

The acquisition of Hebrew unaccusatives: Young children and A-chains

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One of the most influential accounts regarding the acquisition of syntax claims that A-chains mature only around the age of 4 or even 5 years (Borer & Wexler, 1987). Is it really the case that young children cannot produce structures that involve A-chains? The current study tested whether children can produce sentences with movement from object to subject position, using unaccusative verbs. In Hebrew, both SV and VS orders are used with unaccusatives. This optionality allows for the testing of the maturation of A-chains: if indeed young children do not master A-chains, they are expected to produce unaccusatives in their base-generated order VS, and refrain from the SV order. If they assign unaccusatives an interpretation of unergatives, they are expected to produce unaccusatives and unergatives in the same word order, SV only. We conducted 7 experiments that assessed the ability of 1;6-4;0 year-old Hebrew-speakers to produce sentences with unaccusative and unergative verbs using sentence repetition, story retelling and analysis of spontaneous speech. The results indicated that children younger than 4 and even younger than 2 years old already distinguish between unaccusative and unergative verbs, and use both VS and SV order for unaccusatives, but only SV order for unergatives. They use possessive datives in the SV and VS sentences with unaccusatives, indicating that they assign the argument of the unaccusative an interpretation of an internal argument. led us to conclude that children younger than two years can move the argument of unaccusatives from object to subject position, namely, they already produce sentences that include A-chains.

At the early stages of language acquisition, children do not express complete knowledge of the syntax of their language. The maturation of syntax hypothesis, one of the leading theories in the field of language acquisition (Borer & Wexler, 1987), suggests that children actually possess all syntactic components from birth, but these mature gradually. In particular, Borer and Wexler suggested, following the findings about children's difficulty in understanding passives (Maratsos et al., 1983), that the ability to assign thematic roles to constituents that moved to another position in the sentence matures only at around the age of 4 or even 5 years. This hypothesis was termed "The maturation of A-chains".

What are these A-chains? Arguments in a sentence receive a role from the verb, for example, in the sentence "*The girl ate hummus*", the verb "ate" assigns the girl a thematic role of the agent of the action, and the hummus – a thematic role of the theme of the action. However, in some cases constituents can relocate in the sentence, and be produced in a position other than where they get interpreted. In these cases,

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the thematic role needs to be assigned to the constituent in its new position. Chains link between the constituent in its new position and its original position and allow the transfer of the thematic role.

There are several types of chains, which differ in the type of element that moves, and the position to which it moves. A-chains (Argument-chains) are a type of chain that enables an argument to receive its thematic role in a position other than the initial one, i.e. connect two argumental positions: the new position and the original position.

Since the formulation of the maturation of A-chains hypothesis in 1987, the way of thinking about chains has changed, mainly because of the VP internal subject hypothesis (VPISH, Koopman & Sportiche, 1991). Incorporating the VPISH, according to which all subjects that originate within VP move to spec-IP, argument chains include, in fact, both the movement from object to subject position (to spec-VP) in passives and unaccusatives, and the consequent movement from spec VP to spec IP. The maturation of A chains was initially suggested to account for the problems children have with passives (such as *The girl was kissed*) compared to actives (*The grandmother kissed the girl*). Due to the fact that the movement from spec VP to spec IP is common to all subjects – in passives, unaccusatives, unergatives and transitives – this movement cannot be the source of the difficulty in passives and I will not discuss it in this article. I will focus on the movement from object to subject position, which is the closest manifestation, in terms of current linguistic theory, to the essence of Borer and Wexler’s original theory.


This paper will present a line of studies that tested empirically whether Hebrew-speaking toddlers under the age of 4 are able to perform the movement from object to subject position, by exploring the ability of different age groups (between 1;6 and 4;0) to produce sentences that contain this type of chains. The structure we examined was unaccusatives with SV order, which involve the movement of the NP from object to subject position¹.

What are unaccusatives?

The intransitive verbs, verbs that take only one NP argument, are divided into two main groups: unaccusative verbs like *sank*, *fell*, *spilled*, and unergative verbs like *jumped*, *danced* and *laughed*. The main difference between the two is due to the thematic role of the argument NP. The argument of unaccusative verbs is a theme, whereas the argument of unergatives is an agent. In the sentence “The leaf fell”, for example, the leaf is not actively responsible for the action of the verb, but bears the semantic role of patient. In contrast, the bird in the sentence “The bird chirped” is the agent.

¹ We preferred to test unaccusatives over passives due to the fact that in Hebrew passives are uncommon (Berman, 1997a, 1997b, 2002; Jisa, Reilly, Verhoeven, Baruch, & Rosado, 2002), and the use of unaccusatives, on the other hand, is widespread.

The difference between the two intransitive verbs led researchers to assume two different structural analyses for the two types of verbs. The single argument of unaccusatives is a direct object, and is base-generated in object position, after the verb, while in unergatives the argument is base-generated in subject position. Thus, although superficially the sentences “*The leaf fell*” and “*The bird chirped*” both show NP-V word order, the first involves NP movement from object to subject position and its surface structure includes a trace in object position (example 1), while in the other the NP is base-generated in the subject position (2). This hypothesis is called “The Unaccusativity Hypothesis” (Levin & Rappaport-Hovav, 1995; Perlmutter, 1978; Perlmutter & Postal, 1984).²

- (1)  fell the leaf
The leaf_i fell t_i
- (2) The bird chirped

The Unaccusativity Hypothesis is supported not only by theoretical linguistic analysis, but also by online processing studies. A study that tested the reactivation of the moved constituent in object position shows that in an English sentence like “The coffee spilled” the coffee is reactivated after the verb. On the other hand, in sentences with the same word order (NP-V) but with unergative verbs, no such reactivation occurs (Friedmann, Taranto, Shapiro & Swinney, 2003).

In Hebrew, both SV and VS word orders are used with unaccusatives – it is possible to say both (3) and (4). According to the linguistic theory, the movement of the NP “the coffee” from object to subject position constructs sentences like (4) from the base generated order of sentence (3). The moved NP is linked to its initial position via argument chain (A-chain). This chain enables the thematic role assignment despite the movement – the verb assigns the thematic role of patient to the position where the NP was generated, i.e. after the verb, and the role is transferred via the A-chain to the new position, before the verb. The original position is marked by trace (t_i), as seen in example (4). On the other hand, sentences like (3) do not derive from argument movement, and their surface structure and deep structure representations are similar (Borer, 1986).

