Factors that Influence Children's Acquisition of Adjective-Noun Order

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Abstract

Usage-Based theoreticians have argued that children make the biggest strides in learning to use many adult-like grammatical rules in the preschool years. This argument is based on how children use novel verbs in verb clauses: many English-speaking 2-year olds are willing to use novel verbs in ungrammatical order; by 4, few children are willing to use novel verbs in a non-SVO order. In verb clauses, the word order determines the semantic/syntactic role (e.g., subject). By focusing on verbs, researchers have failed to take into account that children might also be learning how meaning and semantic/syntactic function are related. To test this interpretation, we taught novel adjectives to 35 monolingual English-speaking children between 2 and 4 years old, either in a prenominal or postnominal position. Results showed that, while children were more likely to reverse the order of novel postnominal adjectives, even 4-year olds used the new adjectives in the order they were modeled more than half the time. These results suggest that during the preschool years, children are learning to map word order onto semantic/syntactic function.

Keywords

Language acquisition, Usage-based Theory, word order

Background

From the time children first start to put two words together in spontaneous speech, they almost always order the words according to grammatical rules of their input language (e.g., Brown, 1973). For example, English-speaking children often start to talk about possession with constructions like "Mommy sock" that correspond to the typical English word order (Bloom, 1970). What kind of knowledge do children have that allows them to order their words according to grammatical rules of the input language? Until recently, the most frequent answer has been that children must have access to some kind of abstract lexical categories before they start to produce word combinations. These abstract lexical categories could be grammatical, such as noun and verb (Pinker, 1984; Wexler & Culicover, 1980), or semantic, such as object and action (e.g., Dromi), or the semantic role, such as possessor and possessed (e.g., Bloom, 1970).

More recently, researchers working in the framework of a Usage-Based theory of grammar (e.g., Tomasello, 2000a) have argued that children may have little underlying abstract knowledge about grammar. Instead, children start by using words in set utterances, such as "*Here you go*" and "*Where's Daddy*," eventually learning to make minor changes to those utterances by substituting single words in set phrases such as "*Where's X*" (Tomasello, 2000a). Under this framework, previous evidence showing that children are usually correct in ordering their words would be due to the fact that so many studies have studied children's spontaneous speech (e.g., Brown, 1973), rather than how children use novel words in combination.

There is some compelling evidence to support a Usage-Based Theory. For example, Tomasello (1992) showed that his English-speaking daughter's earliest uses of verbs were frequently very similar to previous uses she had made of the same verb. Other researchers have taught children verbs both in an order that corresponds to their input language and in an order that differs from the canonical order. Akhtar (1999) taught novel verbs in one of three word orders to English-speaking children aged two to four years. She showed that the two-year olds were willing to use novel verbs in a non-SVO order (i.e., SOV and VSO), three-year olds used a majority of SVO order and four-year olds almost never used an ungrammatical order. However, even the two-year olds rarely used a familiar verb in a non-SVO order. Part of the reason for the two-year olds' willingness to use the weird word order may have been because they were taught three-word word combinations. When Abbot-Smith, Lieven and Tomasello (2001) taught English-speaking two-year old novel verbs in two-word combinations, they were less willing to use a weird word order than in Akhtar's (1999) study. Nevertheless, the two-year olds were more likely to produce novel verbs in SV order than in VS order.

Similar results were obtained from a study in which researchers chose existing verbs that varied in frequency. Matthews, Lieven, Theakston, and Tomasello (2005) tested preschool children on some high frequency verbs and some low frequency verbs, using some in a non-SVO order and some in the canonical order. The children were more willing to use the low frequency verbs in a non-SVO order than the high frequency verbs. These results suggest that children's willingness to use the canonical verb-clause order is highly related to their familiarity with particular verbs (as estimated by frequency), particularly around two years of age. Between two and four years of age, children make gradual changes to using almost exclusively the canonical

word order. By four years of age, children may start to abstract grammatical knowledge about word order and generalize to novel examples (Tomasello, 2000a). Note that the claim here is not that children have no access to abstract grammatical knowledge before four years of age, but rather that the acquisition of grammatical knowledge becomes increasingly abstract over the preschool years.

