure appeared in each of the samples. Finite embedded structures emerged a year later, at age 2;5, stabilizing at age 3;3, from which on they appeared in all of the samples. A clear Guttman scale can be seen between these two structures: nonfinite embedded complement clauses of modals appeared without finite embedded clauses in 10 samples (18%), together with finite embedded clauses in 32 samples (57%), whereas finite embedded clauses never appeared alone, without nonfinite embedded clauses. This Guttman scale indicates that nonfinite embedded complement clauses are acquired before finite ones.

Interestingly, the first cases of nonfinite embedding were all embedded to modal verbs like *want*, *can*, *need* and *going* in its modal sense. Nonfinite embedding to other verbs, such as purpose clauses (e.g., *saba nose’a le-xuc-la-arec be-aviron liknot le-eran rakevet*, grandpa goes abroad

in-a-plane to-buy for-Eran a-train) appeared later, together with finite embedding, suggesting that their syntactic structure is more similar to that of finite embedded clauses. Nonfinite clauses embedded to modals appeared already for children who only produced SV sentences and for children who produced SV sentences and wh-questions. Finite clauses were produced only by children in the more advanced stage, who also produced relatives/topicalization structures.

3.2.3.5 The order of acquisition of various A-bar-structures and embedding

We reported above that a Guttman scale has been found between wh-questions and relative clauses and topicalization, whereby wh-questions appeared earlier. We also found that there is no difference in the acquisition stage of relatives and topicalization. To examine where embedding fits into the order of acquisition, we examined the patterns of appearance of embedding relative to root wh-questions and to relative clauses and topicalization. The results indicate that finite embedding was acquired together with topicalization and relative clauses and later than wh-questions: embedding appears later than wh-questions, as seen by the fact that there are 11 samples (20%) only with wh-questions, 31 samples (55%) with both embedding and wh-question, but only one sample (2%) only with embedding. No Guttman scale could be found between embedding and relatives/topicalization structures, and they mostly appeared together (29 samples included both, 3 samples included only embedding without relative/topicalization, and 2 samples included relative/topicalization without embedding).

The emerging order of acquisition, then, is root wh-questions, and then finite clausal embedding, relative clauses, and topicalization together (**Figures 10, 11**). This is also reflected in the chronological ages of emergence and stabilization: the first wh-question that appeared in the samples was produced by the youngest girl, aged 1;6, whereas the first finite embedded sentence appeared in a sample almost a year later, at age 2;5, and the first relative clause and first topicalization appeared shortly after, at age 2;6.

3.2.3.6 Structures with verb movement to C

Only seven children produced any sentence with the unergative/transitive verb before the subject. Three of the older children (aged 5;8–6;1) produced $V_{\text{unerg/trans}}S$ structures in declarative sentences, after an adverb or without a trigger in a storytelling context. These children produced wh-questions as well as relative clauses/topicalization, and embedding.

Four additional younger children, aged 1;11–2;2, produced $V_{\text{unerg/trans}}S$ structures only with the verb ‘do’, three of them in object VP-question structure, a very common order in wh-questions in Hebrew (*ma ose ha-oto?* what does the-car? ‘what is the car doing?’; *eix osa para?* how does a cow? ‘what do cows make?’- referring to the sounds they emit). It might be that “do” in these structures moves to a lower portion of the tree than V-C structures with a lexical verb, and indeed these four children were all in the wh-question stage – they already produced wh-questions, but no relatives, topicalization, or embedding.

3.2.3.7 The case marker 'et'

As in the repetition task, the spontaneous speech of the children also showed mastery of the case marker from a very early age. Starting at age 1;10, the utterances of the children contain the case marker *et* in the appropriate places (only). Out of the 6400 spontaneous clauses we analysed, 328 sentences included an indefinite object, and 395 included a definite object. *et* was consistently used properly with a definite object, and (properly) not used with an indefinite object. In 324/328 sentences with an indefinite object (99%) no *et* was produced, as required, and in 370/395 sentences with a definite object (94%), *et* was correctly produced.¹²

3.3 Results: Longitudinal spontaneous speech samples of 5 children

In addition to the group analysis, in which we analysed a single sample of 56 children, we analysed longitudinal data of five children: four girls and one boy. The samples included 21,296 clauses. Whereas in the analysis of the samples of the 56 children we had to rely on the logic of structures that appear with or without other structures and Guttman scales in samples of different children, the longitudinal analyses allowed us to follow a specific child and see the stages of acquisition by age.

For each of the five children, we grouped the samples by month (e.g., the monthly grouped sample of age 36 months included the clauses in all the samples that were collected from a child from age 36;0 to age 36;30). Like in the group samples, we only included samples with sufficient turns, but the very early samples, naturally, included few or no clauses. The analysis followed the same guidelines described in 3.1.2. **Table 6** displays properties of the samples that were included in this analysis.

Figure 12 summarizes the findings on the various structures for the five children. Alongside some individual differences, most of the children show the same acquisition pattern we found in the group data: simple SV structures and structures with A-movement appear first, without order between them, then wh-questions appear, next, embedding structures (sentential complements) appear, roughly at the same time as relative clauses and topicalization. Structures with V-C were the last to appear for all children (Leor produced several sentences in $V_{\text{unerg/trans}}$ S order in early stages, but these were all with the verb “do”).

Two of the five children, Hagar and Leor, were sampled very frequently. This allowed us to pinpoint very accurately when each structure appeared in a resolution of several days. This analysis appears in detail Appendix D. Their data showed a very similar pattern to the group analysis reported above: $SV_{\text{unerg/trans}}$ and SV_{unacc} ; then wh-questions; then relative clauses, topicalization, and finite embedding, appearing together within a two-months span, and only then V-C with a lexical verb. There was no difference between SV and VS order with an

¹² Almost all of the 25 cases in which *et* was not produced before a definite object were sentences with the object *ze* 'this' (*hu ro'e ze* 'He sees this'). This suggests that in early stages children do not identify the deictic object pronoun *ze* 'this' as definite.

Child	Sex	Age range of sampling	Total number of clauses	Total number of samples	Number of monthly grouped samples	Number of clauses per monthly-grouped sample range (mean and sd)
Hagar	female	1;7–2;11	6,780	119	17 (31 bi-weekly)	29–817 (M = 399, SD = 246)
Leor	male	1;9–3;0	9,222	79	16 (31 bi-weekly)	248–959 (M = 576, SD = 186)
Lior	female	1;5–2;9	1,832	29	17	7–239 (M = 108, SD = 76)
Naama	female	1;7–2;6	1,621	15	12	11–308 (M = 135, SD = 103)
Smadar	female	1;4–2;5	1,841	16	12	0–400 (M = 153, SD = 148)

Table 6: Properties of the samples of the five children included in the analysis of longitudinal data (from CHILDES, Berman 2004a; b).

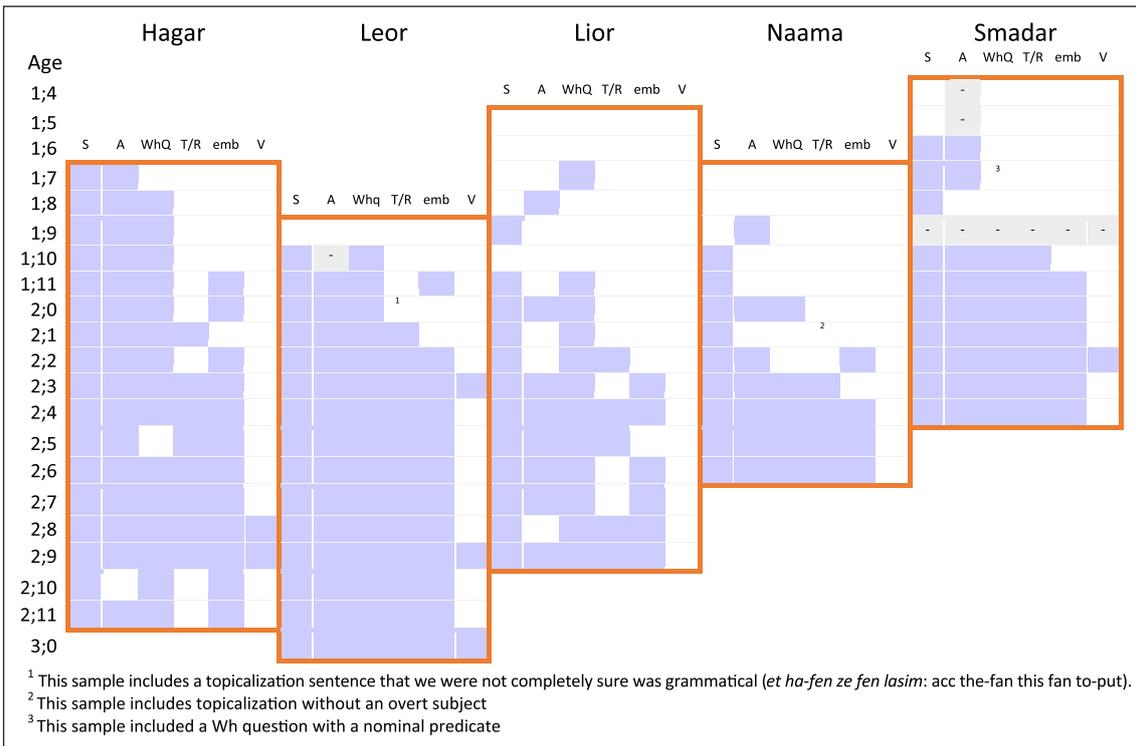


Figure 12: The order of appearance of various structures: longitudinal data from five children. S = simple SV sentences with an explicit subject; A = sentences with A-movement (SV_{unaccusative}); Whq = wh-question; T/R = topicalization or relative clause; emb = finite clausal embedding; V-C = sentences with verb movement to C. Lavender-shaded cells indicate that the child produced the structure. Grey cells with a minus signify a missing sample, or, in the case of A-movement, that the sample did not include any unaccusative verbs.¹³

unaccusative verb (with lexical DP subjects), whereas with unergative verbs, where VS order is a result of verb movement to C, almost only SV structures appeared. (Like in the group samples, in all early VS structures that did appear the moved verb was “do”). This forms further evidence that children distinguish unaccusative from unergative verbs from an early age. Also in accordance with the group level, subject and object questions were acquired together, as did subject and object relatives. The children produced no object A-bar-structure with crossing movement with two lexical DPs.