- (3) nishpax ha-kafe
spilled the-coffee
- (4) ha-kafe_i nishpax t_i
the-coffee spilled

² The term “unaccusative” (that according to Pullum, 1991 was coined by Pullum and adopted by Perlmutter & Postal) derives from the fact that although verbs like “fell” have a theme argument in object position, they do not assign it accusative case.

Since in English, unlike Hebrew, null subject is illicit, the s-structure of unaccusatives demands that the NP moves to subject position. In other words, English unaccusatives require argument movement: the NP that is generated in object position as the complement of the verb inside the VP has to move to subject position before the verb (see examples 5 and 6):

(5) *Broke the vase

(6) The vase_i broke t_i

Based on the analysis of children's passives production, Borer and Wexler (1987) suggested that at the preliminary stages of language acquisition children cannot assign lexical features (thematic roles) to transferred constituents, i.e. cannot link the constituent with its trace and produce A-chain and as a consequence cannot assign the thematic role to the constituent, therefore they reject structures that contain A-chains. According to this hypothesis, at these early stages young children will either produce unaccusatives without NP movement to argument position (i.e. in deep structure form: V-NP order) or avoid using unaccusatives, at least in English, where the utterances without movement are ungrammatical. Only at advanced stages of acquisition, after the maturation of A-chains (which according to Borer and Wexler should happen after age 4 years), these children will start producing utterances in which the NP has moved from its original position after the unaccusative verb to its new position, before the verb. The optionality of the movement of unaccusative subjects in Hebrew enables us to look at the acquisition of A-chains from a new angle. If Hebrew-speaking children are unable to produce A-chains, or if A-movement is "expensive" for them and they prefer the structure without the movement, then they have the option to generate a grammatical sentence in V-NP order. This optionality allows for the testing of the preference of young speakers to one of these structures (see Zuckerman, 2001 for criticism about the existence of real syntactic optionality).

According to a slightly different hypothesis, children have the ability to produce A-chains at very young age, but at the preliminary stages of language acquisition they prefer not to use it if they have another option, that is if they can produce a movement-free utterance. Zuckerman (2001) suggested that in the case of two apparently equal options, children will favor the more economical order. However, in structures that contain obligatory movement in the target language, the movement is easily acquired. Zuckerman found that 3;6-4;3 year olds who were asked to repeat Hebrew sentences with verb movement to second position (triggered inversion), made mistakes in which the verb was "returned" to its original position. Similar findings were reported by Friedmann and Novogrodsky (2003) and by Friedmann, Bastaker and Shatil (2004). These findings indicate that children at this age group prefer not to perform the optional verb movement to C, the highest head of the syntactic tree. On the other hand, when the participants were asked

to repeat sentences with Quotative Inversion (for example *"boker tov", amar Dani* = Good morning, said Danny) they produced the sentences correctly and made very few reversals (4%). According to Zuckerman, verb movement is obligatory in the presence of quotation, i.e. the verb has to move to the second position. This last finding indicates that the ability to perform movement is present at this point, but the young speakers use it only if it is obligatory.

Additional finding regarding the construction of A-chains comes from a study that focused on word order acquisition in English (Pierce, 1989, 1992). The common finding in language acquisition literature is that children rarely make mistakes in basic word order in English, i.e. in 99% of the cases they produce sentences in SV order. Nonetheless, analysis of the numbered cases that appeared in VS order reveals that 75% of these sentences (45 of 60) included unaccusative verbs. Pierce explains that this finding is not an indication for word order acquisition difficulty, but rather for avoiding from raising the NP from its original position (after the verb) to a position before the verb, as expected in adult language. Pierce analyzed spontaneous speech of toddlers (ages 1;6-2;3), and in her opinion the findings reflect the representation of unaccusatives at the early stages of language acquisition. In subsequent studies Déprez and Pierce (1993, 1994) point out once more that in English most of the VS errors occur with unaccusatives, and they also note that there are similar findings in Swedish (i.e. the use of VS order in toddlers is limited to unaccusatives). Does the fact that the majority (99%) of sentences that English-speaking children produce (including unaccusatives) is in SV order allow us to conclude that children can raise unaccusatives arguments to subject position? Not at this point: it is possible that at these early stages children do not analyze this verbs as unaccusatives verbs, and the NP – as it is in the case of unergatives – is base-generated in subject position and does not raise to it from object position. It is also possible that since the SV order is obligatory in English with all verb types, the reference to avoid movement when it is possible cannot express itself in English.

Babyonyshev et al. (2002) conducted a study in Russian, in which they examined the maturation of A-chains hypothesis. The researchers argued that children are indeed analyzing unaccusatives as unergatives. In order to determine if children are able to represent A-chains with unaccusative verbs they used the genitive-of-negation construction in Russian. This construction is a diagnostic of the existence of an internal argument for adults because the genitive appears on an internal argument of either a transitive verb or an unaccusative when the object is nonspecific and indefinite and is included within the scope of negation. (For some internal arguments of unaccusatives it has to appear and for some it is optional). The researchers add an assumption that although the argument of unaccusatives appears in object position rather than in subject position, it can be used to test A-chains because it covertly moves after spell-out to subject position. They presented children in ages 3;0-6;6 a task in which they had to complete the object in

sentences with an unaccusative verb. The children had notable difficulty using the genitive in this task, but were able to produce it with transitive verbs. Babyonyshev et al. concluded that the children failed to produce the genitive case because they could not represent the A-chain, in line with Borer and Wexler's hypothesis. They suggested that the children in fact analyze the object of the unaccusative verb as a subject of an unergative verb, without A-movement. It should be noted, however, that the assessment of A-chains in this experiment was rather indirect (as the object actually does not move before spell-out to subject position in Russian), and that the experiment and the target sentences were complicated for several reasons (the use of negation, genitive, and the fact that genitive is not always obligatory on internal arguments), so there could be several sources for the failure of the children to produce a genitive in these negative construction other than a deficit in A-chains.

The series of experiments we conducted in Hebrew examined in a more direct fashion whether young children distinguish between unaccusatives and unergatives and are aware of their different syntactic requirements; whether they are able to perform A-movement and produce unaccusatives in SV order at early stages; and whether they prefer, at these stages, to use the VS order with unaccusative verbs. If, indeed, children lack the ability to produce argument chains as Borer and Wexler (1987) argued, we expect that they will either generate all their unaccusatives in VS order, i.e. without movement, or parse unaccusatives as unergatives (as Babyonyshev et al., 2002 argue), and in this case produce it consistently in SV order. On the other hand, if they can generate the same unaccusatives both in VS order and in SV order, this would indicate that they have the ability to represent argument chains. The assignment of an unaccusative representation to unaccusative verbs will be tested using possessive datives, which indicate the existence of an internal argument.

