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Animacy, argument structure and unaccusatives in child English

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We offer evidence that children correctly represent unaccusative verbs as taking a single internal argument, rather than an external argument, and they raise this argument to subject position via A-movement, contra Babyonyshev et al. (2001). Our primary evidence comes from the distribution of animate vs. inanimate subjects with intransitive verbs. Perlmutter (1978) argues that inanimate subjects are generally compatible with unaccusative but not unergative verbs. Our data show that children correctly use both animate and inanimate subjects with unaccusatives, and only animate subjects with unergatives. In addition, children correctly limit use of resultatives to unaccusative verbs, and errors involving postverbal subjects occur disproportionally with unaccusatives. If children misanalyzed unaccusatives as unergatives, as argued by Babyonyshev et al. (2001), we would expect similar distributions of these verbs in all of these respects. Thus, we argue that children by age 3 have an adultlike representation of unaccusatives and therefore both respect UTAH (Baker 1988) and represent A-chains.

Keywords: A-chains; animacy; argument structure; maturation; unaccusatives

1. Introduction

We investigate English-speaking children's ability to correctly partition the class of intransitive verbs into the subclasses of unergatives (verbs that take a single external argument) and unaccusatives (verbs that take a single internal argument). These verb subclasses contrast along both semantic and syntactic dimensions. Unergative verbs (e.g. *laugh*, *dance*, *sleep*) select a volitional causer or Agent as their argument, and, correspondingly, this argument is mapped to the external subject position. Unaccusative verbs (e.g. *come*, *fall*, *go*) select an argument that undergoes some change of state or is affected by the event, and this argument, accordingly, is mapped to an internal position, the complement of the verb.

But in many languages, including English, the two types of verbs appear identical in their surface distribution: both occur with a subject and no object.

(1) a.   John laughed/danced/slept.
     b.   John came/fell/went.

Thus, we might ask whether children distinguish these verbs and correctly assign different underlying structures to (1a) and (1b). In particular, the structure in (1b) involves A-movement of the NP *John* into subject position. We argue here that children do correctly distinguish the two verb classes.

A different possibility, which we argue against, is that children fail to distinguish the two types of verbs and instead conflate them into one uniform class of verbs that have an unergative argument structure.[1] In their article on the acquisition of the genitive of negation construction in Russian, Babyonyshev et al. (2001) argue that to the extent that young children appear to produce and comprehend constructions involving A-movement, they are really producing and comprehending "s(yntactic)-homophone" constructions that lack A-movement. This view is in line with the A-chain maturation hypothesis of Borer and Wexler (1987, 1992). That is, young children's apparent verbal passives are really adjectival passives, as in (2b), and children's apparent unaccusative verbs are really unergative, as in (3b).

(2) a.   The doll$_i$ is torn t$_i$
     b.   The doll is torn

(3) a.   John$_i$ arrived t$_i$
     b.   John danced.

This proposal makes quite striking predictions not only about children's classification of verbs, but also about children's projection of argument structure.

One prediction that this view makes is that if children truly treat unaccusatives as unergatives, they should assume that unaccusative verbs select an external argument. One of the primary characterizations of the unaccusative-unergative split, due to Perlmutter (1978) is that unergatives denote a volitional act or state and therefore are predicated of volitional (hence, animate) entities. Unaccusatives, instead, do not have this limitation and are therefore compatible with non-volitional (including inanimate) arguments.

More recent work on the mapping of thematic roles onto argument structure confirms this tendency. According to UTAH (Uniformity of Theta Assignment Hypothesis; Baker 1988) and much other work (Grimshaw 1990; Keenan 1976; Pinker 1984, i.a.), external arguments are Agents or Experiencers, and hence are

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1.   A further logical possibility is that children treat all intransitive verbs as unaccusatives. As far as we know, no one has proposed this possibility.

animate.[2] Internal arguments are generally Themes and lack any kind of animacy restriction. Therefore, we can predict that if children analyze unaccusative verbs as unergative, they should produce these verbs only with animate subjects. At least, the proportion of inanimate subjects with unaccusative verbs should match the proportion of inanimate subjects with unergative verbs, and both proportions should be quite low. On the other hand, if children assign the correct argument structure to unaccusative verbs, they should show an asymmetry in the proportion of inanimate subjects between these two verb classes. That is, they should produce inanimate subjects with unaccusatives but not with unergatives.[3] To preview our findings, we show that the latter is indeed the case.

Additional syntactic criteria distinguish unaccusative from unergative verbs. The resultative construction is permitted with unaccusative verbs and transitives, but not with unergatives (unless the unergative appears as a "fake reflexive," such as *I laughed myself silly*) (Levin & Rappaport Hovav 1995). Therefore, if children represent unaccusatives as unergatives, they should fail to produce resultative constructions with either type of verb. On the other hand, if children correctly represent unaccusatives as distinct from unergatives, they should produce resultatives with unaccusative but not unergative verbs.

Our hypothesis that children correctly distinguish unaccusatives from unergatives also predicts that children may produce a post-verbal subject with unaccusative verbs, leaving the subject in its original position, but not with unergatives. Although both resultatives and postverbal subjects were extremely infrequent in our data, both constructions were found only with unaccusative verbs.