4 Discussion

This study sought to establish the order of acquisition of various kinds of movement and embedding structures in Hebrew. Data from a repetition task and from analyses of spontaneous speech samples converged to yield a clear order of acquisition of the various structures.

4.1 Order of acquisition of various movement structures and embedding

The main finding of this study is that the movement and embedding structures are acquired in several stages, which were the same for all children, those who were included in the samples analysis, in the longitudinal data, and in the repetition task. The structures (or groups of structures) created a Guttman scale. The emerging order is this:

1. In the first stage children produce both **simple SV** structures and **A-movement** structures with movement from object to subject position. A-movement appeared in the spontaneous speech of young Hebrew-speaking children only in SV sentences with unaccusative verbs. There were no verbal passives and almost no raising constructions. In this early stage children also produce nonfinite clauses embedded under modal verbs.
2. **Wh-questions** appear next – root wh-questions emerge already by age 1;6, a year before the appearance of other structures derived by A-bar-movement (relatives and topicalization). The children use a variety of questions from the beginning of their appearance, and subject and object questions are acquired together. At this stage we also saw some productions of VS structures with the verb “do”.
3. Then, **relative clauses and topicalization** appear, together with **finite embedding to verbs**. The embedding structures acquired at this stage were both embedded declaratives and embedded interrogatives, in similar rates. Here, too, subject and object relative are acquired together.

¹³ Naama produced, at age 23 months, the utterance *Uri yipol* ‘Uri fall.FUT’, the meaning, by context, is causative, i.e., that Uri will cause the building to fall, and thus this utterance was not classified as a case of A-movement. Smadar produced at age 18 months *ze sim po po* “this put here here”, which could have been a topicalized structure without an accusative marker and with a bare infinitive, but we were conservative and did not count it as evidence for a productive topicalization structure.

4. **Verb movement to C.** In the repetition task, V-C structures were mastered later than relatives and topicalization; in samples there were very few children spontaneously producing these structures, and the stage in which they are acquired seems to hover over the wh-questions stage and the relative/topicalization/embedding stage: children who were at the wh-questions stage produced only VS sentences with the verb “do”. The three children who produced V-C at the third stage, together with relative clauses, topicalization, and embedding, used lexical additional verbs.

Object A-bar-structures with 2 lexical DPs are probably acquired later than the age range we tested, i.e., later than age six. In the age range we tested none of the structures derived by A-bar-movement that the children spontaneously produced (until age 5;8) – questions, relatives, and topicalization – included a crossing movement of a lexically restricted object over a lexically restricted subject. Such structures, then, seem to be acquired later than the time window we examined.

4.2 Age: What cannot, and what can be said about age of acquisition of a structure

Whereas the order of acquisition, described in terms of precedence between structures and Guttman scales, is very consistent across children and across tasks, both the repetition task and the spontaneous speech analysis indicated that age is not a reliable predictor for acquisition. In the age range we tested, acquisition of each structure differs immensely between children, and different children acquire the same structure at different ages. It is also not the case that the older the children, the more complex structures they master. In the repetition task, no significant correlations were found between the number of correct repetitions of each structure and age for ages 2;4–3;10. In the spontaneous speech analysis, no correlations were found for the production of specific structures in wide age ranges: for instance, between ages 1;6–2;5, wh-questions were produced by half of the children; between ages 2;6–3;7 relative clauses were produced by 39% of the children. These findings are not consistent with attempts to tie together acquisition of a structure to children’s age (e.g., Borer & Wexler 1987; Hirsch & Wexler 2007).

The findings from the spontaneous language samples do allow for a description of the process of language acquisition with regard to age, using three parameters: age at which the structure first emerges for the youngest child who produced it; age of stabilization of the structure’s production, from which on the majority of the children produce the structure (we took the threshold of 80%); and the range between these two ages, in which some children produce the structure and some do not. The age of stabilization, from which on most children already produce the structure, may be taken as a milestone, and can provide important clinical information when evaluating a child’s syntactic development, suggesting which children may need to receive more attention to assure their acquisition of syntax.

4.3 Methodological considerations

4.3.1 The beauty of Guttman scales

The finding that age does not directly predict the acquisition of structures required a different approach to the exploration of the order of acquisition of various structures. Because we analysed the spontaneous data of 56 different children, we could not directly examine who was the youngest child to produce a certain structure and by comparing their age to the youngest child producing another structure, determine order of acquisition. The approach we embraced instead was that of Guttman scale. The idea was that if structure A is acquired before structure B, we will find samples that include only A and samples that include A and B, but no samples that include only B. And indeed, this approach allowed us to depict the specific order of acquisition of the various structures that has emerged from the spontaneous speech samples.

In the longitudinal data it was easier to determine the order directly, because we could, for each child, examine which structure appeared before another (and the results were strikingly similar to those of the 56 sample analysis).

In the repetition task we also used the Guttman scale approach. First, we used a factor analysis that yielded three factors that explain the children's performance in sentence repetition: simple structures without movement, structures with A-bar-movement, and structures with V-C movement. That is, structures are acquired according to the movement by which they are derived, and structures with similar syntactic properties (e.g., type of movement) are acquired together. This was supported by the factor analysis, demonstrating correlations between the correct repetitions of structures of the same movement type, which indicated that sentences derived by the same type of movement are acquired together, lending support for the theoretical distinction between movements of the three kinds. Then, applying the Guttman scale approach, we could identify the order in which the different groups of structures are acquired.

4.3.2 Omissions in the repetition task and what they mean

Beyond the rates of correct repetitions of the various structures, the analysis of omissions of various constituents in the repetition task is also informative about the child's syntactic stage as well as about the relations between different structures.

One example is the object case marker. Both methodologies indicated that the object case marker *et* is acquired very early in Hebrew (consistent with previous findings, Dromi et al. 1993; Berman 1997). In the repetition task, when the children repeated simple sentences that contained a definite object, they never omitted the object case marker *et*. In spontaneous speech, too, children properly produced the case marker. These findings suggest the omission of the object case marker as a clinical marker for language difficulties for children who already produce sentences.

Furthermore, correct production of the object case marker in simple sentences, alongside the omission of the case marker in repetition of certain complex sentences may be indicative of a difficulty in these structures. And indeed, some children who never omitted the case marker in simple sentences did omit it when they repeated relative clauses and topicalization, suggesting that the omission of a case marker may be taken as an indication for a difficulty in relative clauses. More generally speaking, the omission of an element that is already acquired and is not omitted in simple structures may be taken as an indicator for difficulty in the syntactic structure in which it was omitted.

Along the same logic, the omission of complements and adjuncts was found to be correlated with the syntactic ability of the child repeating the sentence and in the structure the child was repeating. More omissions occurred in sentences with movement than in sentences without movement, and children who acquired a certain structure omit fewer complements/adjuncts when repeating this structure than children who have not yet acquired it.

Finally, omission errors can also contribute to the picture of which structures are acquired at the same stage or are in a Guttman-scale relation: for example, children who acquired V-C never omitted preposed temporal adverbs, even in structures that do not involve V-C (but rather, for example, A-bar movement); children who acquired A-bar-movement made significantly fewer omissions of preposed temporal adverbs than children who have not yet acquired this movement. These relations suggest that once A-bar-movement and V-C are acquired, adverb preposing (possibly, the part of the tree that hosts preposed adverbs of the kind we used, Cinque 1999) is available. This is not surprising if we assume they all involve the CP, but see Friedmann, Belletti, and Rizzi (2021) for further discussion of the syntactic details of the various positions within the high periphery.

4.4 What we learned about the acquisition of specific structures

4.4.1 A-movement

The maturation hypothesis states that the principles of syntax develop with age (Borer & Wexler 1987; Wexler 1994). One specific structure to which Borer and Wexler suggest maturation applies is A-movement, which, according to them matures only at age 4–5 years (and according to the most recent claim, based on an understanding of raising constructions, not before age 7, Borer & Wexler 1987; Hirsch & Wexler 2007). Whereas the present study corroborates the basic claim that syntax matures with age, its findings contradict the claim that A-movement only matures at age 4–5 (or 7): 93% of the children younger than 3;10 succeeded in the repetition of sentences that involve A-movement (unaccusative SV). In spontaneous productions as well, 28 of the 30 children younger than age 4 who produced any unaccusative verb with an argument in their samples, produced sentences with unaccusatives in SV order. Could the children's success be a result of an

incorrect analysis of unaccusatives as unergatives (as Babyonyshev et al. 2001, suggested)? The different production patterns of structures with unaccusative and unergative verbs contradict this hypothesis. In the children's spontaneous productions, structures with unaccusatives were produced in SV order as well as in VS order, whereas structures with unergatives were rarely produced in VS order. This indicates that from the onset of the production of sentences with unaccusatives, children distinguish them from unergatives, and there is no foundation to the claim that early production of unaccusatives in SV order stems from children analysing them as unergatives. Another indication for the analysis of unaccusatives in SV order as unaccusatives rather than unergatives is the children's use of possessive datives in this structures, which are markers of internal arguments (Borer & Grodzinsky 1986). In conclusion, very young Hebrew-speaking children master A-movement. This finding joins existing evidence for this ability at a young age (Pierce 1992a; Déprez & Pierce 1993; Fox & Grodzinsky 1998; Sano et al. 2001; Adragão & Costa 2004; Lorusso et al. 2005; Friedmann 2007; Shimada & Sano 2007; Costa & Friedmann 2009; 2012; Friedmann & Costa 2011).

Another finding with respect to unaccusatives was that children are sensitive to the rules that govern the distribution of pronouns and lexical DPs, and produce, as in adult language, lexical DPs before and after an unaccusative verb (equally), but produce pronouns, kinship terms, proper names, and demonstratives only before the unaccusative verb.