Experiment 1 analyzed the occurrences of SV and VS sentences with unaccusative verbs and compared them to unergatives and reflexives in spontaneous speech. Experiment 2 tested the repetition of sentences that include unaccusatives in SV and VS orders and compared them to SV and VS orders with transitive verbs. Experiment 3 compared the repetition of SV sentences with unaccusatives and unergatives. Experiment 4 tested story retelling with SV sentences with unaccusatives, unergatives, and reflexives as well as VS with unaccusatives. Experiment 5 tested story retelling with SV sentences with unaccusatives in which the subjects were pronouns and proper names. Experiments 6 and 7 tested the production of unaccusatives with possessive datives, Experiment 6 did it in a repetition task of SV sentences, and Experiment 7 did it in a story retelling task.

Experiment 1: Analysis of spontaneous speech

The speech of 21 children between the ages 1;6 and 2;11 was analyzed in order to determine if, at this early stage of language acquisition, they produce only unaccusatives that match the deep structure representation (VS order), or whether they produce SV order with unaccusatives as well, and which of these word orders they prefer. We also compared unaccusatives to two other types of intransitive verbs which do not include A-movement, unergatives and reflexives, in order to determine if there is a difference in subject-verb order between the three verb groups, i.e. whether young children already distinguish between these three types of verbs and their requirements with respect to word order. If, indeed, children prefer not to produce A-chains or are unable to produce them, they will favor the structure that does not involve movement. In this case we will expect to find more utterances in VS order (*nishbera ha-ke'ara* = broke the-bowl) compared to SV order (*ha-ke'ara nishbera* = the-bowl broke) among the unaccusatives, or maybe even to see only VS sentences with unaccusatives. If, on the other hand, their speech contains also unaccusatives with A-movement to the position before the verb, namely unaccusatives that are produced in SV order, it will suggest that, contra to Borer and Wexler's prediction, even at this very young age children can represent A-chains and exhaust the optionality in the unaccusative structure.

The unaccusatives were compared to two other types of intransitive verbs: unergatives and reflexives. Unergatives verbs: the NP is base-generated in subject position (Danny laughed, Tammy danced), i.e. the deep structure of these verbs is SV order. Unlike unaccusatives, this type of sentences is not derived by movement, and therefore we do not expect to find any word order errors in this verb group.

Reflexive verbs: the comparison of reflexive verbs (such as *hitkale'ax* = wash-self and *histarek* = comb-self) to unaccusatives is interesting because two different hypotheses regarding their deep structure are found in the literature. One hypothesis holds that reflexives resemble unaccusatives. According to this view, the SV order of a sentence that includes a reflexive verb is a result of movement of the object to a position before the verb, as is the case with unaccusative verbs. The other hypothesis suggests that the deep structure of reflexives resembles the deep structure of unergatives in that for both verb types the argument originates in subject position (Reinhart, 1997; Reinhart & Siloni, 2004). If young children indeed do not have A-chains, this would allow an evaluation of the two theories: If it turns out that in sentences with reflexives the NP is located in subject position and not in object position – like unergatives and unlike unaccusatives – it will support the second hypothesis regarding the analysis of reflexives according to which the argument of reflexives is not base-generated in object position.

We will also distinguish between full NPs and pronouns in each of the structures. While full NPs like “the teddy bear” can stand either before the unaccusative verb or after it, proper names, pronouns (weak, unstressed pronouns), and close family-member terms (daddy, grandma) appear in Hebrew only in pre-

verbal position, post-verbal pronouns or proper names are ungrammatical, as can be seen in examples ((7), (8)).

- (7) a. ha-dubi nafal
the-teddy bear fell
- b. Danny nafal
Danny fell
- c. aba nafal
daddy fell
- d. hu nafal
he fell
- (8) a. nafal ha-dubi
fell the-teddy bear
- b. *nafal Danny
fell Danny
- c. *nafal aba
fell daddy
- d. *nafal hu
fell he

In the structure “He fell” or “Danny fell” the pronoun or the proper name are generated inside the verb phrase, as a complement, but unlike other NPs in the unaccusative structure their movement to a position before the verb (probably outside the VP³) is obligatory. Since pronouns and proper names behave differently from other NPs (i.e. undergo obligatory movement), we will analyze their occurrences separately from instances of full NPs.

Method

Participants

Participants were 21 children (10 girls, 11 boys) ages 1;6-2;11 (mean age 2;5). All the children were native speakers of Hebrew with normal language development.

³ The different behavior of pronouns and proper names, compared to full NPs cannot be, as it is in the case of clitics for instance, phonological in nature, because it applies to long proper names like “Jonathan” as well. Similarly, it cannot get an analysis similar to that of constraints on pronouns in double object constructions, because proper names behave differently from pronouns here: *”Ron natan matana la”=’Ron gave a present to-her”, but “Ron natan matana le-Noga”=’Ron gave a present to-Noga’. A possible explanation for the behavior of pronouns and proper names with unaccusatives might be that Nominative case checking within the VP can only apply to full NPs but not to pronouns and proper names. Pronoun and proper names might require structural case checking, which is possible only in a spec-IP, which means that they must move out of the VP.

Materials and design

The speech transcripts were taken from CHILDES (Berman, 1985; Berman & Dromi, 1984; MacWhinney, 2000) and included 177 utterances with intransitives. We counted the number of unaccusatives, unergatives and reflexives in every transcript, and checked how many times the order was VS and how many times it was SV for each verb type.

For classifying verbs as unaccusatives, both semantic and syntactic criteria were used:

Semantic criterion:

Verbs were classified as unaccusatives if they were of the three types of unaccusatives that were described by Levin and Rappaport-Hovav (1995): change of state caused by external factor verbs (*shattered*), change of place caused by internal factor verbs (*came*), and appearance and existence verbs (*appeared*).

Syntactic criteria:

1. Both VS and SV order are acceptable with the verb (e.g. *nafal ha-kadur* = the ball fell, *ha-kadur nafal* = fell the ball), without a non-subject trigger before the verb.
2. It is possible to insert possessive dative between the NP and the unaccusative verb (Borer & Grodzinsky, 1986) (e.g. *nafal li ha-kadur* = fell **to-me** the ball).
3. The VS utterance that includes the verb and a feminine or plural NP is relatively acceptable even with a default masculine agreement on the verb (e.g. *nigmar ha-kola* = finished-mas the-coke-fem).