Taking Babyonyshev et al.'s (2001) view as the Null Hypothesis (H_0) and our own hypothesis as the Experimental Hypothesis (H_1), the following scheme summarizes our hypotheses and predictions.

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2.   Many languages, including English, allow inanimate Causers as external arguments (this role is sometimes called Force; Huddleston 1970), as in *The rock broke the window*. It is generally agreed, however, that these NPs are not true Agents, since Agents must be sentient or volitional. Moreover, a number of languages disallow inanimate subjects of transitives altogether (Japanese (Kuno 1973), Jacaltec (Craig 1976) and Blackfoot (Ritter & Rosen 2010)), so at best this is a marked construction.

3.   Babyonyshev et al. note that children might use inanimate subjects with unaccusative verbs, while still misanalyzing these verbs as unergative, if we take children's error to be one of syntactic mapping as opposed to semantic mapping. However, this requires that children base-generate Themes as external arguments, at odds with UTAH and the Thematic Hierarchy (Jackendoff 1972). We discuss this in more detail in Section 7.

H_0	H_1
Unaccusatives select only animate subjects	Unaccusatives allow both animate and inanimate subjects
Resultatives occur with neither unaccusatives nor unergatives	Resultatives occur only with unaccusatives
No postverbal subjects	Some postverbal subjects with unaccusatives (not unergatives)

On a theoretical note, the supposition that children incorrectly categorize unaccusatives as unergatives has deep implications for the Uniformity of Theta Assignment Hypothesis (UTAH, Baker 1988), as Babyonyshev et al. concede. In particular, it requires that UTAH be either violable or not part of children's initial grammar at all. Here we examine both the empirical predictions and the theoretical implications of this claim. We argue, contrary to Babyonyshev et al. that children do correctly categorize unaccusative and unergative verbs, and that UTAH is available and unviolated in children's early grammar.

Our article is structured as follows. In Section 2 we provide a basic discussion of the syntax of unaccusative and unergative constructions within the GB/Minimalist framework. In Section 3 we briefly review the arguments from Babyonyshev et al. (2001) claiming that young children cannot represent unaccusatives as involving A-chains, along with counterarguments based on Romance reflexive clitic constructions (Snyder, Hyams & Crisma 1994; Snyder & Hyams in prep) and Hebrew unaccusatives (Friedmann 2007). In Section 4 we present our predictions about English-speaking children's discrimination between unaccusative and unergative verbs. In Section 5 we discuss our methodology. In Section 6 we present our results and in Section 7 we conclude.

2.   Theoretical background: The unaccusative-unergative distinction

Over the years the specific formalism used to treat unaccusative verbs has changed, but the spirit of the distinction between unaccusatives and unergatives remains the same: unaccusative verbs are verbs that take a single *internal* argument, while unergatives are verbs that take a single *external* argument. Here we give only the briefest overview of syntactic analyses of unaccusative constructions.

The treatment of intransitive verbs as dividing into two classes, unaccusative and unergative, is due to David Perlmutter (1978). He argued that unergative verbs are "predicates describing willed or volitional acts," and their sole argument is projected externally ("initial 1" in Relational Grammar) – an underlying subject. Unaccusative

verbs, on the other hand, include verbs of existence, aspectual and inchoative verbs and verbs denoting "non-voluntary emission of stimuli that impinge on the senses." Their sole argument is projected internally ("initial 2" in Relational Grammar), that is, an underlying object.

Burzio's (1986) treatment of unaccusative verbs within the GB framework involves the projection of only an internal argument at D-structure, and A-movement of that argument to SpecIP at S-structure.

(4)   a. $[_{IP}$ e $[_{VP}$ arriverà Gianni]]
       b. $[_{IP}$ Gianni$_i$ $[_{VP}$ arriverà t$_i$]]

That the argument in (4) is an underlying internal argument can be shown with examples involving *ne*-cliticization. *Ne*-cliticization is possible only with (underlying) direct objects. Hence (5a) is grammatical, but (5b), where the transitive subject is supposed to be cliticized with *ne*, is ungrammatical. In parallel fashion, (6a) is grammatical, where the argument is underlyingly internal, but (6b), with an unergative verb, is ungrammatical.

(5)   a.   Gianni ne inviterà molti.
           Gianni will invite many of them

       b.   *Molti studenti ne mangeranno una mela.
           Many of the students will eat an apple

(6)   a.   Ne arriveranno molti.
           Many of them will arrive

       b.   *Ne telefoneranno molti.
           Many of them will call

In matrix clauses the internal argument must raise to get case. Unaccusative verbs, which do not theta-mark their subject, cannot assign Accusative case to their direct object (this is known as Burzio's Generalization). Therefore, the caseless internal argument of the unaccusative becomes the surface subject of the clause, where it receives Nominative case from tensed Infl.

Early Minimalist work distinguished unaccusatives from both unergatives and transitives by the lack of *v*P. Chomsky (1995: 316) claims that *v*P hosts the external argument of the predicate and therefore is absent in unaccusative constructions. More recently, the three main verb classes (transitive, unergative, unaccusative) are unified such that all of them project *v*P, but they differ in the features that are represented on the head of that projection. This distinction may be couched in terms of whether there is an agentive ([AG]) feature or not (yes for transitives and unergatives but no for unaccusatives), or whether the phase is defective (yes for unaccusatives but no for transitives and unergatives) (Chomsky 2001).