Finally, A-movement was presented in the children's samples almost exclusively by sentences with unaccusatives, and only one structure that may be a raising construction was produced. This finding is consistent with what has been reported on the rare use of raising structures with the verb *seem* in the spontaneous language of English-speaking children (Hirsch & Wexler 2007). In addition, no verbal passive appeared in any of the children's samples, and this finding matches the reports in the literature regarding the scarce use of passives in Hebrew (Berman & Sagi 1981; Berman 1997; Ayal-Smikt 2001; Jisa et al. 2002).

4.4.2 A-bar-movement

We examined a variety of structures derived by A-bar-movement: wh-questions, relative clauses, and topicalization, each of various kinds. The analysis of the speech samples indicated that the three structures, albeit derived from the same movement type, are not acquired together. Wh-questions were the first A-bar-structure to appear in children's spontaneous speech. Wh-questions started to appear in the earliest samples: from age 1;6 they appeared in about half of the samples up to age 2;5, and from that age on they appeared in almost all (92%) the samples. These findings are in accordance with Armon-Lotem's (1996; 2008) findings on the early acquisition of questions in Hebrew. Relative clauses and topicalization structures were acquired together (as shown in both the repetition task and the spontaneous speech samples),

and later than wh-questions but still at a very young age, starting at around age 2;6, with great variance between the children after this point, and stabilizing around age 3;7–4;0 (consistent with previous findings in literature: Berman & Herzberg 1983; Berman 1997; McKee et al. 1998; Soares 2003a; b; Adragão & Costa 2004; Friedmann et al. 2011; Biran & Ruigendijk 2015; Lustigman & Berman 2016; Berman 2018). In the repetition task, in which we examined subject relatives, object relatives, and topicalization, no significant differences were found between these structures, and high internal consistency was found, indicating that relative clauses and topicalization structures, all derived by this A-bar movement are acquired together. (Notice that wh-questions were not tested in repetition).

4.4.2.1 No subject-object asymmetry and no crossing movement in early A-bar structures

Prima facie, there seems to be inconsistency between many previous findings, according to which children up to age 6 have difficulties understanding and producing relative clauses, topicalized structures, and wh-questions (e.g., Friedmann et al. 2009; Friedmann & Novogrodsky 2004, for Hebrew), and the current findings that Hebrew-speaking children produce these structures in spontaneous speech in far younger ages, even at age 1;6.

Additional apparent inconsistency refers to subject-object asymmetry: many studies in the literature, including studies on Hebrew, report subject-object asymmetry in the typical acquisition of relative clauses and wh-questions (Brown 1971; de Villiers et al. 1994; Correa 1995; Berman 1997; Friedmann & Novogrodsky 2004; Arosio et al. 2009; Friedmann et al. 2009; Adani 2010; Adani et al. 2010; Belletti & Contemori 2010; Friedmann & Costa 2010; Rahmany et al. 2011; Metz et al. 2012; Biran & Ruigendijk 2015; Kim & O’Grady 2016; Guasti et al. 2018; D’Ortenzio & Volpato 2020). However, the findings of the spontaneous speech analysis, both the group data and the longitudinal data, were that there were no precedence relations between subject and object questions, nor between subject- and object relatives. Subject and object A-bar-structures seem to be acquired together (in line with previous findings from Hebrew, Ayal-Smikt 2001, and English, Stromswold 1995).

The key to solving this riddle lies in the finding that in the spontaneous samples, children were using a restricted inventory of these structures that match their linguistic stage at that age. None of the A-bar-movement structures that the children produced – wh-questions, relatives, and topicalization – included a crossing movement of a lexical object (a lexical DP) over a lexical subject (except one at age 5;8). Most previous tests of the comprehension and production of object relatives, topicalization, and object questions tested structures with a crossing movement, in which a lexical object crosses over a lexical subject. When testing object A-bar-movement structures with crossing movement, Hebrew-speaking children up to around six years old find it difficult to understand and produce these sentences (Friedmann & Novogrodsky 2004;

Armon-Lotem et al. 2006; Friedmann et al. 2009; 2011; Costa et al. 2014). However, young children can understand and produce object A-bar-movement structures without such crossing movement, e.g., when the moved object or the embedded subject are not lexically restricted (e.g., *pro* or a pronoun). When the comprehension of relative clauses and questions with and without crossing movement was directly compared, young children aged 3;6–5;6 could already understand the structures without crossing movement but not the ones with crossing movement (Günzburg-Kerbel et al. 2008; Friedmann et al. 2009; Belletti et al. 2012).

The picture that arises, then, is the following: A-bar-movement itself is already acquired between the ages one and a half to four years (wh-questions are acquired first, followed by relative clauses and topicalization), but until around age six, children understand and produce sentences with A-bar-movement that do not include crossing movement, and struggle with A-bar-movement of a lexical object over a lexical subject. This is indeed what we found in the spontaneous speech samples: children produced many subject- and object-A-bar structures, but all the object A-bar sentences included at least one DP that was not lexically-restricted – the subject or the moved object. None of the object relatives, object questions (and only a single topicalization) included a lexically restricted object moving across a lexically restricted subject. They used pronouns or *pro* as the subject or object, and in object wh-questions they never produced the lexically restricted *which* question (with 2 exceptions), only bare questions like *who* and *what*. That they did not have any general tendency to avoid two lexical DPs in a sentence can be learned from the finding that this *did* produce two lexical DPs in subject structures; that they did not have any general problem in producing *which* structures can be seen in that a quarter of the samples included questions of the form *which* + DP or the exclamative *which* + adverb (which are grammatical in the null-copula Hebrew). After age six, beyond the time window we examined in the current study, the ability to understand and produce sentences with crossing movement is acquired, and children are able to produce and understand sentences like “This is the woman that the girl is painting” (Friedmann & Novogrodsky 2004; Costa et al. 2014).

4.4.2.2 Resumptive pronouns in relative clause, and DP vs PP relatives

Previous studies that used structured tasks to elicit relative clauses report a stage in which children prefer to produce their object relatives with a resumptive pronoun rather than with a gap (see, for example, Varlokosta & Armon-Lotem 1998; Friedmann et al. 2009). The picture portrayed in spontaneous speech is entirely different. There were significantly fewer children who produced DP object relatives with a resumptive pronoun than children who produced them without a resumptive pronoun. In fact, only two children out of the 56 produced DP object relatives with a lexical head and a resumptive pronoun. A possible explanation for this difference lies in methodological differences. The structured tasks (of the sort used by Varlokosta & Armon-Lotem 1998 and Friedmann et al. 2009) require the participant to produce a structure even if

they have not yet acquired it fully, whereas in spontaneous speech, which we examined in this study, children seem to only use structures they have already acquired.

4.4.3 Embedding

One of our main research questions, which led us to include embedded sentences in the analysis, was whether the order of acquisition of the different constructions is related to movement or to the tree structure. A striking finding was that finite embedded clauses without A-bar movement appeared at the same stage as relative clauses and topicalization structures. This finding suggests that movement types cannot fully account for the stages of acquisition.

We also examined the order of acquisition of various types of embedded structures as reflected in the order they appeared in spontaneous speech.

Nonfinite complement clauses of modals were the first to appear, before finite embedded clauses. They appeared already at age 1;6, and until age 2;5 were the only embedding structures in the children's spontaneous speech (in line with Bowerman 1979; Kaplan 1983; Bloom et al. 1989; Diessel 2004; Owen & Leonard 2006; Berman 2018; Berman & Lustigman 2020). Then, from age 2;5, 89% of the children had already produced finite embedded clauses, and from age 3;3 all have. In the longitudinal data, finite embedding first appeared at ages 1;11–2;3. This order of nonfinite clauses before finite ones may be ascribed to the part of the tree that they involve, suggesting that nonfinite embedding to modals does not require higher nodes of the tree, but finite embedding does. Nonfinite embedding was acquired in two stages: the first cases of nonfinite embedding were all embedded to modal verbs (mainly *want* and *going-to*), and these already appeared in the stage in which children produced SV structures, before the acquisition of wh-questions and relatives/topicalization. Nonfinite embedding to other verbs appeared later, together with finite embedding, relative clauses, and topicalization.

Declarative and interrogative embedding appeared together. The co-appearance of declarative and interrogative embedding differs from Bowerman (1979), who reported declarative before interrogative embedding in English. (This can be attributed to the fact that in English the embedded interrogative clause is structurally different from the corresponding root question.) The finding also differs from Kaplan (1983), who took a different measure of acquisition (stabilization) and reported interrogative before declarative embedding in Hebrew. We also found that embedded clauses that are complements preceded embedded adjuncts, and that sentential complements of verbs preceded complements of nouns. Relative clauses, which are also clauses embedded to nouns, preceded noun clausal complements.

Finally, we found that finite sentential complements and relative clauses appear together, similarly to Armon-Lotem (2005 for Hebrew, Penner 1992; Müller & Penner 1996, for Swiss German; see Steel et al. 2013 and Nir 2016 for review and discussion).

4.4.4 Verb movement to C

Both the repetition results and the spontaneous speech analyses demonstrated that V-C structures are still difficult in the ages we tested, and are acquired relatively late. In repetition, it was the last structure to be acquired, and only 8 of the 60 children succeeded to repeat it consistently; in the spontaneous speech only 7 of the 56 samples of children produced any instance of V-C. This is in line with previous research in Hebrew, and in European Portuguese, another language in which V-C is optional, reporting difficulties in V-C at least until age 6 (Zuckerman 2001; Friedmann & Novogrodsky 2003; Friedmann 2007; Costa & Friedmann 2009; 2012; Friedmann & Costa 2011).

An interesting finding emerged from the spontaneous speech samples, was that of the 7 children who produced a (non-unaccusative) VS structure that could be an instance of V-C, the 4 younger ones were at the stage in which they have acquired wh-questions but no relative, topicalization, and embedding yet. The VS sentences of all these four children were with the verb “do”. Only the three older children (aged 5;8–6;1) used other, lexical verbs, and all three were already at the third stage – they all also produced relative clauses/topicalization and embedding. The longitudinal analysis yielded the same picture: in the first stages the children only produced V-C structures with “do”, and once they acquired relatives, topicalization, and embedding, additional verbs appeared in their V-C structures.