Reflexives were identified by their semantic definition (verbs in which the subject performs the action on himself) and by a linguistic test: in Hebrew, reflexive verbs take instrumental case (it is possible to add *be'emca'ut...* = using... to the sentence: *ha-yeled histarek be'emcaut mivreshet* = the boy combed using a brush). Unergatives were identified by the semantic definition, which classifies them as denoting events in which the subject is perceived as actively initiating or actively responsible for the action expressed by the verb, and by not meeting the criteria for unaccusatives and reflexives.

Results

Every utterance the children produced and included intransitive verb (unaccusative, reflexive or unergative) was noted, even if it was a repetition after an adult or after himself. A total of 177 utterances with intransitive verbs were produced. Table 1 summarizes the distribution of the relevant utterances with respect to word order and NP type.

Table 1. Number and percentage of intransitive utterances in SV and VS order

	Unaccusatives		Unergatives		Reflexives	
	Full NP	Pronoun/ Proper name	Full NP	Pronoun/ Proper name	Full NP	Pronoun/ Proper name
VS	9 (50%)	1 (2%)	1 (5%)	0	0	0
SV	9 (50%)	57 (98%)	21 (95%)	76 (100%)	0	3 (100%)
total	76		98		3	

The results show that the same number of utterances with unaccusatives were produced in SV order and in VS order; half of the utterances that included an unaccusative verb and full NP were produced with movement of the object to subject position. Therefore we can conclude that children can perform A-movement even before they are two years old. Furthermore, two of the utterances with unaccusatives included possessive datives, what indicates that the children analyze the NP in these sentences as internal argument (according to Borer & Grodzinsky, 1986, possessive datives are assigned to internal argument). On the other hand, the group of unergatives, in which the NP is base-generated in subject position, includes only one utterance with NP in object position. In other words, among the unergatives there are significantly more utterances in SV order than in VS order ($\chi^2 = 36.36, p < .0001$). The only unergative utterance in VS order was *boxe tinok* = cries baby (Yahel, 2;3)⁴.

The number of times that the full NP appears after the verb in unaccusatives was significantly larger than with unergatives ($\chi^2 = 10.9, p < .001$). This indicates that young children distinguish between the two types of intransitive verbs, and use both VS and SV orders only when it is grammatical in Hebrew, namely with unaccusatives.

The analysis of the utterances that included pronouns and proper names reveals that they were produced properly preverbally in the overwhelming majority of the cases for both unaccusatives and unergatives (98% and 100% of the cases, respectively). That is, when object movement is obligatory (i.e. the object is a pronoun or a proper name) the children apply it in most of the times.

As for the production of verbs of different types, the findings (presented in the bottom row of Table 1) show that Hebrew-speaking children do not refrain from using unaccusatives, and they produce both unergative and unaccusative verbs. The findings also show that the young children rarely produced reflexives in the corpus we examined, but this might have been due to absence of relevant contexts (such as bathing) in these random spontaneous speech samples.

⁴ Another girl (Alita 1;8) repeated this phrase few times while asking “mi boxe tinok?”=‘who cries baby?’. Since the context suggested that she meant “Who cries? Baby?”, we excluded it. Nonetheless, it is possible that toddlers comprehend the verb “cry” as unaccusative – something that the baby is not responsible for.

As for ages, there was no significant difference in the rate of VS compared to SV order that related to age within the group of children. Unaccusatives with full NP were produced in our samples starting from the age of 2;1, and at this age both SV and VS utterances were already seen at the children's speech. The first unaccusatives in the corpus were produced at age 1;11, with pronouns and names.

Interim discussion – Experiment 1

Several conclusions emerge from Experiment 1. First, the finding that toddlers under the age of 3 produced the unaccusatives in both VS and SV orders implies that they are capable of representing an A-chain that links the original position of the NP after the verb with its new, movement derived, subject position. Contrary to Borer and Wexler's hypothesis (1987), children master the argument-chain movement before they are 2 years old.

Second, children do not use SV and VS order randomly in all verb types but only in the unaccusative group. All the unergatives except one were produced in SV order. Considering this data, we can conclude that at a very young age children distinguish between different kinds of intransitives and represent unaccusatives and unergatives differently.

Additional finding comes from the comparison of full NPs versus pronouns and proper names. Unaccusatives and unergatives show similar pattern when pronouns or proper names are involved: the children produce the pronoun/proper name before the verb in 133 out of 134 utterances. If indeed pronouns and proper names are base-generated, like other NPs, inside the VP, this finding highly supports the suggestion that young children do master A-movement and A-chains. It is important to note that in adult language there is no optionality in the case of unaccusatives that involve pronouns or proper names, thus it is reasonable to assume that the children regard this movement (if indeed pronoun/proper name movement occurs) as obligatory⁵.

Another interesting finding is the distribution of full NPs compared to pronouns and proper names (unaccusatives: 18 full NPs, 58 pronouns/proper names; unergatives: 22 and 76, respectively).⁶

Unlike unaccusatives and unergatives, reflexives were rare in the corpus we examined. Nonetheless, it should be noted that all the occurrences with reflexives were of SV order. However, this cannot be taken as

⁵ There is, however, another possible explanation by which pronouns, unlike full NPs, are base-generated in spec IP. In this case the location of the pronoun can argue not for a movement but for the existence of functional node above VP. Nonetheless, it will be difficult to justify the analysis that proper names, that behave similarly to pronouns in this case, appearing only preverbally, are also base-generated in spec IP.

⁶ A possible account would have claimed, assuming that pronouns are base-generated outside the VP, that the wide use of pronouns enables the children to avoid from raising the NP from object to subject position in unaccusatives. However, the fact that the distribution ratio of pronouns and full NPs is almost equal in unergatives, and is not characteristic only of unaccusatives (3.2 in unaccusatives, 3.4 in unergatives) rules this explanation out.

an argument for the deep structure of sentences with reflexives, not only because the small number of data points does not allow for any conclusion about their representation, but also because given that we have shown that A movement is not problematic for the participants, and therefore we cannot conclude whether the SV order was base-generated or derived by movement.

To summarize, Experiment 1 shows that even before they are two years old, children distinguish between different types of intransitive verbs and are aware of the word orders that are associated with each type. The unaccusative verb, which can appear both before and after the subject NP in Hebrew adult language, appears in both orders in the young children's language as well.