3.   Previous studies: Arguments for and against A-movement in children's unaccusatives

As noted in the Introduction, Babyonyshev et al. (2001) report that children have difficulty interpreting the genitive of negation construction in Russian, which is an unaccusative construction (Pesetsky 1982). They take this evidence as support for the view that A-chains are not represented by children until later in development (after age 5 or so). Importantly, the genitive of negation is a construction that involves *covert* movement of the verb's internal argument: it is realized in object position on the surface, similar to *ne*-cliticization (Burzio 1986). This is important because it disallows an s-homophonic interpretation of the construction without raising: that is, it cannot be analyzed as an unergative structure. Therefore, Babyonyshev et al. argue, children perform poorly on this construction because they are forced to give it an unaccusative analysis, yet they do not possess the ability to handle the A-movement required by this construction.

Other researchers have reached a different conclusion about children's ability to represent A-movement in unaccusatives. Snyder, Hyams and Crisma (1994) investigated children's ability to apply correct auxiliary selection in reflexive clitic constructions in Romance (Italian, French). Both Italian and French exhibit auxiliary selection, employing the HAVE auxiliary (*avere/avoir*) for transitive and unergative past participles, but the BE auxiliary (*essere/être*) for unaccusative past participles, as illustrated in (7) and (8).

(7)   a.   *Jean   a   dormi/mangé   une   pomme*
           John   has   slept/eaten   an   apple

      b.   Gianni ha dormito/mangiato una mela

(8)   a.   *Jean   est   arrivé*
           John   is   arrived

      b.   Gianni è arrivato

Reflexive clitic constructions are argued to be unaccusative (Marantz 1984) and therefore take the BE auxiliary:

(9)   a.   *Je   me   sui/*ai   mordu*
           I   me   am/*have   bitten
           "I have bitten myself"

      b.   *Gianni   si   è/*ha   morso*
           Gianni   self   is/*has   bitten

Snyder et al. show that very young children acquiring French and Italian are virtually perfect in their auxiliary choice in these constructions, deviating from the correct form in only 2 cases out of 133 for French (1.5%) and in 1 case out of 88 for Italian

(1.1%). More recently, Snyder and Hyams (in prep) cite further data in support of this pattern. Data from 4 additional children turned up 4 errors out of 114 reflexive clitic constructions (and the errors came from only 2 of the 4 children). (See also arguments from Italian children's (non-reflexive) object clitic agreement in Schaeffer 1996.)

Further evidence from child Italian comes from Lorusso, Caprin and Guasti (2005), who measured the rate of subject omission and the position of overt subjects (pre- vs. postverbal) in both longitudinal and cross-sectional spontaneous speech data. Lorusso et al. wanted to know whether children's pattern of using subjects differed according to the type of intransitive verb used. They found that these children, ages 18 to 36 months (the cross-sectional data came from a narrower age range: 22–35 months) produced overt subjects more frequently with unaccusative than with unergative or transitive verbs. Subject production with unergatives and transitives patterned together (25% and 22%, respectively, from the longitudinal corpus, and 12% and 13%, respectively, from the cross-sectional study). Subject production with unaccusatives exceeded these means in both corpora: 36% overt subjects in the longitudinal data and 29% in the cross-sectional data. Interestingly, children's distribution of overt vs. null subjects did not exactly mirror adults' distribution. Adults used overt subjects with roughly equal frequency with both unaccusative and unergative verbs (41% and 40%, respectively), but much less frequently with transitive verbs (20%).

As for the position of overt subjects with respect to the verb, Lorusso et al. found that it varied by verb category. While subjects were overwhelmingly preverbal with both transitive and unergative verbs (79% and 72%, respectively, from the longitudinal data and 74% each in the cross-sectional data), they were more evenly split with the unaccusatives, and there was a mild tendency for these subjects to be postverbal (66% postverbal for the longitudinal data, 54% postverbal for the cross-sectional data).

Although subject overtness and position are not diagnostics for unaccusativity, these distributions show that children distinguish these verb classes. The fact that, in child Italian, unergatives pattern together with transitives to the exclusion of unaccusatives suggests an adultlike partition: transitives and unergatives are alike in projecting a "true" subject (an external argument). The fact that subjects of unaccusatives are postverbal more often than subjects of unergatives suggests children represent them as underlying objects (and their preverbal occurrence is the result of A-movement). The fact that subjects of unaccusatives are frequently postverbal could be taken as support for the A-chain maturation hypothesis. However, it seems to us that the A-chain maturation hypothesis is that A-chains are unavailable to children, not that they are dispreferred. Since Italian-speaking children still produce preverbal subjects of unaccusatives about half the time we reason that though A-movement may be somewhat dispreferred, it is not categorically unavailable to children at this age.

Moreover, Lorusso et al. explain the asymmetry in subject overtness in terms of the unaccusative-unergative distinction: null subjects are pronouns (*pro*) that have

raised to SpecIP. Since subjects of unergative verbs are external, null subjects will be licensed more frequently with these verbs. Subjects of unaccusatives have the option of remaining in the internal position, in which they cannot be pronominal and therefore cannot be omitted.