It might be that “do” in these structures moves to a lower portion of the tree than V-C structures with a lexical verb or that V-C with “do” is not part of a register that needs to be anchored in higher functional nodes. (See a related discussion of the Dutch *doen*, which appears early in V2 position, and suggested not to reflect the acquisition of V2, Jordens 1990; Roeper 1991; Hollebrandse & Roeper 1996; Zuckerman 2001).

4.5 Considering possible accounts for the order of structures

Several accounts are imaginable for the acquisition of wh-questions before relatives, topicalization, and embedding, and for the co-acquisition of relatives, topicalization, and embedding.

One account could have been that the early questions are formed by movement to a functional node lower than CP, and when CP is acquired, embedding structures, relative clauses, and topicalization also appear. However, it is unclear why children do not use this option to produce topicalization structures, as well, with movement to a functional node below CP in this early stage, since there is no embedding that requires movement to the CP node in topicalization as well. It is also hard to explain how such analysis is un-learned and corrected (see Radford 1994 for a related discussion).

Another account that is ruled out on similar bases is that A-bar-movement is acquired at age 1;6, allowing children to produce wh-questions, but the mechanism for embedding is acquired

roughly a year later, and when it does, sentential embedding and relative clauses, which include both embedding and A-bar-movement, appear. This proposal does not explain why topicalization appears together with embedding and relatives, rather than with questions.

The precedence of questions over relatives and topicalization could not be attributed to the fact that in the early questions (all but 2) the moved element is bare (= non lexically-restricted), whereas in relatives and topicalization it is full. If this were the case, we would expect to find, together with the wh-questions, also relative clauses with a non-lexical head – free relatives, and possibly topicalization of an pronoun. But the findings are different. Relative clauses, including those with a non-lexical head, appear later than questions, together with sentential embedding. We also did not find a difference between the appearance of relative clauses with or without a lexical head.

There is another option according to which A-bar-movement is already acquired by age one and a half years, and what changes over time is a need for the two DPs in the sentence to be disjoint. Friedmann et al. (2009) and Belletti et al. (2012) discussed a notion of disjointness in intervention A-bar configurations according to which one DP is not lexically restricted. It might be that an earlier stage of disjointness requirement, which is the stage in which only wh-questions are acquired but not relative/topicalization, two DPs are disjointed enough only when one is morphologically marked as a question element (e.g., *mi* ‘who’) (and the other is a regular DP). This would yield the attested situation of a stage in which children can produce (subject and object) bare questions, in which the wh-phrase is ‘who’, ‘what’, and so on, and not a lexically-restricted phrase such as ‘which elephant’, and cannot produce any other A-bar-structure. In the next stage children can distinguish two DPs in an intervention configuration when one of them is not full – a pronoun for example - and now there is no need for them to also be different in the question feature. At this point, relative clauses and topicalization structures appear (except for those with intervention and 2 lexical DPs). The downside of this proposal is that it does not explain the appearance of embedding at the same stage as relatives and topicalized structures, and it does not explain why subject relatives, in which there is no intervention configuration, do not appear together with wh-questions.

Finally, another possible account would be to consider the complex cartographic structure of the CP layer (Rizzi 1997; 2017; Rizzi & Bocci 2017), and assume that different fields within the CP layer are acquired gradually. It may be that questions are acquired first because they involve the lowest part of the left periphery, and when higher nodes are acquired, other structures appear, which rely on higher nodes – embedding, relatives, and topicalization. This is the approach advocated in Friedmann et al. (2021).¹⁴

¹⁴ An alternative explanation according to which this acquisition order can be simply explained by an increase in the number of words the child can produce is ruled out. The structures that were delayed until the later stages,

4.6 Clinical implications: From research findings to diagnosis

Our findings can be translated into several recommendations regarding diagnosis of atypical language development. First, we have seen that tree-structure building and the computation of intervention (crossing movement) configurations are separate abilities that develop in different stages. There were stages in which the syntactic structure of *wh*-questions, relative clauses, and topicalization was acquired, including both object and subject movement structures. The production of these structures does not guarantee yet that the child is able to understand A-bar structures in which a lexically-restricted DP moves across another. There seems to be another, later stage, in which the ability to handle such intervention structures is acquired (Friedmann et al. 2009). This distinction may reflect in language impairment, where some children may be impaired in structure building, and others may be able to produce and understand relative clauses, and *wh*-questions, including object relatives and object questions, except for when one full DP crosses another full DP. These two types of deficits should be identified separately, for example by examining object relatives and object questions both with and without two lexically restricted DPs (Friedmann et al. 2015).

In the assessment process, both sentence repetition and the analysis of spontaneous speech can be useful and informative. In both methodologies, it is important to incorporate a variety of syntactic structures, and to include structures that are known to be good clinical markers in the language for language impairment.

When assessing a child's linguistic ability, knowing the order of acquisition that emerged from the current study can refine the description of their syntactic development status and can guide the decision as to whether their syntactic development is typical or not: as we have seen, the acquisition of structures occurs in ordered stages, so the point in the syntactic development of a typically developing child can be specified according to the stage they reached in the order of structures. So whereas language-age cannot be used with respect to the acquisition of syntactic structures, a child may be described in terms of stages: they may be in Stage 1 (SV), Stage 2 (*wh*-questions), or Stage 3 (relatives, topicalization, and finite embedding). Gaps in the order of structures may indicate a language difficulty. Thus, for example, a child who masters A-movement and V-C but struggles with A-bar-movement skipped a stage in acquisition, a fact that could indicate a syntactic difficulty.

wh-questions, and then embedding, relatives, or topicalization, could all be cast in Hebrew in short 2-word utterances (e.g., *wh*-questions like *mi caxak?* 'who laughed?', relative clauses like *ha-yalda še-nishakt*, the-girl that-kissed-2nd.SG.PAST, 'the girl that you kissed'; embedded sentences like *xashavti še-halaxt*, thought.1st.SG.PAST that-left-2nd.SG.PAST, 'I thought that you left'). Nevertheless, these were not produced in the early SV sentences stage. On the other direction, the simple SV sentences produced in the SV stage did include 3- and 4-word sentences, and the children who already produced *wh*-questions but not yet relative clauses, topicalization, and embedding even produced sentences up to 7 words. But still – none of the above structures, even though these could be stated in sentences far shorter than 7 words.

Alongside the consistent and reliable order of acquisition of various structures, we found that age is *not* a good predictor of the acquisition of syntactic structures (in the age range we tested), and that there are wide ranges of ages, sometimes as wide as 20 months, in which variance between children is immense. We were, however, able to identify for most of the structures analysed a stabilization age, from which on most children already master the structure. Because a stabilization age can be defined for each structure, a child who is older than the stabilization age and still does not produce this structure may be at risk for a syntactic impairment, and needs a thorough examination of her/his syntactic abilities and a syntactic development follow-up. For example, we found that from age two years some, but not all, children produced embedded sentences. From age two and a half, most children in the sample (roughly 90%) correctly used embedding, and from age 3;3 all children, with no exception, produced grammatical finite sentential embedding structures. This establishes sentential embedding as a robust milestone after that age. Hence, no concern should be raised if a child aged, say, 2;2 does not produce embedding. However, a child above age 3;3 who does not yet use any kind of embedding may require further syntactic examination and support. A similar logic can be applied to other structures: from age 2;6, all children (apart from one) who produced any structure with A-bar-movement or embedding, had produced a grammatical wh-question. Thus, a child after age 2;6 who produced these other structures but has not yet produced grammatical wh-questions requires examination of their syntactic (and pragmatic) abilities. Another instance is the object case marker. It was produced correctly even by the youngest children who produced an SVO sentence. Therefore, omissions and incorrect use of this case marker can serve as a clinical marker for language difficulties in (monolingual) children who already produce SVO structures.

The final diagnostic conclusion from this study is that one should use extreme caution when applying tools and drawing conclusions from one language to another, as the same structure that may be produced early and frequently by children who acquire one language may not be a good indicator for acquisition in another language where it is not frequently used or used in specific formal contexts. Namely, the properties of each structure and its use in a language may interact with the stage of acquisition and create apparent differences between languages. For example, whereas in English passives are commonly used and many language tests use passive to evaluate a child's syntactic state, Hebrew-speaking children with typical language abilities, like Hebrew-speaking adults, tend not to use this structure. Passives in Hebrew are used almost exclusively in formal news-like contexts, and many verbs do not even have a passive form. In our samples, encompassing 27,696 clauses, not even one grammatical passive construction appeared. Passives in Hebrew, then, are not a good litmus test for syntactic abilities.

5. Conclusion: Same path, different paces

In conclusion, sentence repetition and the analysis of spontaneous speech both found, alongside fluctuation in the age of acquisition of various structures, a clear order of acquisition of the various structures in Hebrew: first, structures with movement to the subject position are acquired – specifically, structures in subject-verb order with unaccusative verbs (A-movement) and with unergatives/transitives. Nonfinite embedding, especially complements to “want” and “going to” also appear in this first stage. Next, wh-questions are acquired. The third stage involves finite sentential embedding to verbs appear, together with topicalization and relative clauses, and lastly structures with a lexical verb moving to the second position in the sentence, to C, are acquired. The path that different typically-developing children take seems identical, but the pace in which each child walks in this path may be different: one child may be sprinting her way through the path, whereas another child may leisurely stroll from one milestone to the next.

Additional files

The additional files for this article can be found here: <https://doi.org/10.16995/glossa.5716.s1>.

This file contains the following 4 Appendices:

- Appendix A. Types of grammatical questions (only questions that include a verb) that each child in the samples produced.
- Appendix B. Types of relative clauses in the samples.
- Appendix C. Types of embedding in the samples.
- Appendix D. The order of appearance of A-bar movement structures and finite embedding in each sample in the longitudinal data of the two heavily sampled children.

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Competing Interests

The authors have no competing interests to declare.