Experiment 2: Repetition of unaccusatives in SV and VS order

Experiment 1 indicated that equal number of sentences with unaccusative verbs were produced in SV and VS orders. Nonetheless, only 18 utterances in the corpus included full NP, and therefore in order to enlarge the relevant data base, the next step was to use a different experimental design, one that enables the selection and control of the target sentences. In Experiment 2 we used repetition task in order to test children's ability to produce VS and SV sentences with different types of verbs. The repetition task allows a window into children's syntactic abilities, because when a child repeats a sentence she is not just passively copying it, but actively reconstructing it (Lust, Flynn & Foley, 1996). This task was chosen since it can reveal the difficulty in different syntactic structures according to the child's repetition pattern. Children can only repeat structures they already acquired, and therefore the comparison of sentences that are repeated correctly and sentences with errors can indicate the stage of syntax acquisition. Indeed, if the child repeats all the sentences correctly we cannot draw any conclusion about acquisition, because the correct repetition might have merely been verbatim. But if we compare two sentences that are equal in length and constituents, and the child has difficulty with only one of them, it will be possible to conclude that the problematic structure is unavailable at this point.

The experiment tested the children's ability to produce unaccusatives in VS and SV orders, and included also transitive verbs in VS and SV orders for comparison.

Method

Participants

Eighteen children were tested in 3 age groups: 6 children ages 2;3-2;8 (4 girls, 2 boys), 6 children ages 2;11-3;4 (4 boys, 2 girls), and 6 children ages 3;6-3;10 (4 boys, 2 girls). All the children were native speakers of Hebrew with normal hearing and no language disorders.

Procedure

The children were asked to help "Shoko" the puppet. They were told that Shoko is very shy, and does not speak to adults, and in order to help him they have to repeat the sentences that they hear as accurately as they can. The two older groups responded very well to the task and found it easy and enjoyable. However, the task turned out to be inadequate for the younger children (2;3-2;8). After few trials in which they failed to cooperate and refused to help Shoko, they were given an alternative task: building a tower up "to the sky". They were asked to repeat after the experimenter as accurately as they can, and for each sentence they repeated they were awarded with a block and added it to the tower.

Materials

The experiment included 40 sentences in VS and SV order with unaccusative verbs ((9),(10)) and transitive verbs ((11),(12)). All the sentences started with a temporal adverb (*etmol* = yesterday) to allow for the transitive verbs to raise to a position before the subject. The younger group was given only the 20 unaccusative sentences. We introduced 10 sentences of each type in a random order.

(9) *etmol nigmera ha-uga*

yesterday finished the-cake

(10) *etmol ha-xalav nigmar*

yesterday the-milk finished

(11) *etmol lavsha xen sveder*

yesterday wore Xen sweater

(12) *etmol ha-safta ciyra praxim*

yesterday the-grandmother drew flowers

Results

The results, seen in Table 2, show that all age groups were able to produce sentences with unaccusative verbs in both SV and VS order. The difference between SV and VS order in unaccusatives was non-significant in all the three groups ($\chi^2 = 2.60$, $p = .11$ for the young group). Nonetheless, the repetition task was informative as for the children's ability to represent syntactic structures – the same children performed poorly on sentences that involved transitive verb movement (11) (Triggered Inversion, Shlonsky, 1997). The difference between AVSO and ASVO sentences was significant in the two groups that repeated transitives ($\chi^2 = 50.9$, $p < .0001$, for the middle group; $\chi^2 = 43.93$, $p < .0001$ for the older group). In both groups the common error in AVSO sentences was reversals of the subject and the verb to create ASVO order. In total, 72 out of 76 errors in transitives (95%) were reversals.

Children at the middle and young groups tended to omit the temporal adverb. Omission of the temporal adverb accompanied with correct subject-verb order repetition was not treated as error. Except for one girl at the young age group (whose age was 2;7), all the unaccusatives were repeated correctly in at least 8 cases (80%). Namely, the pattern of good repetition of both SV and VS with unaccusatives was present even for the youngest girl in the young group, who was 2;3.

Table 2. Repetition task performance in different types of sentences: % correct (correct/total)

Age	Unaccusative VS	Unaccusative SV	Transitive VSO	Transitive SVO
2;3-2;8	82% (49/60)	92% (55/60)	-	-
2;11-3;4	100% (60/60)	97% (58/60)	30% (18/60)	93% (56/60)
3;6-3;10	100% (60/60)	100% (60/60)	43% (26/60)	98% (59/60)

Interim discussion – Experiment 2

The repetition task also shows that even at the age of 2;3 children can repeat unaccusatives in SV order not differently than in VS order. At the same time, they fail to repeat sentences with verb movement to C (with transitives), which indicates that they can already move NPs from object to subject position, but they still cannot (or prefer not to) move the verb to C⁷.

In other words, Experiment 2 also shows that children at the age of 2;3 are capable of producing sentences that involve object-to-subject position movement. It is possible, of course, that there is a stage at which they lack this ability, but this stage must be prior to the age of 2;3, and maybe – according to the results of Experiment 1 – prior to the age of 2;1. In Experiment 3 we tested the production of unaccusatives in 2;2 year olds.

⁷ A possible explanation for the difference between movement of the subject of unaccusatives and verb movement to C is that children have difficulties only when the movement results in lack of adjacency between the verb and its arguments, or to ambiguity with respect to thematic role assignment. So they can repeat an SV sentence with unaccusatives because the verb is still adjacent to its argument, and there is only a single thematic role to assign, but they cannot repeat a sentence with a transitive verb in C, before the subject and the object, because the verb ceases to be adjacent to its theme, and there are two thematic roles to be assigned. This might also be the source for the difference between the early acquisition of movement of the subject in unaccusatives and the late acquisition of verbal passive in English. In the case of unaccusatives there is only one thematic role, and this might be the reason that there is no difficulty even in the presence of movement of the argument. But in the case of passives, there are two possible thematic roles (i.e. Theme and an implicit Agent) and this might make the movement problematic (see Fox & Grodzinsky 1998 for an analysis of the origin of the difficulty in the acquisition of passive).

Experiment 3: Repetition of SV order with unaccusatives and unergatives

Another experiment was aimed at directly comparing the ability of young children to repeat SV sentences with unaccusative verbs and SV sentences with unergative verbs.

Method

Participants

The participants were 60 children ages 2;2-3;10: 21 children ages 2;2-2;9, 19 children ages 2;10-3;2, and 20 children ages 3;3-3;10.. All the children were native speakers of Hebrew, with normal language development and no hearing impairment.

Procedure

As in the second experiment, the children were asked to repeat sentences. The motivation was, again, helping a shy puppet or building a block tower up "to the sky".

Materials

20 sentences in SV order – 10 with unaccusatives (13) and 10 with unergatives (14).