Most of the research that has been done in a Usage-Based theoretical framework has focused on verb clauses. In verb clauses (in English, at least, the language most of the research has focused on), the word order corresponds to the semantic/syntactic role. So, a noun preceding a verb in English is almost always the subject of the verb or the agent of the action. In fact, English constructions in which this basic order is not followed are often notoriously difficult for children, such as Object-Verb-er compounds (Clark, Hecht, & Mulford, 1986) and passive sentences (e.g., Koff, Kramer, & Fowles, 1980; Lempert, 1978). Thus, by focusing on verb clauses, it is not clear that the observed changes in children's usage between two and four years is due increasing sensitivity to word order (Tomasello, 2000a) or increasing sensitivity to semantic/syntactic roles (e.g., Braine & Brooks, 1995) or both.

The purpose of the present study was to try to elucidate the nature of children's underlying grammatical knowledge, particularly between the ages of two and four years. We did this by using a weird word order paradigm (following Akhtar, 1999) with adjective-noun constructions. Unlike in verb clauses, the order of an adjective relative to a noun does not change the semantic/syntactic significance of the words. For example, if someone said "I saw a dog big yesterday", a native English speaker would undoubtedly identify the sentence as ungrammatical but would be able to recover the meaning. In a verb clause, the placement of a noun signifies its syntactic role (e.g., whether it is the subject or object of the verb) and therefore also affects the meaning of the sentence. If someone said "The dog chased the cat" when he or she meant "The cat chased the dog", there would be no way for a listener to recover the intended meaning on the basis of the sentence alone. There is no such distinction with adjectives: in English, there are no subtleties by which adjective placement affects the syntax or semantics of a sentence. If, between the ages of two and four, children's production becomes increasingly sensitive to the underlying abstract basis for canonical word ordering in their language (Tomasello, 2000a), then we would expect them to correct weird adjective order as often as they correct weird verb order (e.g., Akhtar, 1999). If the changes seen between two and four years of age are also due to children's increasing sensitivity to how word order affects semantic/syntactic roles, then children in this age range may still be willing to use adjective-noun combinations in a non-canonical order.

English Adjective Placement and Acquisition

In English, the canonical order for simple adjectives is pre-nominal (as in *big car*). In some cases, modified adjectives can occur post-nominally (as in *hair whiter than snow*). Also, some adjectives are used post-nominally, usually adjectives borrowed from French (as in *the dinner extraordinaire*) or with some quantifiers (as in *something blue*). Note that, like many other researchers, we assume that any change in order will have an effect on meaning. The key component of adjective-noun ordering for our study is that the use of an adjective before or after a noun changes neither the semantic nor syntactic function of either word. So if someone mentioned *a car big*, native speakers would find it odd, but would probably understand the meaning. In contrast, much previous research has focused on verb constructions, where a change in the order changes its semantic or syntactic function.

There is little research on children's acquisition of the order of adjective-noun constructions. Most acquisitional work has been on children's understanding of the semantics of adjectives and/or how the syntactic frame determines children's understanding of the semantic category of an adjective (e.g., Akhtar, 2002). However, the extant evidence on children's spontaneous speech has shown that children are usually accurate in their ordering of adjectives and nouns. For example, Brown (1973) observed that English-speaking children used adjectives and nouns in the correct order, except when the copula was thought to be missing in a sentence. One elicitation study with children between three and five years of age showed that monolingual English-speaking children made less than 5% errors in adjective-noun order (Nicoladis, 2006). Even French-English bilingual children, who have to learn two different rules for adjective placement, order adjectives over 90% correctly in spontaneous speech in English and over 90% in an elicitation task in English from at least the age of two and a half (Nicoladis, 2006; 2002).

On the basis of these studies, it would seem that the acquisition of either one or two adjective-noun orders is a trivial problem for children. However, it should be noted that all of these studies concerned adjectives that children already knew.

Weird Word Order Paradigm

The purpose of this experiment was to test English-speaking children's knowledge of adjective-noun order. We used Akhtar's (1999) weird word order methodology where children are taught novel words in both the correct (or default) order of their language and in at least one alternative order. With adjectives and nouns, there is only one other possible order (i.e., in English postnominal). We presented children with play scenarios in which an experimenter taught them novel adjectives, some of which were in the canonical (prenominal) position and some of which were in the non-canonical (postnominal) position. Children's spontaneous use of the new words was recorded. Because the context of this Experiment was a game, children might have been willing to go along with non-canonical word order for the purposes of the game. In other words, this paradigm probably underestimated children's

ability to produce the correct word order. For this reason, we taught children novel adjectives in both the canonical and novel orders, and compared their usage of both orders within the play scenario. Also, we discuss how our results compare with those of Akhtar (1999), who used a similar methodology to research children's use of novel verbs.