References

- Abbot-Smith, Kirsten & Behrens, Heike. 2006. How known constructions influence the acquisition of other constructions: The German passive and future constructions. *Cognitive Science* 30. 995–1026. DOI: https://doi.org/10.1207/s15516709cog0000_61
- Adani, Flavia. 2010. Rethinking the acquisition of relative clauses in Italian: Towards a grammatically based account. *Journal of Child Language* 38. 141–165. DOI: <https://doi.org/10.1017/S0305000909990250>
- Adani, Flavia & Van der Lely, Heather K. J. & Forgiarini, Matteo & Guasti, Maria Teresa. 2010. Grammatical feature dissimilarities make relative clauses easier: A comprehension study with Italian children. *Lingua* 120. 2148–2166. DOI: <https://doi.org/10.1016/j.lingua.2010.03.018>
- Adragão, Maria do Mar & Costa, João. 2004. On the status of preverbal subjects in null subject languages: Evidence from acquisition. In van Kampen, Jacqueline & Baauw, Sergio (eds.), *Proceedings of GALA 2003*. The Hague: Utrecht University, Lot Publications.
- Armon-Lotem, Sharon. 1996. *The minimalist child: Parameters and functional heads in the acquisition of Hebrew*. Phd Dissertation, Tel Aviv University. DOI: <https://doi.org/10.13140/RG.2.2.19807.25761>
- Armon-Lotem, Sharon. 2005. The acquisition of subordination: From preconjunctivals to later use. In *Perspectives on language and language development*, 91–202. Boston, MA: Springer. DOI: https://doi.org/10.1007/1-4020-7911-7_15
- Armon-Lotem, Sharon. 2008. The interaction between question formation and verbal morphology in the acquisition of Hebrew: A minimalist perspective. In Armon-Lotem, Sharon & Danon, Gabi & Rothstein, Susan (eds.), *Current issues in generative Hebrew linguistics*, 223–244 (*Linguistik Aktuell/Linguistics Today* 134). Benjamins. DOI: <https://doi.org/10.1075/la.134.09the>
- Armon-Lotem, Sharon & Botwinik-Rotem, Irena & Birka, Sigal. 2006. The acquisition of relative clauses in Hebrew: Prepositions and resumptive pronouns. In Belletti, Adriana & Bennati, Elisa & Chesi, Cristiano & Di Domenico, Elisa & Ferrari, Ida (eds.), *Language acquisition and development*, 1–14. Newcastle, UK: Cambridge Scholars Press.
- Armon-Lotem, Sharon & Haman, Ewa & de López, Kristine Jensen & Smoczynska, Magdalena & Yatsushiro, Kazuko & Szczerbinski, Marcin & van Hout, Angeliek & Dabašinskienė, Ineta & Gavarró, Anna & Hobbs, Erin & Kamandulytė-Merfeldienė, Laura & Katsos, Napoleon & Kunnari, Sari & Nitsiou, Chrisa & Olsen, Lone Sundahl & Parramon, Xavier & Sauerland, Uli & Torn-Leesik, Reeli & van der Lely, Heather. 2016. A large-scale cross-linguistic investigation of the acquisition of passive. *Language Acquisition* 23(1). 27–56. DOI: <https://doi.org/10.1080/10489223.2015.1047095>
- Arosio, Fabrizio & Adani, Flavia & Guasti, Maria Teresa. 2009. Grammatical features in the comprehension of Italian relative clauses by children. In Brucart, José M. & Gavarró, Anna & Sola, Jaume (eds.), *Merging features: Computation, interpretation and acquisition*, 138–155. Oxford, UK: Oxford University Press. DOI: <https://doi.org/10.1093/acprof:oso/9780199553266.003.0008>

- Ayal-Smikt, Tsufit. 2001. *H-IPSyn – a developmental procedure: For the evaluation of the morphological and syntactical ability of Hebrew Speaking Children*. Unpublished MA Thesis, Tel Aviv University.
- Babyonyshev, Maria & Ganger, Jennifer & Pesetsky, David & Wexler, Kenneth. 2001. The maturation of grammatical principles: Evidence from Russian unaccusatives. *Linguistic Inquiry* 32. 1–44. DOI: <https://doi.org/10.1162/002438901554577>
- Becker, Misha. 2006. There began to be a learnability puzzle. *Linguistic Inquiry* 37. 441–456. DOI: <https://doi.org/10.1162/ling.2006.37.3.441>
- Belletti, Adriana & Contemori, Claudia. 2010. Intervention and attraction: On the production of subject and object relatives by Italian (young) children and adults. In Costa, João & Castro, Ana & Lobo, Maria & Pratas, Fernanda (eds.), *Language acquisition and development: Proceedings of GALA 2009*, 39–52. Cambridge: Cambridge Scholars Press.
- Belletti, Adriana & Friedmann, Naama & Brunato, Dominique & Rizzi, Luigi. 2012. Does gender make a difference? Comparing the effect of gender on children's comprehension of relative clauses in Hebrew and Italian. *Lingua* 122(10). 1053–1069. DOI: <https://doi.org/10.1016/j.lingua.2012.02.007>
- Belletti, Adriana & Guasti, Maria-Teresa. 2015. *The acquisition of Italian: Morphosyntax and its interfaces in different modes of acquisition* (Language Acquisition and Language Disorders). John Benjamins Publishing Company. DOI: <https://doi.org/10.1075/lald.57>
- Berman, Ruth A. 1997. The acquisition of syntax and discourse forms in native Hebrew. In Joseph Shimron (ed.), *Psycholinguistics in Israel: Language acquisition, reading and writing*, 57–100. Jerusalem: Magnes & The Hebrew University. (in Hebrew)
- Berman, Ruth. 2004a. *Hebrew BSF corpus*. TalkBank: CHILDES.
- Berman, Ruth. 2004b. *Hebrew Na'ama Corpus*. TalkBank: CHILDES.
- Berman, Ruth. 2018. Development of complex syntax: From early clause-combining to text-embedded syntactic packaging. In Bar-On, Amalia & Ravid, Dorit (eds.), *Handbook of communication disorders: Theoretical, empirical, and applied linguistic perspectives*, 235–256. Berlin, Boston: De Gruyter Mouton. DOI: <https://doi.org/10.1515/9781614514909-013>
- Berman, Ruth & Herzberg, Orly. 1983. *The acquisition of relative structures by three-to-five years-old Hebrew-speaking children*. Unpublished ms., Tel Aviv University.
- Berman, Ruth & Lustigman, Lyle. 2020. Acquisition and development of verb/predicate chaining in Hebrew. *Frontiers in Psychology* 10. 2958. DOI: <https://doi.org/10.3389/fpsyg.2019.02958>
- Berman, Ruth A. & Sagi, Yisrael. 1981. On early word formation. *Hebrew Computational Linguistics* 18. 32–62. (in Hebrew)
- Bianchi, Valentina. 1999. *Consequences of antisymmetry: Headed relative clauses*. Berlin: Mouton de Gruyter. DOI: <https://doi.org/10.1515/9783110803372>
- Bibi, Hana. 2003. *Mother language input and early verbs acquisition in Hebrew*. Unpublished MA Thesis, Tel Aviv University.
- Biran, Michal & Ruigendijk, Esther. 2015. Do case and gender information assist sentence comprehension and repetition for German-and Hebrew-speaking children? *Lingua* 164. 215–238. DOI: <https://doi.org/10.1016/j.lingua.2015.06.012>

- Bloom, Lois & Rispoli, Matthew & Gartner, Barbara & Hafitz, Jeremie. 1989. Acquisition of complementation. *Journal of Child Language* 16. 102–120. DOI: <https://doi.org/10.1017/S0305000900013465>
- Borer, Hagit & Grodzinsky, Yosef. 1986. Syntactic cliticization and lexical cliticization: The case of Hebrew dative clitics. In Borer, Hagit (ed.), *Syntax and semantics 19: The syntax of pronominal clitics*, 175–217. Academic Press. DOI: https://doi.org/10.1163/9789004373150_009
- Borer, Hagit & Wexler, Kenneth. 1987. The maturation of syntax. In Roeper, Thomas & Williams, Edwin (eds.), *Parameter-setting and language acquisition*, 123–172. Dordrecht: Springer. DOI: https://doi.org/10.1007/978-94-009-3727-7_6
- Bowerman, Melissa. 1979. The acquisition of complex sentences. In Fletcher, Paul & Garman, Michael (eds.), *Language acquisition: Studies in first language development*, 285–305. Cambridge: Cambridge University Press.
- Brown, H. Douglas. 1971. Children's comprehension of relativized English sentences. *Child Development* 42(6). 1923–1936. DOI: <https://doi.org/10.2307/1127595>
- Burzio, Luigi. 1986. *Italian syntax: A Government-Binding approach*. Springer Science & Business Media. DOI: <https://doi.org/10.1007/978-94-009-4522-7>
- Cinque, Guglielmo. 1999. *Adverbs and functional heads: A cross-linguistic perspective*. New York & Oxford: Oxford University Press.
- Clahsen, Harald & Penke, Martina. 1992. The acquisition of agreement morphology and its syntactic consequences: New evidence on German child language from the Simone-corpus. In Meisel, Jürgen (ed.), *The acquisition of verb placement*, 181–223. Dordrecht: Kluwer. DOI: https://doi.org/10.1007/978-94-011-2803-2_7
- Clahsen, Harald & Penke, Martina & Parodi, Teresa. 1993/1994. Functional categories in early child German. *Language Acquisition* 3. 395–429. DOI: https://doi.org/10.1207/s15327817la0304_3
- Correa, Letícia M. Sicuro. 1995. An alternative assessment of children's comprehension of relative clauses. *Journal of Psycholinguistic Research* 24. 183–203. DOI: <https://doi.org/10.1007/BF02145355>
- Costa, João & Friedmann, Naama. 2009. Hebrew and Arabic children going Romance: On the acquisition of word order in Semitic and Romance. In Aboh, Enoch Olade & van der Linden, Elisabeth & Quer, Josep & Sleeman, Petra (eds.), *Romance languages and linguistic theory 2007* (Current Issues in Linguistic Theory Series), 51–66. Amsterdam: John Benjamins. DOI: <https://doi.org/10.1075/rllt.1.03cos>
- Costa, João & Friedmann, Naama. 2012. Children acquire unaccusatives and A-movement very early. In Everaert, Martin & Marelj, Marijana & Siloni, Tal (eds.), *The theta system: Argument structure at the interface* (Oxford Studies in Theoretical Linguistics 37), 354–378. Oxford, UK: Oxford University Press. DOI: <https://doi.org/10.1093/acprof:oso/9780199602513.003.0013>
- Costa, João & Friedmann, Naama & Silva, Carolina & Yachini, Maya. 2014. The boy that the chef cooked: Acquisition of PP relatives in European Portuguese and Hebrew. *Lingua* 150. 386–409. DOI: <https://doi.org/10.1016/j.lingua.2014.08.005>
- Crain, Stephen & McKee, Cecile & Emiliani, Maria. 1990. Visiting relatives in Italy. In Frazier, Lyn & de Villiers, Jill (eds.), *Language processing and language acquisition*, 335–356. Dordrecht: Kluwer. DOI: https://doi.org/10.1007/978-94-011-3808-6_14