(13) etmol ha-misxak hitparek ba-xeder

yesterday the-game collapsed in the room

(14) etmol ha-sus dahar ba-sade

yesterday the-horse galloped in the-field

Results

As can be seen in Figure 1, the performance of the children in the repetition of both SV sentences with unaccusative verbs and of SV sentences with unergative verbs was high (93.5% and 93.8% respectively for the group). The repetition of the two verb types did not differ significantly, in any of the age groups, and did not differ for the whole group, $t(59) = 0, p = .87$.

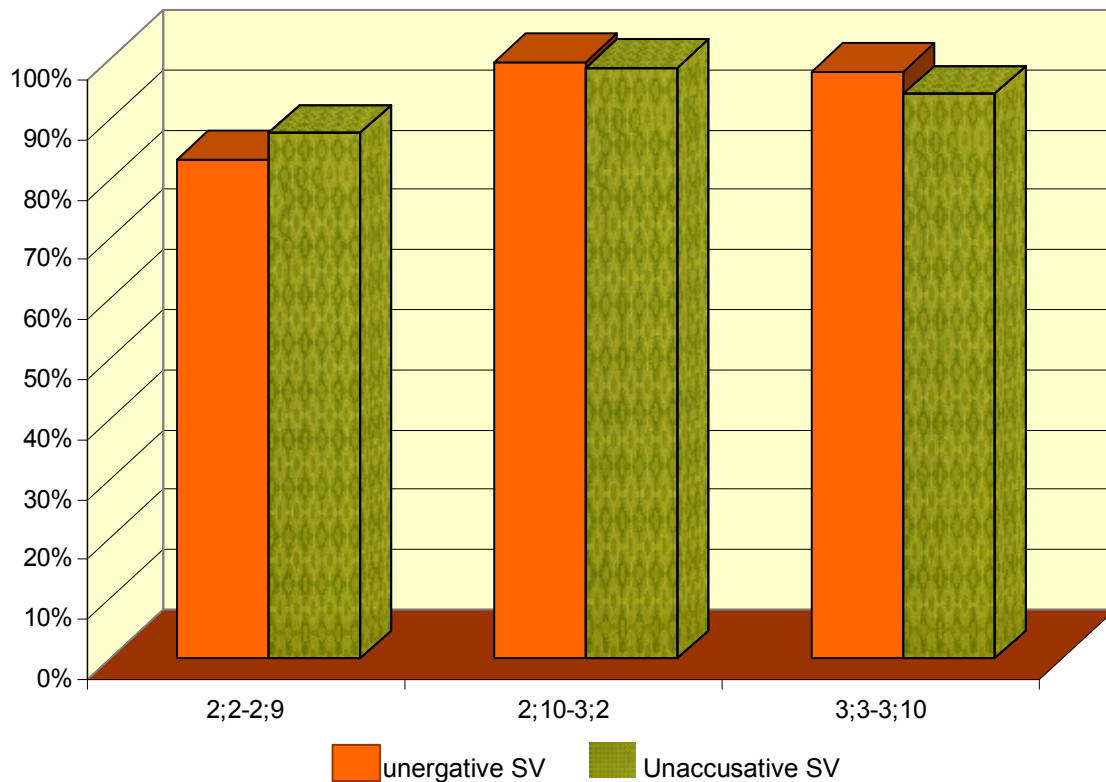


Figure 1. Repetition of SV sentences with unaccusatives and unergatives – percent correct

Experiment 4: Story retelling – unaccusatives in VS and SV order

In Experiment 4 we tested more natural production of unaccusatives, by means of a story retelling task. The children in this experiment were younger than the children that attended Experiment 3 – between year-and-a-half and two years old.

Method

Participants

The participants were 30 children ages 1;6-2;0. All the children were native speakers of Hebrew with normal language development and no hearing problem.

Procedure

A story retelling task was used. The children were looking at an illustrated story, and the experimenter or the mother were reading it to them enthusiastically, with matching facial expressions and gestures, in order to keep the child as attentive and focused as possible. After reading the relevant sentences, the child was

asked to retell the story (in fact, repeat each sentence). See Figure 2 for an example of one of the story pages. The retelling was taped and transcribed. Due to the young ages of the children, every session lasted several hours that were necessary to get acquainted with the child and to complete the retelling of the whole story.

Materials

The whole story included 57 intransitive verbs, Experiment 4 compared 37 of them, which included a full NP subject: 8 SV unaccusatives, 8 VS unaccusatives, 11 unergatives, 10 reflexives.



Figure 2. An example of one of the story pages

(A box with tiny colorful cake-candies was standing on the table. Suddenly, daddy sneezed, the box wobbled, then it fell down, the candies scattered on the table and on the carpet, and the carpet got dirty')

Results

Only 17 out of 30 children who participated in the experiment were able to repeat more than two sentences out of the 57, and only these children (ages 1;9-2;0) were included in the analysis. For these children, a total of 134 unergative SV, 145 reflexive SV, 111 unaccusative SV and 113 unaccusative VS sentences were read. The 13 other children, who produced only two or less full sentences in response to the 57 story sentences had mainly no-responses, and in the few utterances that they did produce they typically produced single word utterances, mainly a single verb, or only the final word, in response to all types of target sentences.

First we compared unaccusatives with full NPs in SV and VS orders. There was no significant difference between the two orders: 36% of the SV sentences were produced as full sentences compared to 40% of the

VS sentences, $t(16) = 0.85$, $p = .35$. The children aged 1;9-1;10 produced less full utterances of all types than the children who were 1;11-2;0 but even the youngest child was able to produce the unaccusatives in both VS and SV order (as well as the SV sentences with unergatives and reflexives).

Another analysis compared the production of SV unaccusatives and the production of SV unergatives and SV reflexives. No significant difference between the verb types was detected, $F(2,32) = 1.32$, $p = .28$. See Figure 3 for the performance in the production of the four structures.

Almost no subject-verb order reversals occurred in either of these structures: there was 1/134 for the unergatives, 0/145 for the reflexives, 1/111 for the SV unaccusatives and 1/113 for the VS unaccusatives. The main responses that were not full utterance were either no response, or omission of the first constituent – omission of the subject for the three target sentence types of the order SV, and omission of the verb for the VS unaccusatives. No response and omission of first constituent constituted 42% and 54% of the non-full utterance responses for the unergatives, 35% and 61% for the reflexives, 34% and 58% for the SV unaccusatives, and 32% and 59% for the VS unaccusatives.