Finally, Friedmann (2007) conducted both a series of elicitation experiments and a study of spontaneous productions of Hebrew-speaking children's unaccusative and unergative verbal constructions. Hebrew admits both an SV and a VS order for unaccusatives, but only an SV order for unergatives (unless a non-subject, e.g. an adjunct, is fronted and the verb then raises to C as a residual V2 movement; Friedmann notes this is a fairly marked construction in modern Hebrew). Thus, Hebrew allows the argument of an unaccusative to remain in its underlying position. Friedmann postulates that if children correctly distinguish unaccusative from unergative verbs, they should produce unaccusatives with both orders but unergatives with only SV order. In fact, she shows that children ages 1;6 to 2;11 (mean 2;5) produce unaccusatives in both SV and VS orders (50% in each), but limit unergatives to SV order (95%).

A series of elicitation experiments (some employing a repetition task and others employing a story retelling task) further demonstrate 2-year-old children's correct categorization of intransitive verbs: (a) they correctly repeat unaccusative sentences in both SV and VS order while having difficulty repeating transitive sentences with XVSO order (i.e. a non-unaccusative construction with a postverbal subject); (b) they are equally competent to repeat SV unaccusatives and unergatives (at ceiling for both); (c) they correctly produce possessive datives (which can modify only a direct object argument) with unaccusatives even in the SVPP order, suggesting that children have correctly analyzed the verb's argument as an underlying object.

4.   English unaccusatives: Diagnostics and predictions for child language

English does not provide the relatively straightforward morphosyntactic marking of unaccusativity found in other languages. Without constructions like *ne*-cliticization, auxiliary selection and variable word order, how can we tell whether children acquiring English correctly represent unaccusative and unergative verbs with divergent syntactic structures? Little work has explored children's categorization of these two verb classes in English. One study worth mentioning is that of Pierce (1989), who found more use of postverbal subjects with unaccusative than unergative verbs in child English, consistent with Lorusso et al.'s finding for Italian (above). (We find the same pattern in our data, below.) We rely on two types of diagnostics for unaccusativity, one semantic and one syntactic. First we discuss the semantic diagnostic of subject animacy: only unaccusative verbs should tolerate inanimate subjects, while unergatives should be restricted to animate subjects (cf. Perlmutter 1978).

Unergative verbs project an external argument, and external arguments are generally Agents (Keenan 1976; Jackendoff 1972). This restriction jibes with Perlmutter's (1978) semantic characterization of unergative verbs as expressing a volitional action or state and therefore requiring an agentive, or at least animate, subject. Unaccusatives, on the other hand, take an internal argument, generally a Theme, and Themes have no animacy restriction: they may be animate or inanimate entities. Thus, unergative verbs place a semantic restriction on their subject: it must be animate. Unaccusative verbs may occur with either animate or inanimate subjects, as shown in (10) and (11).[4]

(10)   a.   The girl slept.
       b.   #The rock slept.[5]

(11)   a.   The girl fell.
       b.   The rock fell.

Our prediction is that if children correctly distinguish unaccusative and unergative verbs, they should limit unergatives to occuring with animate subjects, but they should freely allow unaccusative verbs to occur with either animate or inanimate subjects.

In addition we look at two syntactic patterns that we expect to show a distinction between unaccusative and unergative verbs:

(a) The occurrence of resultatives with unaccusatives but not with unergatives.

As argued by Levin and Rappaport Hovav (1995) resultative constructions have a Direct Object Requirement, meaning that the resultative adjective phrase can be predicated only of a direct object. Thus, they are possible with objects of transitive verbs or subjects of unaccusative verbs, but not subjects of unergative verbs (unless a "fake reflexive" or other non-subcategorized object is utilized). This is illustrated in (12):

(12)   a.   John swept the table clean.
       b.   The river froze solid.
       c.   *The girl swam sober. (meaning = 9d)
       d.   The girl swam herself sober.

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4.   A subset of unergative verbs deviate from the general pattern: verbs of emission (*glow, glimmer, squeak*, etc.) are unergative (by syntactic tests such as resultative constructions) but select an inanimate subject. We will not address this subclass in detail here, and none of the verbs we searched for in the child data were verbs of this sort. Perhaps relevantly, verbs of emission actually show hybrid properties of unergatives and unaccusatives in some languages, such as Cree and Blackfoot (Brittain 2012; Johansson & Ritter 2012), and they are considered unaccusative according to Perlmutter's definition (see Section 2 above).

5.   We use the # symbol to indicate semantic anomaly.

(b) The occurrence of postverbal subjects with unaccusative but not unergative verbs. Recall that Lorusso et al. (2005) found such an asymmetry in child Italian, and we ask whether the same might be found in child English.

In addition, we considered whether children might make errors of using unaccusative (but not unergative) verbs in transitive frames. Since some unaccusative verbs alternate with a transitive use (*I opened the door; The door opened*), we might expect children to occasionally overgeneralize this alternation to other unaccusative verbs (such as *fall*) and use these verbs transitively. However, we found that children did not use either type of verb in transitive frames with any frequency (about 1–2% for both verb types).