This Study

This experiment was designed to explore three effects on children's use of word order: 1) familiarity, 2) canonical order independent of semantic/syntactic role and 3) the semantic/syntactic role.

As noted in the above literature review, there is evidence that the greater children's experience with specific words, the less likely they are to mis-order those words. To verify that this is also the case with adjective-noun constructions, the children were also taught a control adjective ("green") in a novel position, that is, postnominally. We expected to replicate previous findings, showing that children's willingness to use the unconventional word order with a known word would decrease with age (e.g., Akhtar, 1999).

To test for an effect of children's use of canonical order independent of semantic/syntactic function, we compared their use of novel postnominal adjectives and prenominal adjectives. If children become increasingly more sensitive to canonical order as they get older (Tomasello, 2000a), then we should see a decrease in age with using postnominal order, particularly between two and four years of age. By four, children should almost never use the non-canonical order (cf. Akhtar, 1999). Alternatively, if three- to four-year old children's avoidance of non-SVO order (e.g., Akhtar, 1999) is due additionally to increasing sensitivity to the interaction between word order and syntactic/semantic role, there should be little effect of age. In this case, even the four-year olds might be willing to use the weird word order.

Methods

Thirty-five English-speaking children between two and four years of age (mean age was 3;7 [years; months]) participated in this study. There were approximately equal numbers of girls and boys in each age group.

Materials

Children were presented with a farm set including a barn, pond, and some trees and chickens. For each of four novel adjectives and the control adjective *green*, a different set of toys was used. Each of the novel adjectives had a clear meaning which is described in Table 1. We chose to create novel adjectives with the ending *–ish* because of evidence that English-speaking children can understand this suffix as an adjectival marker before they are two years old (e.g., Waxman & Klibanoff, 2000). For every object described by the novel adjective, there was at least one and usually two other objects to contrast. For example, for the adjective *drackish*, children were shown one fish that had had the property (i.e., it had wings), as well as two other fish that lacked the property (i.e., had no wings). We included contrasting objects because adjectives are often used, and easiest to learn, in contrasting situations (Waxman & Klibanoff, 2000).

Table 1: Novel adjectives, their meaning, and objects described with those adjectives.

Adjective	Meaning	Objects
Blickish	Two-colored	Ball, star, duck, pencil
Drackish	Winged	Turtle, frog, dolphin
Groffish	Legless	Cow, horse, pig, chicken
Strivvish	With skis instead of wheels	Truck, car, motorcycle
Green (control)	Green	Ball, dinosaur, pencil

Procedure

Each child was videotaped during the task, either by a silent, second experimenter, or by a camera simply sitting on a tripod. When the experimenter started to present a new adjective, he/she first brought out objects that did not correspond to the novel adjective (e.g., "Here's a fat fish. Here's a little skinny fish."). Then the experimenter presented the novel adjective paired with the object name and defined the adjective (e.g., "Here's a *fish drackish*. It's *drackish* because it has wings."). Experimenters were instructed to use the adjective in several contexts so that children would understand that we meant the new words as adjectives (e.g. "This fish isn't drackish." [about another fish]). To ensure that the children understood what was meant by each novel adjective, the experimenters posed a number of questions, such as "Is this a fish drackish?" and "Which one of these is drackish?". Children were encouraged to produce adjectives in as natural a way as possible (e.g., in response to the question "Which one do you want to play with now?"). The questions used to elicit adjective-noun constructions were different from the elicitations used in Akhtar (1999). This change was necessary because adjectives are often used to contrast one object from another (see Waxman & Klibanoff, 2000). Note that experimenters and children were not limited to producing adjectives paired with the names of objects in Table 1. They could also refer to a superordinate category (e.g., *animals drackish* or *toys drackish*), replace the noun with *one* (e.g., *ones drackish*) or talk about non-present things.

Each child was presented with four novel adjectives, the order of which was counterbalanced across children. Each child learned two adjectives in the post-nominal position, and two adjectives in the pre-nominal position. Four different experimenters performed the task (with different children), each of whom learned only one set of adjective orders, so as not to mix up adjective ordering during the experiment. This was important, so each experimenter sounded equally confident in each adjective condition. The

control adjective *green* was always presented last, and always in the post-nominal position (e.g., "a dinosaur green"). On average, the experimenters produced 30.5 (SD = 12.6) constructions in the prenominal order and 30.8 (SD = 10.2) in the postnominal order.