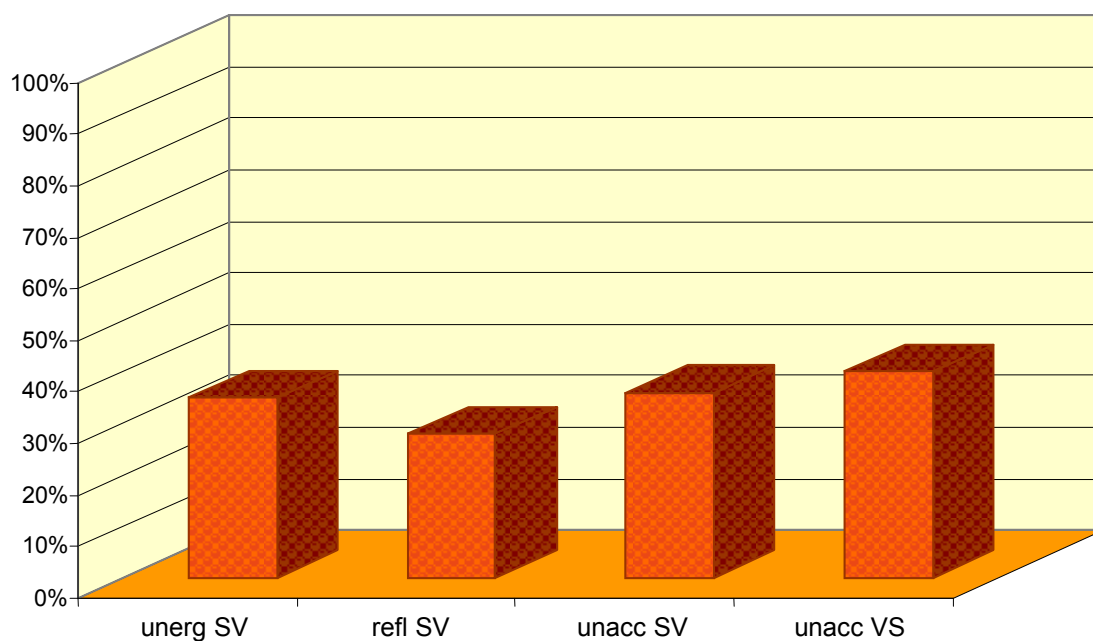


Figure 3. Production of full sentences in story retelling task: SV unergatives, SV reflexives, SV unaccusatives, and VS unaccusatives

Experiment 5: Story retelling – SV unaccusatives with pronouns and proper names

As we pointed out earlier, weak pronouns, proper names and family-member names are always in subject position in Hebrew unaccusatives (see examples (7) and (8) on page 7). In the current experiment we tested the production of unaccusatives with this kind of subjects compared to unaccusatives with full NP subjects, in order to find out whether children raise the NP to subject position when it is obligatory.

Method

Again, we used a story retelling task, with the same 30 children who participated in Experiment 4, aged 1;6-2;0, analyzing the production of the 17 children (ages 1;9-2;0) who produced at least two sentences in throughout the study.

Materials

The story included 9 sentences with a pronoun, a proper name or a family-member name (Daddy, Mommy) subject – all of them NPs that have to appear preverbally.

Results

Out of 119 sentences with pronouns/proper names/family-member names, only a single VS order error was detected. In other words, the children produced the obligatory movement to subject position in all the sentences with this type of NPs, although in Experiment 4 they showed their ability to produce unaccusatives in VS order too, when the subject was a full NP. Even the youngest participant, who was 1;9, was able to produce the target sentences in SV order.

Interim discussion – Experiments 3, 4 and 5

Experiments 3, 4 and 5 show, similarly to Experiment 1 and 2, that even under the age of two, and even at age 1;9, children are capable of producing both VS and SV order with unaccusatives, and that their performance with SV unaccusatives is not different from their performance with movement-free SV order sentences, like reflexives and unergatives. The fact that they use VS order only with unaccusatives indicates that at this young age children already distinguish between unaccusatives on the one hand, and unergatives and reflexives on the other. In addition, the findings show that the children are not making any order errors when the movement is obligatory, i.e. when the NP is a pronoun or a proper name it is always in subject position.

Experiment 6: Possessive datives

So far we showed that children can produce SV structure for unaccusative verbs as well as VS structure, and that they use only SV order with unergatives. My suggestion was that children can tell unaccusatives from unergatives, and that they know that unaccusatives can appear both in SV and in VS order, while unergatives appear only in SV order, and are capable of performing object-to-subject movement with unaccusatives. Nonetheless, an alternative explanation is still open, according to which the children are not using A-movement in SV order unaccusatives, and in fact interpret the unaccusative verb as an unergative verb. Because the same verbs were used both in SV and in VS order, it is impossible to claim that the unaccusatives always get an unergative interpretation, but it might still be claimed that they give the same verb an unergative interpretation when they produce it in SV order, but when they give it an unaccusative interpretation they produce it in VS order, without A-movement. Do they really assign unaccusatives in SV order an unergative interpretation?

In order to test this alternative hypothesis, we used possessive datives, which indicate the existence of an internal argument in deep structure (Borer & Grodzinsky, 1986). As noted by Borer and Grodzinsky, possessive datives can only modify internal arguments. Hence, they can serve as possessors to objects of transitive verbs (*ha-geshem hirtiv le-miri et ha-ciyur* – the rain wet to-Miri the-drawing, meaning the rain wet Miri's drawing) but also as subjects of unaccusatives (example 15, meaning the girl's teddy bear fell), but not to subjects of unergatives. The production of SV sentences with unaccusatives and possessive datives would indicate that the speaker analyzes the subject as moving from internal argument position. Hence, if the children will produce SV unaccusatives with possessive datives successfully, it will refute the hypothesis suggesting that they are base-generating the NP as external arguments. For that reason we tested the ability of children to repeat SV unaccusatives with possessive datives.

Method

Participants

20 children participated in this study, 7 children ages 2;0-3;0 (mean 2;7), and 13 ages 3;4-4;0 (mean 3;7). All the children were native speakers of Hebrew with normal language development and no hearing problem.

Procedure and Materials

The experiment used a sentence-repetition task. Each child repeated 40 sentences, of 5 types, 8 of each type: SV with unaccusatives and a possessive dative (example 15), SV and VS unaccusatives with PP adjuncts (examples 16 and 17), and SV and VS transitives (18 and 19).