5.   Method

We examined all files within the available data from Adam (ages 2;3–5;2), Eve (ages 1; 6–2; 3, both from Brown 1973) and Nina (ages 1;11–3;3, Suppes 1974) in the CHILDES database (MacWhinney 2000). We searched the files for children's productions of specific unaccusative and unergative verbs and categorized the subject of the sentence as either animate, inanimate or null. The unergative verbs we searched for were *sleep, laugh, dance,* and *cry*,[6] and the unaccusatives were *open, close, fall, come* and *go*. We chose these verbs because we judged them to be the most frequent intransitive verbs (in children's speech) that are unambiguously categorized as either unaccusative or unergative. That is, we excluded manner of motion verbs such as *run* which are ambiguous between an unaccusative and an unergative designation (Levin & Rappaport Hovav 1995). When used with a *directed motion* meaning, these verbs are unaccusative, while with a *nondirected motion* meaning (e.g. locational), they are unergative. In fact, Italian *correre* 'run' can take either the HAVE or BE auxiliary in the *passato prossimo* (examples cited in Levin & Rappaport Hovav 1995, attributed to C. Rosen 1984: 67).

(13)   a.   *Ugo ha corso meglio ieri.*   (nondirected motion)
              Ugo has run   better yesterday
              "Ugo ran better yesterday"

       b.   *Ugo è corso a   casa.*   (directed motion)
              Ugo is run   to home
              "Ugo ran home"

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6.   We also searched for the verb *shout* but found too few occurrences (3 by Adam and 1 formulaic use by Eve). We kept *close*, despite its small number of occurrences (8) so as to include a second unaccusative verb that alternates with a transitive form, like *open*.

In addition, this selection of verbs gives us some variety within the unaccusative set, as *open* and *close* are both causative alternation verbs, while the other unaccusative verbs are not.

Some additional details about how items were counted follow. (1) Exact repetitions of utterances were counted only once. (2) Exact repetitions of an adult's immediately preceding utterance were not counted. (3) References to toys that are frequently "animated" in children's play were counted as animate (e.g. *doll*). (4) Utterances with a null subject were counted separately. An attempt was made to infer the animacy of the missing subject from context, but the utterance itself was not counted as having either an animate or inanimate subject. (5) The expression *come on* was not counted, and neither were imperatives or "future" *go* (i.e. *gonna/going-to*). (6) Subjects such as *one* and *they* are ambiguous with respect to animacy, and so we used context to try to determine the animacy of the intended referent. If none could be found we did not count the item.

6.   Results

6.1   Subject animacy

First, let us look at the proportion of overt subjects that were animate or inanimate according to verb type. We will turn to null subjects below. The ages of the children span various time periods. Eve's data span ages 1;6 to 2;3, Adam's data span 2;3 to 5;2, and Nina's data span 1;11 to 3;3.

With the exception of Adam's uses of the verb *dance*, which we will return to in a moment, the children are fairly uniform in limiting subjects of unergative verbs to animate subjects (93.1%) but allowing unaccusative verbs to occur equally with both animate and inanimate subjects (51.5% and 48.5%, respectively).

The numbers of occurrences of the verbs *open* and *close* may seem unexpectedly small. The counts above are limited to intransitive occurrences of these verbs. They were used vastly more frequently in transitive frames, and when used transitively these verbs generally had animate subjects and inanimate objects (e.g. *would you open this, Mommy?* Nina 48).

The data in Tables 1 and 2 reveal that while children overwhelmingly used animate subjects with unergative verbs, their subjects were more evenly split between animate and inanimate for unaccusative verbs, in some cases showing a strong preference for inanimate subjects (e.g. *open* for Adam and Nina). By far the most striking counterexample to this trend is Adam's use of the unergative verb *dance* with inanimate subjects slightly more than half the time. In fact, as they stand the numbers are a bit misleading. Five of his ten utterances of *dance* with an inanimate subject included

Table 1. Percentage of animate/inanimate subjects with unergative verbs

verb	child	% Animate subject (N)	% Inanimate subject (N)	Total N
sleep	Nina	93.9 (170)	6.1 (11)	181
	Eve	100 (4)	0	4
	Adam	94.5 (52)	5.5 (3)	55
laugh	Nina	100 (3)	0	3
	Eve	–	–	0
	Adam	100 (9)	0	9
dance	Nina	97.3 (36)	2.7 (1)	37
	Eve	100 (2)	0	2
	Adam	47.4 (9)	52.6 (10)	19
cry	Nina	96.1 (50)	3.9 (2)	52
	Eve	100 (10)	0	10
	Adam	95.1 (39)	4.9 (2)	41
Mean/Total[7]		*93.1%*	*6.9%*	*413*

Table 2. Percentage of animate/inanimate subjects with unaccusative verbs

Verb	child	% Animate subject (N)	% Inanimate subject (N)	Total N
Open	Nina	21.1 (4)	78.9 (15)	19
	Eve	66.7 (2)	33.3 (1)	3
	Adam	23.1 (6)	76.9 (20)	26
Close	Nina	0	100 (4)	4
	Eve	–	–	0
	Adam	25 (1)	75 (3)	4
fall	Nina	64.9 (96)	35.1 (52)	148
	Eve	54.8 (17)	45.2 (14)	31
	Adam	54.2 (123)	45.8 (104)	227
come	Nina	70.3 (97)	29.7 (41)	138
	Eve	86.0 (49)	14.0 (8)	57
	Adam	41.8 (104)	58.2 (145)	249
go	Nina	82.9 (500)	17.1 (109)	609
	Eve	89.5 (231)	10.5 (27)	258
	Adam	40.6 (426)	59.4 (623)	1049
Mean/Total		*51.5%*	*48.5%*	*2822*