- Dabrowska, Ewa. 2000. From formula to schema: The acquisition of English question. *Cognitive Linguistics* 11. 83–102. DOI: <https://doi.org/10.1515/cogl.2001.013>
- Danon, Gabi. 2015. What is “this”? a syntactic analysis of the copula “ze” in Modern Hebrew. *Hebrew Linguistics* 69. 23–43. (in Hebrew)
- Davidson, Sagit. 2002. *The language profile of preschool Hebrew-speaking children with SLI*. Unpublished MA thesis. Tel Aviv University.
- Demuth, Katherine. 1996. Collecting spontaneous production data. In McDaniel, Dana & McKee, Cecile & Cairns, Helen Smith (eds.), *Methods for assessing children’s syntax*, 3–22. Cambridge, MA: MIT Press.
- Déprez, Viviane & Pierce, Amy. 1993. Negation and functional projections in early grammar. *Linguistic Inquiry* 24. 25–67. <https://www.jstor.org/stable/4178801>
- de Villiers, Jill & de Villiers, Peter & Hoban, Esme. 1994. The central problem of functional categories in the English syntax of oral deaf children. In Tager-Flusberg, Helen (ed.), *Constraints on Language Acquisition: Studies of Atypical Children*, 9–47. Hillsdale, NJ: Erlbaum.
- de Villiers, Jill & Roeper, Thomas & Bland-Stewart, Linda & Pearson, Barbara. 2008. Answering hard questions: Wh-movement across dialects and disorder. *Applied Psycholinguistics* 29(1). 67–103. DOI: <https://doi.org/10.1017/S0142716408080041>
- Diessel, Holger. 2004. *The acquisition of complex sentences* (Vol. 105). Cambridge University Press. DOI: <https://doi.org/10.1017/CBO9780511486531>
- D’Ortenzio, Silvia & Volpato, Francesca. 2020. How do Italian-speaking children handle wh-questions? A comparison between children with hearing loss and children with normal hearing. *Clinical Linguistics & Phonetics* 34(4). 407–429. DOI: <https://doi.org/10.1080/02699206.2019.1677779>
- Dromi, Esther & Berman, Ruth A. 1986. Language-specific and language-general in developing syntax. *Journal of Child Language* 13(2). 371–387. DOI: <https://doi.org/10.1017/S0305000900008114>
- Dromi, Esther & Leonard, Laurence B. & Adam, Galit. 1997. Evaluating the morphological abilities of Hebrew-speaking children with SLI. In Baker, Anne & Beers, Mieke & Bol, Gerard & de Jong, Jan & Leemans, Geertje (eds.), *Child language disorders in a cross-linguistic perspective. Proceedings of the fourth symposium of the European group on child language disorders*, 65–78. Amsterdam: Amsterdam Series in Child Language Development.
- Dromi, Esther & Leonard, Laurence B. & Adam, Galit & Zadunaisky-Ehrlich, Sara. 1999. Verb agreement morphology in Hebrew-speaking children with specific language impairment. *Journal of Speech, Language, and Hearing Research* 42(6). 1414–1431. DOI: <https://doi.org/10.1044/jslhr.4206.1414>
- Dromi, Esther & Leonard, Laurence B. & Shteiman, Michal. 1993. The grammatical morphology of Hebrew-speaking children with specific language impairment: Some competing hypotheses. *Journal of Speech and Hearing Research* 36. 760–771. DOI: <https://doi.org/10.1044/jshr.3604.760>
- Fox, Danny & Grodzinsky, Yosef. 1998. Children’s passive: A view from the by-phase. *Linguistic Inquiry* 29(2). 311–332. DOI: <https://doi.org/10.1162/002438998553761>

- Friedemann, Marc-Ariel. 1993/1994. The underlying position of external arguments in French: A study in adult and child grammar. *Language Acquisition* 3(3). 209–255. DOI: https://doi.org/10.1207/s15327817la0303_2
- Friedemann, Marc-Ariel. 2000. Early French postverbal subjects. In Friedemann, Marc-Ariel & Rizzi, Luigi (eds.), *The acquisition of syntax* (Longman Linguistics Library), 63–83. Geneva, Switzerland: Longman. DOI: <https://doi.org/10.4324/9781315839899-3>
- Friedmann, Naama. 2007. Young children and A-chains: The acquisition of Hebrew unaccusatives. *Language Acquisition* 14(4). 377–422. DOI: <https://doi.org/10.1080/10489220701600523>
- Friedmann, Naama & Aram, Dorit & Novogrodsky, Rama. 2011. Definitions as a window to the acquisition of relative clauses. *Applied Psycholinguistics* 32. 687–710. DOI: <https://doi.org/10.1017/S0142716411000026>
- Friedmann, Naama & Belletti, Adriana & Rizzi, Luigi. 2009. Relativized relatives: Types of intervention in the acquisition of A-bar dependencies. *Lingua* 119. 67–88. DOI: <https://doi.org/10.1016/j.lingua.2008.09.002>
- Friedmann, Naama & Belletti, Adriana & Rizzi, Luigi. 2021. Growing trees: The acquisition of the left periphery. *Glossa: A journal of general linguistics* 6(1): 131. 1–38. DOI: <https://doi.org/10.16995/glossa.5877>
- Friedmann, Naama & Costa, João. 2010. The child heard a coordinated sentence and wondered: On children's difficulty in understanding coordination and relative clauses with crossing dependencies. *Lingua* 120(6). 1502–1515. DOI: <https://doi.org/10.1016/j.lingua.2009.10.006>
- Friedmann, Naama & Costa, João. 2011. Acquisition of SV and VS order in Hebrew, European Portuguese, Palestinian Arabic, and Spanish. *Language Acquisition* 18(1). 1–38. DOI: <https://doi.org/10.1080/10489223.2011.530507>
- Friedmann, Naama & Fattal, Iris & Fattal-Valevski, Aviva. 2010, October. *The effect of thiamine deficiency in infancy on the development of syntactic and lexical abilities*. Presented at the Academy of Aphasia 2010 meeting, Athens, Greece. DOI: <https://doi.org/10.1016/j.sbspro.2010.08.083>
- Friedmann, Naama & Lavi, Hedva. 2006. On the order of acquisition of A-movement, Wh-movement and V-C movement. In Belletti, Adriana & Bennati, Elisa & Chesì, Cristiano & Di Domenico, Elisa & Ferrari, Ida (eds.), *Language acquisition and development*, 211–217. Newcastle, UK: Cambridge Scholars Press.
- Friedmann, Naama & Novogrodsky, Rama. 2003, June. *Verb movement in Hebrew-speaking children with G-SLI*. Presented at the 19th annual meeting of the Israel Association for Theoretical Linguistics. Ben Gurion University.
- Friedmann, Naama & Novogrodsky, Rama. 2004. The acquisition of relative clause comprehension in Hebrew: A study of SLI and normal development. *Journal of Child Language* 31. 661–681. DOI: <https://doi.org/10.1017/S0305000904006269>
- Friedmann, Naama & Novogrodsky, Rama. 2011. Which questions are most difficult to understand? The comprehension of Wh questions in three subtypes of SLI. *Lingua* 121. 367–382. DOI: <https://doi.org/10.1016/j.lingua.2010.10.004>

- Friedmann, Naama & Szterman, Ronit. 2011. The comprehension and production of wh questions in children with hearing impairment. *Journal of Deaf Studies and Deaf Education* 16(2). 212–235. DOI: <https://doi.org/10.1093/deafed/enq052>
- Friedmann, Naama & Yachini, Maya & Szterman, Ronit. 2015. Relatively easy relatives: Children with syntactic SLI avoid intervention. In Di Domenico, Elisa & Hamann, Cornelia & Matteini, Simona (eds.), *Structures, strategies and beyond. Studies in honour of Adriana Belletti*, 303–320. Amsterdam, The Netherlands: John Benjamins, Linguistik Aktuell series. DOI: <https://doi.org/10.1075/la.223.14fri>
- Froud, Karen & Tsakali, Vina & Wexler, Kenneth. 2010, June. *Late maturation of raising in English: Evidence from typically developing children*. Presented in Language Disorders in Greek 3: Language Disorders and Bilingualism Conference, Lefkosia, Cyprus.
- Goodluck, Helen & Tavakolian, Susan. 1982. Competence and processing in children's grammar of relative clauses. *Cognition* 11. 1–27. DOI: [https://doi.org/10.1016/0010-0277\(82\)90002-6](https://doi.org/10.1016/0010-0277(82)90002-6)
- Guasti, Maria Teresa. 1993/4. Verb syntax in Italian child grammar: Finite and non-finite verbs. *Language Acquisition* 3. 1–40. DOI: https://doi.org/10.1207/s15327817la0301_1
- Guasti, Maria Teresa. 2000. An excursion into interrogatives in early English and Italian. In Friedemann, Marc-Ariel & Rizzi, Luigi (eds.), *The acquisition of syntax*, 105–128. Harlow, England: Longman. DOI: <https://doi.org/10.4324/9781315839899-5>
- Guasti, Maria Teresa. 2002. *Language acquisition: The growth of grammar*. Cambridge, MA: MIT Press.
- Guasti, Maria Teresa & Cardinaletti, Anna. 2003. Relative clause formation in Romance child's production. *Probus* 15(1). 47–89. DOI: <https://doi.org/10.1515/prbs.2003.005>
- Guasti, Maria Teresa & Vernice, Mirta & Franck, Julie. 2018. Continuity in the adult and children's comprehension of subject and object relative clauses in French and Italian. *Languages* 3(3). 24. DOI: <https://doi.org/10.3390/languages3030024>
- Günzberg-Kerbel, Noa & Shvimer, Lilach & Friedmann, Naama. 2008. “Take the Hen that the cow kissed the hen”: The acquisition of comprehension and production of various relative clauses in Hebrew. *Language and Brain* 7. 23–43. (in Hebrew)
- Guttman, Louis. 1944. A basis for scaling qualitative data. *American Sociological Review* 9. 139–150. DOI: <https://doi.org/10.2307/2086306>
- Guttman, Louis. 1950. The basis for scalogram analysis. In Stouffer, Samuel A. & Guttman, Louis & Suchman, Edward A. & Lazarsfeld, Paul F. & Star, Shirley A. & Clausen, John A. (eds.), *Measurement and prediction* (Studies in Social Psychology in World War II, 4), 60–90. Princeton University Press.
- Haddad-Hanna, Manar & Friedmann, Naama. 2015. On the acquisition of relative clauses and Wh questions in Palestinian Arabic speaking children. In Russo-Zimet, Gila & Ziv, Margalit & Masarwah, Afnan (ed.), *Young children in the Arab society in Israel*, 134–167. Tel Aviv: Mofet. (in Hebrew)
- Haegeman, Liliane. 1994. *Introduction to government and binding theory*. Oxford: Blackwell.
- Hamann, Cornelia. 2000. The acquisition of constituent questions and the requirement of interpretation. In Friedemann, Marc-Ariel & Rizzi, Luigi (eds.), *The acquisition of syntax*, 170–201. Harlow, England: Longman.