Coding

To analyze our results, three mutually exclusive codes were used to categorize children's responses (following Akhtar, 1999): imitation, extension and reversal. *Imitation* was the repetition of the novel adjective with the same noun in the same order as a researcher had used at least once, even if it was several minutes later. *Extension* referred to an extension of the same order used by the researcher to another noun. For example, if a researcher said *a groffish cow*, the child was counted as extending if he/she said *a groffish horse*. *Reversal* referred to a change of order from the one used by the researcher, for example, if a researcher said *a groffish cow* and a child said either *a cow groffish* or *a horse groffish*, this was considered a reversal.

For some analyses, we present the data in terms of *matches* and *mismatches* to the modeled order. The matches are both imitations and extensions under our coding scheme and mismatches are reversals. Unlike Akhtar (1999), we included imitations in our analyses because many acquisition theories consider imitations as an important sign of learning (e.g., Tomasello, 2000b). In the discussion, we will return to whether the inclusion of imitations could have significantly changed the results.

Some children did not produce any novel adjectives with nouns in a given condition. Those children were excluded from the analyses, as appropriate according to the relevant statistic.

Results

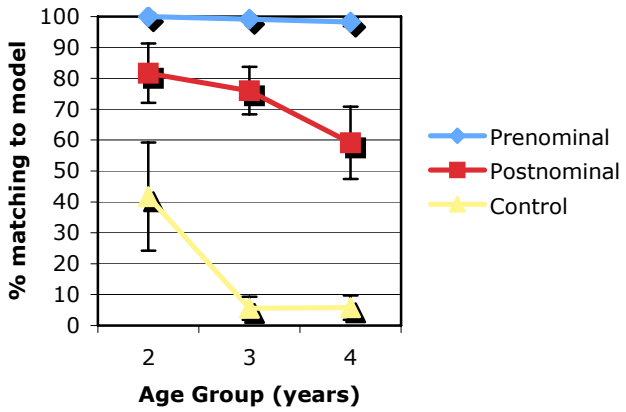
Overall, children of all ages were quite willing to use novel adjectives in the way that they were modeled. While older children tended to reverse postnominal adjectives more than younger children, this tendency was still quite weak.

Overall tendency to match order. The average percentage of matches in the pre-nominal condition for all the children was 99.1% (*SD* = 2.9%) while the average percentage of matches in the post-nominal condition was 71.5% (*SD* = 32.1%). The average percentage of matches for the control adjective was 16.8% (*SD* = 32.6%).

To test for developmental change, the children were divided into three age groups. The two-year old group refers to the 12 children who were between 2;2 and 3;2, (*M* = 2;7). The three-year old group refers to the 12 children who were between 3;4 and 4;1 (*M* = 3;8). The four-year old group refers to the 11 children who were between 4;2 and 4;9 (*M* = 4;5). Figure 1 summarizes the average rate of matches by the children in the three age groups for each condition.

A 3 x 3 [Condition x Age Group] ANOVA with Condition as a repeated measure compared the children's percent of matches. This analysis showed a main effect for Condition, F (2, 38) = 88.22, $p < .001$, but no main effect for Age Group, F (2, 19) = 1.30, *ns*. There was no significant interaction between Condition and Age Group, F (4, 38) = 1.45, *ns*.

Within-subjects repeated contrasts confirmed that the children's rate of matching utterances with novel prenominal adjectives was significantly higher than with novel postnominal adjectives [F (1, 22) = 24.22, $p < .001$], and their proportion of matching utterances with novel postnominal adjectives was higher than with a familiar adjective in the postnominal position (i.e., "green") [F (1, 22) = 63.05, $p < .001$].



Error bars represent standard errors

Figure 1: Average Percent Matches by Age Group.

Correlations with age. Another way to analyze developmental trends is by correlating age in months and proportion of matching responses in each condition. The older the children were, the lower their proportion of matching utterances to the familiar post-nominal (control) constructions, r (33) = -.41, $p < .05$. There was no correlation between age and the rate of matching novel prenominal adjectives, r (33) = -.18, $p > .05$, or novel postnominal adjectives, r (30) = .23, $p > .05$.