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7. Means were calculated by averaging across the percentages in each column.

sentential negation and therefore are not semantically ill-formed. His utterances of this type are illustrated here:

(14) a. tree can't dance (Adam 13)
      b. I never seen a tree dance (Adam 20)
      c. a tree can't dance (Adam 21)
      d. it can't dance (Adam 21)
      e. a tree can't dance (Adam 21; N.B. this was not a direct repetition)

Removing these counterexamples we are left with a ratio of 9 animate to 5 inanimate, or 64.3% animate subjects. While this percentage is better than 47.4% it is still very far from the percentages given for the other unergative verbs. Adam's other examples of *dance* with inanimate subjects are difficult to explain. They are given here:

(15) a. a house dance (Adam 21)
      b. another shell dance (Adam 22)
      c. when you throw it's dance (Adam 34)
      d. it's dance all de way (Adam 34)
      e. his head dance (Adam 37)

It is possible that some of these occurrences of *dance* are actually nominals. In fact, all of them are tagged as a nominals in the %mor tier. It is also possible that Adam intended them as verbs and is using them in a non-canonical, imaginative way. For example, the conversation surrounding (15e), *his head dance*, is the following (dependent tiers omitted):

(16) *CHI: make them together again.
      *MOT: what d(o) you mean?
      *CHI: I want to.
      *CHI: (be)cause it ate dis up too.
      *CHI: why he's putting his head back?
      *MOT: is that a dance he's doing?
      *CHI: no.
      *CHI: his head dance.
      *CHI: Mommy will you put de animals back together?
      *MOT: ok # he's all put together.

Adam's other uses of *dance* with an inanimate subject are similarly cryptic in their discourse context and so without a clearer window into his intended uses of these verbs, these occurrences remain counterexamples to the general pattern. Nevertheless, these counterexamples are not directly problematic for our specific hypothesis, since our prediction was that children would not treat unaccusative verbs as if they were unergative. Adam's uses of *dance* with inanimate subjects would, if anything, amount to treating an unergative verb as if it were unaccusative.

Since the data reported above span such a large range of ages let us consider whether the proportions are robust across different points in development. To do this, let us divide the data points into two sets, using age 3;0 as an (admittedly arbitrary) dividing point.

As we can see in Table 3, the young vs. old data look identical for the unergative verbs, as expected on either hypothesis. Children know by age 3;0 that unergative verbs are restricted to having animate subjects. The mean proportions of animate subject use in Table 4 are somewhat different between the younger and older groups, with a higher proportion of animate subject use in the younger children. A logistic regression did reveal a significant main effect of age (chi^2 = 9.87, p < 0.002). However, it should be noted that this difference is largely due to Eve's data, which have a considerably higher proportion of animate subjects, and whose data go up only to age 2;3 (no subjects analysis was possible due to the small number of children in the sample). Yet if we compare Nina's earlier and later files, and Adam's earlier and later files, the proportions are virtually identical (neither child's distribution is significantly different between the earlier and later files). While it is possible that Eve produces so many animate subjects with unaccusatives because she has misanalyzed (some) unaccusative verbs as unergatives, it should be noted that Eve's own proportions are significantly different from each other. That is, her distribution of 71 vs. 1 unergative verbs with

Table 3. Percentage of animate/inanimate subjects with unergative verbs, young vs. old

Child	% Animate subj. (N)	% Inanimate subj. (N)	Total N
Nina (1;11–2;11)	93.5 (188)	6.5 (13)	201
Eve (1;6–2;3)	98.6 (71)	1.4 (1)	72
Adam (2;3–2;11)	92.9 (39)	7.1 (3)	42
Mean/Total pre-3;0	*95%*	*5%*	*315*
Nina (3;0–3;3)	98.6 (71)	1.4 (1)	72
Adam (3;0–5;2)	85.4 (70)	14.6 (12)	82
Mean/Total post-3;0	*92%*	*8%*	*154*

Table 4. Percentage of animate/inanimate subjects with unaccusative verbs, young vs. old

Child	% Animate Subj. (N)	% Inanimate Subj. (N)	Total N
Nina (1;11–2;11)	76.2 (372)	23.8 (116)	488
Eve (1;6–2;3)	85.7 (299)	14.3 (50)	349
Adam (2;3–2;11)	45.8 (200)	54.2 (237)	437
Mean/Total pre-3;0	*69.2%*	*30.8%*	*1274*
Nina (3;0–3;3)	75.2 (325)	24.8 (107)	432
Adam (3;0–5;2)	41.1 (460)	58.9 (659)	1119
Mean/Total post-3;0	*58.2%*	*41.9%*	*1551*

animate subjects and 299 vs. 50 unaccusative verbs with animate subjects is significant by a chi-square test (chi^2 = 9.38, df = 1, p ≤ 0.002). Moreover, a logistic regression on the data of all three children (data in Tables 3 and 4) revealed a significant main effect of verb type (chi^2 = 130.08, p < 0.0001) but no interaction between the age and verb type (chi^2 = 0.46, p = 0.5).