- Hamburger, Henry & Crain, Stephen. 1982. Relative acquisition. In Kuczaj, Stan A. (ed.), *Language development: Syntax and semantics*, 245–274. Hillsdale, N. J.: Erlbaum.
- Hirsch, Christopher & Wexler, Ken. 2007. The late development of raising: What children seem to think about seem. In Davies, William D. & Dubinsky, Stanley (eds.), *New horizons in the analysis of control and raising*, 35–70. Dordrecht: Springer. DOI: https://doi.org/10.1007/978-1-4020-6176-9_3
- Hollebrandse, Bart & Roeper, Thomas. 1996. The concept of do-insertion and the theory of INFL in acquisition. In Koster, Charlotte & Wijnen, Frank (eds.), *Proceedings of the Groningen assembly on language acquisition*, 261–271. Netherlands: Center Language & Cognition Groningen.
- Israel, Michael & Johnson, Christopher & Brooks, Patricia J. 2000. From states to events: The acquisition of English passive participles. *Cognitive Linguistics* 11(1/2). 103–129. DOI: <https://doi.org/10.1515/cogl.2001.005>
- Jisa, Harriet & Reilly, Judy & Verhoeven, Ludo & Baruch, Elisheva & Rosado, Elisa. 2002. Passive voice constructions in written text: A crosslinguistic developmental study. *Written Language and Literacy* 5(2). 163–182. DOI: <https://doi.org/10.1075/wll.5.2.03jis>
- Jordens, Peter. 1990. The acquisition of verb placement in Dutch and German. *Linguistics* 28. 1407–1448. DOI: <https://doi.org/10.1515/ling.1990.28.6.1407>
- Kaplan, Dafna. 1983. *Order of acquisition of morpho-syntactic categories among Hebrew-speaking children aged 1;9–3;6*. Unpublished MA thesis, Tel Aviv University.
- Kayne, Richard. 1994. *The antisymmetry of syntax*. Cambridge, MA: The MIT Press.
- Kim, Chae-Eun & O’Grady, William. 2016. Asymmetries in children’s production of relative clauses: data from English and Korean. *Journal of Child Language* 43(5). 1038–1071. DOI: <https://doi.org/10.1017/S0305000915000422>
- Landau, Idan. 2011. Predication vs. aboutness in copy raising. *Natural Language & Linguistic Theory* 29(3). 779–813. DOI: <https://doi.org/10.1007/s11049-011-9134-4>
- Levin, Beth & Rappaport Hovav, Malka. 1995. *Unaccusativity: At the syntax–lexical semantics interface*. Cambridge, MA: MIT Press.
- Lorusso, Paolo & Caprin, Claudia & Guasti, Maria Teresa. 2005. Overt subject distribution in early Italian children. In Brugos, Alejna & Clark-Cotton, Manuella R. & Ha, Seungwan (eds.), *A Supplement to the Proceedings of the 29th Annual Boston University Conference on Language Development*. Cascadilla Press.
- Lust, Barbara & Flynn, Suzanne & Foley, Claire. 1996. What children know about what they say: Elicited imitation as a research method for assessing children’s syntax. In McDaniel, Dana & McKee, Cecile & Cairns, Helen Smith (eds.), *Methods for assessing children’s syntax*, 55–76. Cambridge, MA: MIT Press.
- Lustigman, Lyle. 2016. From opacity to transparency: Transitional categories in early Hebrew grammar. In Berman, Ruth A. (ed.), *Acquisition and development of Hebrew: From infancy to adolescence*, 225–258 (Trends in Language Acquisition Research 19). John Benjamins Publishing Company. DOI: <https://doi.org/10.1075/tilar.19.08lus>
- Lustigman, Lyle & Berman, Ruth A. 2016. Form and function in early clause-combining. *Journal of Child Language* 43(1). 157–185. DOI: <https://doi.org/10.1017/S0305000915000100>

- Machida, Nanako & Miyagawa, Shigeru & Wexler, Kenneth. 2004. A-chain maturation re-examined: Why Japanese children perform better on full unaccusatives than on passives. In Csirmaz, Aniko & Gualmini, Andrea & Nevins, Andrew (eds.), *MITWPL48 Plato's problem: Papers in language acquisition*, 91–112. Cambridge, MA: MIT press.
- MacWhinney, Brian. 1991. *The CHILDES handbook: Tools for analyzing talk*. Hillsdale, NJ: Erlbaum.
- Maratsos, Michael & Fox, Dana E. C. & Becker, Judith A. & Chalkley, Mary Anne. 1985. Semantic restrictions on children's passives. *Cognition* 19. 167–191. DOI: [https://doi.org/10.1016/0010-0277\(85\)90017-4](https://doi.org/10.1016/0010-0277(85)90017-4)
- Mateu, Victoria Eugenia. 2020. Intervention effects in the acquisition of raising: Evidence from English and Spanish. *Language Acquisition* 27(1). 1–34. DOI: <https://doi.org/10.1080/10489223.2019.1598412>
- McKee, Cecile & McDaniel, Dana & Snedeker, Jesse. 1998. Relative children say. *Journal of Psycholinguistic Research* 27. 573–596. DOI: <https://doi.org/10.1023/A:1024901029643>
- Meisel, Jürgen M. (ed.) 1992. *The acquisition of verb placement*. Dordrecht: Kluwer. DOI: <https://doi.org/10.1007/978-94-011-2803-2>
- Melnik, N. 2017. Raising, inversion and agreement in modern Hebrew. *Journal of Linguistics* 53(1). 147–179. DOI: <https://doi.org/10.1017/S0022226715000444>
- Metz, Marijke & van Hout, Angeliek & van der Lely, Heather. 2012. Subject interpretation of object questions by Dutch 5-year-olds: The role of number agreement in comprehension. *Linguistics in the Netherlands* 29(1). 97–110. DOI: <https://doi.org/10.1075/avt.29.08met>
- Müller, Natascha & Penner, Zvi. 1996. Early subordination: The acquisition of free morphology in French, German, and Swiss German. *Linguistics* 34. 133–165. DOI: <https://doi.org/10.1515/ling.1996.34.1.133>
- Nir, Bracha. 2016. Development of intra- and inter-clausal dependency in Hebrew. In Berman, Ruth (ed.), *Acquisition and development of Hebrew: From infancy to adolescence* 19, 258–294. John Benjamins Publishing Company. DOI: <https://doi.org/10.1075/tilar.19.09nir>
- Orfitelli, Robyn Marie. 2012. *Argument intervention in the acquisition of A-movement*. UCLA dissertation.
- Otsu, Yukio. 1994. Early acquisition of scrambling in Japanese. In Hoekstra, Teun & Schwartz, Bonnie D. (eds.), *Language acquisition studies in generative grammar* 8, 253–264. John Benjamins Publishing. DOI: <https://doi.org/10.1075/lald.8.12ots>
- Owen, Amanda J. & Leonard, Laurence B. 2006. The production of finite and nonfinite complement clauses by children with specific language impairment and their typically developing peers. *Journal of Speech, Language, and Hearing Research* 49(3). 548–571. DOI: [https://doi.org/10.1044/10902-4388\(2006/040\)](https://doi.org/10.1044/10902-4388(2006/040))
- Penner, Zvi. 1992. The ban on parameter resetting, default mechanisms, and the acquisition of V2 in Bernese Swiss German. In Meisel, Jürgen M. (ed.), *The acquisition of verb placement*, 245–281. Springer, Dordrecht. DOI: <https://doi.org/10.1007/978-94-011-2803-2>