(15) S-V-PPdative unaccusatives with possessive dative

ha-dubi nafal la-yalda
the-teddy-bear fell to-the-girl

(16) A-S-V-PP unaccusatives with PP adjuncts

etmol ha-kos nishbera b-a-ki'yor
yesterday the-glass broke in-the-sink

(17) A-V-S-PP unaccusatives with PP adjuncts

etmol nishpax ha-mic me-ha-kos
yesterday spilled the-juice from-the-glass

(18) A-S-V-O transitives

etmol ha-doda kanta simla
yesterday the-aunt bought dress

(19) A-V-S-O transitives with verb movement

etmol kar'aa ha-safta sefer
yesterday read the-grandma book

Results

Table 3 summarizes the results of Experiment 6. The children produced SV order with unaccusatives without difficulty with the possessive dative. The production of SV sentences with unaccusatives was not poorer than the parallel VS sentences. This held even for the youngest child who was 2;0. Thus we can conclude that the children correctly interpret SV unaccusatives as structures in which the argument is based-generated in object position and moves to subject position. The current experiment also repeats the findings of previous experiments, showing that children can easily produce SV and VS order unaccusatives, and that they can repeat XSVO transitives but not XVSO transitives (with verb movement to C).

Table 3. Correct repetition percentages for each sentence type

	Unaccusative	Unaccusative	Unaccusative	Transitive	Transitive
Age	SVPDative	AVSP	ASVP	AVSO	ASVO
2;0-3;0	82%	46%	65%	18%	77%
3;4-4;0	88%	71%	77%	39%	88%

Experiment 7: Story retelling – SV and VS unaccusatives with possessive dative

We conducted another experiment with possessive datives, this time using a story retelling task. In the current experiment we compared the repetition of sentences with unaccusatives and possessive datives in VS (20) and SV (21) order.

(20) ha-kafe nishpax lo
the-coffee spilled to-him

(21) nigmar lo ha-kemax
finished to-him the-flour

Method

Participants were the same children who participated in Experiments 4 and 5, the 17 children aged 1;9-2;0 who produced at least two sentences throughout the study.

Each child heard a story and was asked to retell it. Each child heard 5 sentence like (20), with a full NP, an unaccusative verb and a possessive dative, and 6 sentence like (21), starting with the unaccusative verb and then a possessive dative and a full NP. A total of 43 utterances and attempts at retelling the VS sentences and 46 utterances and attempts for the SV targets were collected from the children's retelling.

Results

The results, presented in Figure 4, show that the children retold sentences with possessive dative in both SV and VS orders – without significant difference, $t(16) = 2.23, p = .56$. Only 2 errors of subject verb order reversals occurred in the VS target sentences, and 1 reversal in the SV order.

Although they did not produce many full sentences with all the components, an NP, an unaccusative verb and a possessive dative at this young age, the rate of full utterances they produced was similar for the VS and SV target orders. Out of 61 sentences they heard in the VS order, they produced 16 full utterances, and for the SV order they produced a similar rate of 14/60 sentences. The possessive dative was omitted in 36 sentences in the VS order, and in only 10 sentences in the SV order.

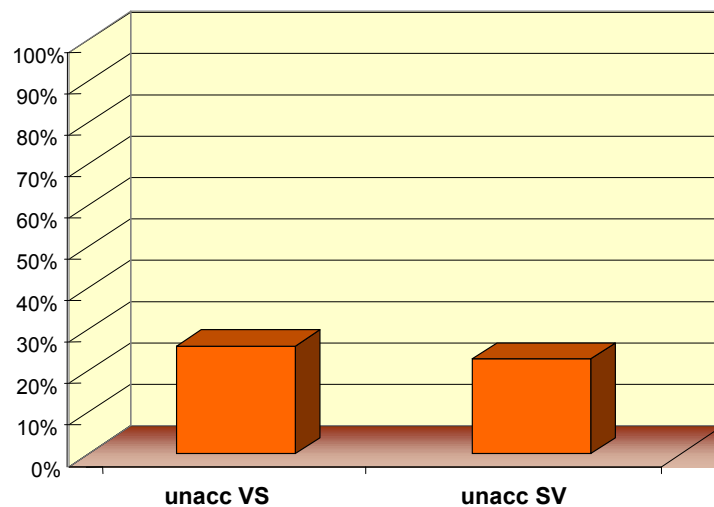


Figure 4. Story retelling – VS and SV order unaccusatives with possessive dative, percent correct

Interim discussion – Experiments 6 and 7

Experiments 6 and 7 reveal that children use unaccusatives with possessive dative in both VS and SV order. Since possessive datives indicate the existence of an internal argument, this finding supports the hypothesis that the children analyze SV order unaccusatives as derived by movement of the internal argument (object). Furthermore, the spontaneous speech analysis in Experiment 1 also showed that children use possessive dative properly, as an indication for internal argument.

Summary

All the 149 children who participated in the seven experiments in this study seemed to have the same opinion as to the question whether they can form A-chains. They produced structures that include A-chains. Even the participants who were younger than two years produced the internal argument of the unaccusative verbs both in post verbal and in preverbal position. The participants showed their ability to move the argument of the unaccusative verbs to a preverbal position in a variety of tasks: sentence repetition, story retelling and spontaneous speech. Importantly, at this early age they are already aware of the differences between different types of intransitives: they only produced both VS and SV orders with unaccusative verbs, but with unergatives, reflexives and transitives they only used SV. They produced sentences with unaccusatives with a possessive dative, which indicates that they assign the subject an interpretation of an internal argument.

The main result of the seven experiments in this study is thus that children younger than 2 years old can already produce sentences that involve movement from object to subject position. The current results do not say whether this movement is all the way up to spec-IP or whether it is only to spec-VP. Is there a stage at which children still do not raise the NP to a position before the verb? Possibly, but this stage was not detected even in the 1;9 year-olds in our study. If such a stage exists, it must occur very very early, prior to the age of two and at the beginning of the two-word stage, with the very first utterances with unaccusatives the child produces.

Author's note

These experiments were conducted as part of seminar papers prepared for the course "Neuropsychology of Language" during the years 2001-2003. Experiment 1 was conducted by Noga Balaban and Liat Zilbermann, Experiment 2 by Yafa Rosenfeld, Experiment 3 by Hedva Lavie, Experiments 4,5, and 7 by Efrat Emanuelli and Zohar Halamish and Experiment 6 by the students of "Introduction to Linguistics and Psycholinguistics" course 2002 and by Rama Novogrodsky. And many thanks to Sarit Cohen-Shalev for her help, and to Irena Botwinik-Rotem, Dror Dotan, Hagar Levy and Michal Biran for comments on an earlier version of the manuscript.

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