6.2   Null subjects

We mentioned earlier that the above counts include only utterances containing an overt subject, since null subjects cannot be definitively counted as animate or inanimate (although in many cases contextual evidence favored one interpretation over the other). One could argue that if children distinguish unaccusative from unergative verbs but have difficulty with A-movement, we might find a greater proportion of omitted subjects of unaccusative verbs. That is, perhaps English-learning children project the argument of unaccusatives internally and know they cannot occur postverbally (but see Section 6.4 below for more on this), and since they cannot raise the NP under A-movement they simply delete it (perhaps at the level of performance).

As shown in Table 5, the overall proportion of null subjects is slightly higher with unaccusative than unergative verbs (note: this is the opposite trend from what Lorusso et al. found for child Italian). However, the difference is not the sort of difference we have seen in terms of the animacy of the subject, nor, as we will see below, in terms of the use of postverbal subjects.

Table 5. Proportion of verbs occurring with null subjects, by verb type

Child	Unaccusative (N)[8]	Unergative (N)
Nina	49.1% (1296)	22.1% (391)
Eve	39.3% (448)	44.7% (27)
Adam	35.4% (2011)	22.3% (153)
Mean	*41.3%*	*29.7%*

Moreover, the proportion of null vs. overt subjects varies greatly across the children (hence it does not show a clear pattern), and certain unaccusative verbs are used vastly more frequently with overt subjects than null subjects. For example, Adam uses *go* with an overt subject 1049 times, and with a null subject 331 times. Thus, there does not seem to be a robust pattern of deleting subjects of unaccusatives as a means of avoiding building A-chains.

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8.   N here indicates the denominator.

Next we turn to two syntactic tests for distinguishing unaccusative from unerga-tive verbs: resultatives and postverbal subjects. Each of them yields a small amount of empirical evidence, but in both cases the evidence available goes in favor of children's accurate distinction of the two classes of intransitives.

6.3   Resultatives

Recall that resultative constructions have a Direct Object Requirement, meaning that the resultative adjective phrase can be predicated only of a direct object (Levin & Rappaport Hovav 1995). Thus, they are possible with objects of transitive verbs or subjects of unaccusative verbs, but not subjects of unergative verbs.

We found few resultative constructions in our data (and found them in the data of only one of the children), but the ones we found are limited to transitive and unaccusative verbs. Some examples of resultatives are given in (17).

(17)   a.   gonna fall him to pieces (Adam 34)
         b.   can you close dis back? (Adam 38)
         c.   Mommy see it's couldn't come loose (Adam 39)
         d.   close it all wet (Adam 53)

No examples of resultatives were found with the unergative verbs we investigated.

6.4   Postverbal subjects

The children in our sample occasionally produced utterances containing an intransitive verb and a single NP, where the NP followed the verb. Several of these constructions appeared to involve postverbal subjects (as opposed to a transitivized construction with a null subject and an overt postverbal object). Since unaccusatives project their lone argument postverbally, while unergatives project their argument preverbally, if children distinguish these verb types appropriately we might expect to find occasional errors in which the argument of the unaccusative remains postverbal (i.e. it fails to raise), but we would not expect such errors with unergative verbs. As noted in Section 4, Pierce (1989), using a similar set of data (including Adam and Eve but not Nina) found that postverbal subjects occurred overwhelmingly with unaccusative verbs, and not with unergative verbs.

In fact, this is precisely what we found. In Table 6 we show the proportions of postverbal subjects with unaccusative and unergative verbs (the denominator in this table refers to the number of verbs used with an overt subject).

While postverbal subjects are exceedingly rare for either type of intransitive verb, they occur five times more frequently with unaccusative than unergative verbs. This difference is moderately significant by a logistic regresstion (chi^2 = 4.34, p = 0.04). Another way to look at this data is that out of the 63 postverbal subjects found, 61,

Table 6. Percentage use of postverbal subjects, by verb type

Child	Unaccusatives	Percent	Unergatives	Percent
Nina	10/918	1.1%	2/273	.7%
Eve	6/349	1.7%	0/16	0%
Adam	45/1555	2.9%	0/119	0%
Total	*61/2822*	*2%*	*2/408*	*.4%*

or 97% were with unaccusative verbs. Some examples of children's unaccusatives with postverbal subjects are given in (18).

(18)   a.   fall down lady (Nina 01)
       b.   came a man (Eve 05)
       c.   go block? (Adam 01)

The two counterexamples, Nina's use of unergative verbs with postverbal subjects, are given here in (19).[9]

(19)   a.   dance dolly (Nina 01)
       b.   make a crying the baby (Nina 05)

Some of these postverbal subject utterances were in fact grammatical, such as certain cases with the verb *come* (*down came baby*, Eve 12). The point, however, is that they occur almost exclusively with unaccusative verbs.

The fact that postverbal subjects occur at all with unaccusative verbs could be taken as support for the A-chain maturation viewpoint. If children have the capacity to form A-chains they should always raise the internal argument and not allow it to remain in postverbal position, especially in a language like English. However, we note that postverbal subjects are comparatively rare: with 61 occurrences, this represents only 2% of the nearly 3000 occurrences of unaccusatives in this corpus. Therefore, we do not believe that these few examples constitute support for the view that children cannot form A-chains.