- Perlmutter, David M. 1978. Impersonal passives and the Unaccusative Hypothesis. In Perlmutter, David & Jaeger, Jeri J. & Woodbury, Anthony C. & Ackerman, Farrell & Chiarello, Christine & Gensler, Orin D. & Kingston, John (eds.), *Proceedings of the Fourth Annual Meeting of the Berkeley Linguistics Society*, 157–189. Berkeley: University of California, Berkeley. DOI: <https://doi.org/10.3765/bls.v4i0.2198>
- Pierce, Amy E. 1992a. *Language acquisition and syntactic theory: A comparative analysis of French and English child grammars*. Dordrecht: Kluwer. DOI: https://doi.org/10.1007/978-94-011-2574-1_1
- Pierce, Amy E. 1992b. The acquisition of passives in Spanish and the question of A-chain maturation. *Language Acquisition* 2(1). 55–81. DOI: https://doi.org/10.1207/s15327817la0201_3
- Poeppel, David & Wexler, Ken. 1993. The full competence hypothesis of clause structure in early German. *Language* 69. 1–33. DOI: <https://doi.org/10.2307/416414>
- Radford, Andrew. 1990. *Syntactic theory and the acquisition of English syntax: The nature of early child grammars of English*. Blackwell: Oxford.
- Radford, Andrew. 1994. The syntax of questions in child English. *Journal of Child Language* 21(1). 211–236. DOI: <https://doi.org/10.1017/S0305000900008722>
- Rahmany, Ramin & Marefat, Hamideh & Kidd, Evan. 2011. Persian speaking children’s acquisition of relative clauses. *European Journal of Developmental Psychology* 8(3). 367–388. DOI: <https://doi.org/10.1080/17405629.2010.509056>
- Rasin, Ezer. 2016, October. *Resumptive pronouns across components: Evidence from Hebrew*. NELS 47, UMass Amherst.
- Rizzi, Luigi. 1997. The fine structure of the left periphery. In Haegeman, Liliane (ed.), *Elements of grammar*, 281–337. Dordrecht: Kluwer. DOI: https://doi.org/10.1007/978-94-011-5420-8_7
- Rizzi, Luigi. 2017. Locality and the functional sequence in the left periphery. In Aboh, Enoch & Haerberli, Eric & Puskás, Genoveva & Schönenberger, Manuela (eds.), *Elements of comparative syntax: Theory and description* 127, 319–348. Boston/Berlin: De Gruyter. DOI: <https://doi.org/10.1515/9781501504037-012>
- Rizzi, Luigi. 2018. Intervention effects in grammar and language acquisition. *Probus* 30(2). 339–367. DOI: <https://doi.org/10.1515/probus-2018-0006>
- Rizzi, Luigi & Bocci, Giuliano. 2017. Left periphery of the clause: Primarily illustrated for Italian. In Everaert, Martin & van Riemsdijk, Henk C. (eds.), *The Wiley Blackwell companion to syntax*, 1–30. Wiley. DOI: <https://doi.org/10.1002/9781118358733.wbsyncom104>
- Roeper, Thomas. 1991. How a marked parameter is chosen: Adverbs and do-insertion in the IP of child grammar. In Maxfield, Thomas L. & Plunkett, Bernadette (eds.), *Chapters in the acquisition of WH: Proceedings of the Umass roundtable*, 175–202. GLSA Publications, Department of Linguistics, South College, University of Massachusetts.
- Rowland, Caroline F. & Pine, Julian M. 2000. Subject-auxiliary inversion errors and Wh-question acquisition: “What children do know?” *Journal of Child Language* 27. 157–181. DOI: <https://doi.org/10.1017/S0305000999004055>

- Rowland, Caroline F. & Pine, Julian M. & Lieven, Elena V. M. & Theakston, Anna L. 2003. Determinants of acquisition order in wh-questions: Re-evaluating the role of caregiver speech. *Journal of Child Language* 30(3). 609–635. DOI: <https://doi.org/10.1017/S0305000903005695>
- Sano, Tetsuya. 2004, November. *The acquisition of Japanese topicalization and the role of discourse context*. Presented at the 29th Boston University Conference on Language Development, Boston, MA.
- Sano, Tetsuya & Endo, Mika & Yamakoshi, Kyoko. 2001. Developmental issues in the acquisition of Japanese unaccusatives and passives. In Do, Anna H-J. & Domínguez, Laura & Johansen, Aimee (eds.), *BUCLD Proceedings* 25, 668–683. Somerville, MA: Cascadilla Press.
- Santelmann, Lynn & Adger, David. 1998. The acquisition of verb movement and spec-head relationships in child Swedish. *Specifiers: Minimalist approaches*, 271–298.
- Sauerland, Uli. 2000. Two structures for English restrictive relative clauses. In Saito, Mamoru & Abe, Yasuaki & Aoyagi, Hiroshi & Arimoto, Masatake & Murasugi, Keiko & Suzuki, Tatsuya (eds.), *Proceedings of the Nanzan GLOW*, 351–366. Nagoya: Nanzan University.
- Sekali, Martine. 2012. The emergence of complex sentences in a French child's language from 0;10 to 4;01: Causal adverbial clauses and the concertina effect. *Journal of French Language Studies* 22(1). 115–141. DOI: <https://doi.org/10.1017/S0959269511000615>
- Sheldon, Amy. 1974. The role of parallel functions in the acquisition of relative clauses in English. *Journal of Verbal Learning and Verbal Behavior* 13(3). 272–281. DOI: [https://doi.org/10.1016/S0022-5371\(74\)80064-2](https://doi.org/10.1016/S0022-5371(74)80064-2)
- Shen, Zheng. 2018. Fragment answers and movement. *Natural Language & Linguistic Theory* 36(1). 309–321. DOI: <https://doi.org/10.1007/s11049-017-9369-9>
- Shimada, Hiroyuki & Tetsuya Sano. 2007. A-chains and unaccusative-unergative distinction in the child grammar: The acquisition of Japanese *te-iru* constructions. In Belikova, Alyona & Meroni, Luisa & Umeda, Mari (eds.), *Proceedings of the 2nd conference on Generative Approaches to Language Acquisition North America (GALANA)*, 386–393. Somerville, MA: Cascadilla Proceedings Project. Retrieved from www.lingref.com, document # 1578.
- Shlonsky, Ur. 1992. Resumptive pronouns as a last resort. *Linguistic Inquiry* 23. 443–468. DOI: <https://www.jstor.org/stable/4178780>
- Shlonsky, Ur. 1997. *Clause structure and word order in Hebrew and Arabic*. New York: Oxford University Press.
- Shlonsky, Ur & Doron, Edit. 1992. Verb second in Hebrew. In Bates, Dawn (ed.), *Proceedings of the West Coast Conference on Formal Linguistics* 10, 431–446. Stanford, CA: Center for the Study of Language and Information.
- Snyder, William & Hyams, Nina & Crisma, Paola. 1995. Romance auxiliary selection with reflexive clitics: Evidence for early knowledge of unaccusativity. In Clark, Eve V. (ed.), *Proceedings of the 26th Annual Child Language Research Forum*, 127–136. CSLI Publications, Stanford, CA.
- Soares, Carla. 2003a. The C-domain and the acquisition of European Portuguese: The case of wh-questions. *Probus* 15(1). 147–176. DOI: <https://doi.org/10.1515/prbs.2003.002>
- Soares, Carla. 2003b, December. *Computational complexity and the acquisition of the CP field in European Portuguese*. Paper presented at ConSole XII. Patras, Greece.

- Spinner, Patti & Grinstead, John. 2006. Subjects, topicalizations and wh-questions in child German and Southern Romance. In Sagarra, Nuria & Toribio, Almeida Jacqueline (eds.), *Selected proceedings of the 9th Hispanic linguistics symposium*, 241–251. Somerville, MA: Cascadilla Proceedings.
- Steel, Gillian & Rose, Miranda & Eadie, Patricia & Thornton, Rosalind. 2013. Assessment of complement clauses: A comparison between elicitation tasks and language sample data. *International Journal of Speech-Language Pathology* 15(3). 286–295. DOI: <https://doi.org/10.3109/17549507.2013.777852>
- Stromswold, Karin. 1995. The acquisition of subject and object Wh question. *Language Acquisition* 4. 5–48. DOI: <https://doi.org/10.1080/10489223.1995.9671658>
- Szterman, Ronit & Friedmann, Naama. 2020. The effect of syntactic impairment on errors in reading aloud: Text reading and comprehension of deaf and hard of hearing children. *Brain Sciences* 10(896). 1–35. DOI: <https://doi.org/10.3390/brainsci10110896>
- Thornton, Rosalind Jean. 1990. *Adventures in long-distance moving: The acquisition of complex wh-questions*. University of Connecticut Dissertation.
- Thornton, Rosalind. 2008. Why continuity. *Natural Language & Linguistic Theory* 26(1). 107–146. DOI: <https://doi.org/10.1007/s11049-007-9031-z>
- Thornton, Rosalind & Stephen Crain. 1994. Successful cyclic movement. In Hoekstra, Teun & Schwartz, Bonnie D. (eds.), *Language acquisition studies in generative grammar*, 215–252. Amsterdam, Philadelphia: John Benjamins.
- Tur-Kaspa, Hana & Dromi, Esther. 2001. Grammatical deviations in the spoken and written language of Hebrew-speaking children with hearing impairment. *Language, Speech, and Hearing Services in Schools* 32. 79–89. DOI: [https://doi.org/10.1044/0161-1461\(2001/007\)](https://doi.org/10.1044/0161-1461(2001/007))
- van Kampen, Jacqueline. 2010. Typological guidance in the acquisition of V2 Dutch. *Lingua* 120(2), 264–283. DOI: <https://doi.org/10.1016/j.lingua.2008.07.005>
- van Riemsdijk, Henk. 1978. A case study in syntactic markedness: The binding nature of prepositional phrases. *Studies in Generative Grammar* 4. 1–313.
- Varlokosta, Spyridoula & Armon-Lotem, Sharon. 1998. Resumptives and Wh-movement in the acquisition of relative clauses in Modern Greek and Hebrew. In *Proceeding of the 22nd Boston University Conference on Language Development*, 737–746. Somerville, MA: Cascadilla Press.
- Vergnaud, Jean-Roger. 1974. *French relative clauses*. PhD diss., Massachusetts Institute of Technology.
- Wexler, Ken. 1994. Optional infinitives, head movement and the economy of derivations. In Lightfoot, David & Hornstein, Norbert (eds.), *Verb movement*, 305–350. Cambridge: Cambridge University Press.
- Williams, Edwin. 1980. Predication. *Linguistic Inquiry* 11. 203–238. <https://www.jstor.org/stable/4178153>
- Zuckerman, Shalom. 2001. *The acquisition of “optional” movement*. Groningen dissertations in linguistics, 34. Rijksuniversiteit Groningen. ISSN 0928-0030