7.   Conclusions

By way of concluding let us consider briefly the theoretical implications of the claim that children violate UTAH in the early stages of grammatical development. This

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9.   Adam also had one utterance, *dance a Cromer* (Adam 10), that could have involved a postverbal subject. However, the context of the conversation suggested an interpretation of "dance with Cromer" instead.

proposal could take two forms: (a) UTAH is not part of Universal Grammar (UG) and must be constructed on the basis of input, and this input-based construction is not completed until late in development; (b) UTAH is part of children's innate grammar but it is one of those components of mental grammar that needs to "mature" (along the lines that A-chains are said to mature). Presumably, Babyonyshev et al. (2001) had in mind something closer to (b). In fact, if UTAH exists at all as a restriction on human language, it is precisely the sort of restriction that is ideally suited to be part of UG. It accounts for widely attested patterns of mapping between semantic roles and structural positions in syntax across typologically diverse languages. In this light, form (a) of UTAH violation seems unfeasible.

Option (b), that UTAH is part of UG but needs time to mature, is also implausible, in our view. One of the great strengths of UTAH is its potential utility in helping children begin the mapping process between sound and structure. Both syntactic and semantic bootstrapping approaches assume that at the earliest stages of grammar, when sentences are beginning to be parsed and represented structurally, children draw on extra-linguistic cues to figure out which words label objects and what roles those objects play in perceived events. For instance, children can determine that a given entity (perhaps labeled "Mom") is the causer of an event by exerting force on some object. If "Mom" is the causer of an event through exertion of force, she might be construed as an Agent. According to UTAH, then, the label "Mom" should be mapped to the subject position in a sentence describing this event. Thus, not only should UTAH be part of children's initial grammatical apparatus, but it should be available to them in the very earliest stages of grammatical construction.

With respect to how all of this relates to children's discovery of the unaccusative/ unergative distinction, if children expect inanimate NPs to be nonvolitional and non-agentive, and furthermore to map to an internal argument position, then hearing verbs used with a single inanimate argument should cue an unaccusative structure, even if that inanimate NP is heard in subject position. Corpus-based studies of both adult-directed and child-directed language show that subject animacy is a significant predictor of intransitive verb class (Becker 2012; Merlo & Stevenson 2001; Scott & Fisher 2009).

In addition, experimental work shows how these cues can be used on-line. For example, Bunger and Lidz (2004, 2008) have shown that when 2-year-olds are familiarized with a causative action and a transitive sentence (*The girl is pimming the ball*), they then interpret an unaccusative sentence (*The ball is pimming*) as referring to the result component of the event (i.e. what is happening to the ball), rather than the causative motion of the Agent. In contrast, when children were presented with an unergative sentence (*The girl is pimming*), they take the sentence to be about the Agent's action. Thus, children have expectations about the respective argument structures

of unaccusative and unergative verbs, and use semantic cues (such as animacy) to categorize verbs appropriately.

To summarize, in this paper we have presented some arguments, backed by empirical evidence from child English, that children correctly distinguish unaccusative and unergative verbs in the early stages of language production. That is, like adult speakers, children project an external argument with unergatives and an internal argument with unaccusatives. Since children's intransitive verbs occur almost always with a preverbal subject (when it is overt), we conclude that children have no difficulty raising the internal argument to subject position via A-movement.

Our evidence came primarily from the proportions of animate and inanimate subjects with verbs of both types. While unergative verbs select an external argument, which is typically Agentive and therefore animate, unaccusative verbs select only an internal argument, which bears a Theme theta-role and has no animacy restriction – it is free to be inanimate. Accordingly, unergative verbs are (generally) restricted to occurring with animate subjects, but unaccusative verbs can occur with either animate or inanimate subjects. We reasoned that, if children are like adults in their thematic and structural distinction between unaccusatives and unergatives, children would, like adults, use unergatives with only animate subjects and unaccusatives with both types of subjects. Our hypothesis was overwhelmingly supported: only 51.5% of subjects of unaccusative verbs were animate, while over 93% of subjects of unergatives were animate (95% if we adjust for Adam's utterances with sentential negation, e.g. *A tree can't dance*). We construe these results as supporting our conjecture that children correctly distinguish unaccusative and unergative verbs, and, moreover, that children obey UTAH in their early grammar.

Some additional support for our argument came from resultatives and postverbal subjects. Although we found resultatives only in Adam's speech, and a very small number of them at that, they were used exclusively with unaccusative verbs and never with unergative verbs. This is expected, since resultatives can be used only when the verb selects an internal argument (direct object).

We also found that the small number of apparent postverbal subjects occurred disproportionately with unaccusative verbs. Although the very existence of postverbal subjects might seem to argue in favor of an A-chain maturation story, we argue that these utterances, which were quite rare, show that children are at least distinguishing the two classes of intransitive verbs. Thus, the vast number of unaccusative constructions that appear with a preverbal subject are derived by A-movement.

We see a number of potentially fruitful extensions of this work. Most interesting would be an experiment that elicited resultatives with different verbs, to measure whether children could be led to produce resultatives with both classes of verbs or only with unaccusatives. Such a task would be along the lines of Friedmann's (2007)

study of Hebrew unaccusatives. Alternatively, a sentence judgment task might uncover children's judgment of unaccusative or unergative verbs in resultative constructions as grammatical or ungrammatical. These controlled tasks could provide additional information about children's representation of unaccusative and unergative verbs in constructions that are rare in spontaneous speech.

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