Discussion

Between two and four years of age, these children were more likely to use the order of novel adjectives used in the canonical, prenominal position than those in the non-canonical postnominal position. This result replicates findings with novel verbs showing that children as young as two years of age prefer the canonical order of their language (Abbot-Smith et al., 2001; Hirsh-Pasek & Golinkoff, 1996). This result suggests that children's knowledge about the canonical order of adjective-noun constructions is starting to emerge in the preschool years.

This study also showed that even two-year old children avoided using a familiar adjective ("green") in a non-canonical order. Further, children's willingness to use this known adjective in a non-canonical order decreased with age. These results also replicate previous results with verb clauses, in which children are less likely to allow non-

canonical order for a known verb than a novel verb (Akhtar, 1999; Matthews et al., 2005). These results lend further support to the argument that children's familiarity with a word is an important determinant in their usage (Tomasello, 2000a).

Where the results of this study depart from previous results with verb clauses is in the three and four year olds' *degree* of willingness to use the non-canonical order. For verb clauses, the majority of three- and four-year olds did not use the non-canonical word order (Akhtar, 1999). In the current study, however, the majority of even four-year olds' productions of the novel adjectives presented in non-canonical order matched the order in which they were presented. While this result is augmented by our inclusion of imitations in our analysis (where Akhtar, 1999, did not), that inclusion does not account for the scale of the difference. When imitations are removed from our analysis, the four-year olds in this study still averaged 41% matching order with the postnominal adjectives (cf. approximately 5% for the four-year olds in Akhtar, 1999). This result suggests then that preschool children may simply be less interested in ordering novel adjective phrases correctly than in ordering novel verb clauses correctly. We suggest that the reason for the difference is that the word order in verb clauses determines the semantic/syntactic role of the nouns. In contrast, the semantic/syntactic role of an adjective is not as dependent on its position relateive to the noun. We will consider three alternative possibilities for this difference. First, it is possible that children treat adjective-noun constructions differently from verb clauses because they are only exposed to a single adjective order, whereas they are exposed to verbs in many sentence positions (e.g., passive sentences and Object-Verb-er compounds). Some researchers have argued that the existence of contrasting types of constructions can lead to productivity (e.g., Bybee, 1995). It is possible that because children occasionally have to interpret Object-Verb-er compounds and passive sentences, the exposure to many different orders forces them to pay attention to the word order of verb clauses. If this were true, then we would expect that children learning a language where more than one adjective order is available would learn the rule earlier in development. We have run a similar study with French-speaking children (Nicoladis & Rhemtulla, in preparation), the results of which suggest that this is not, in fact, the case. French allows both prenominal and postnominal adjectives, with the postnominal adjective being the default. The French-speaking children in that study performed almost exactly like the English-speaking children in this study. For that reason, we think it unlikely that it is the availability of options in word order that encourages three- and four-year old children to revert to canonical word order for verb clauses but not for adjective-noun constructions.

A second possible interpretation that we consider unlikely is that these results are due to methodological differences between our study and Akhtar's (1999). For example, in this study, we used different elicitation questions than Akhtar (1999) did, in order to elicit adjective-noun constructions in the most naturalistic way possible. Also, in this study we used novel adjectives but did not use novel nouns. Children's sensitivity to non-canonical word order should be tested with a variety of novel words. It will be important for future research to investigate which methodological parameters (e.g., the elicitation questions, the number of items, the number of exemplars in the learning phase, the lexical category of the novel words, the number of novel words, etc.) make a difference in children's performance.

A thirdpossible interpretation of the present results is that children attend more to verb clauses because verbs are required to make a grammatical sentence while adjectives are optional. We have collected data from three- and four-year olds' use of non-canonical ordering of another optional phrase-type in English, that is, novel noun-noun compounds (Moroschan & Nicoladis, forthcoming). As in adjective phrases, in English noun-noun compounds the first word modifies the second. We found that children were significantly less likely to use the non-canonical word order for novel nouns as modifiers than for novel adjectives as modifiers. In combination with the current data, these results support our conclusion that what is really at play is the effect of phrasal ordering on meaning. In noun-noun compounds, unlike adjective phrases, the order of the words makes a substantial difference to the meaning of the phrase (e.g., compare *door factory* to *factory door*). Unlike noun-noun compounds, and unlike verb phrases, adjective order does not determine the syntactic/semantic role of adjectives. These results support our hypothesis that three- and four-year olds revert to the canonical order when the word order determines the syntactic/semantic role.

In sum, we have replicated previous studies' results showing that from the age of two years on, children are sensitive to the canonical order in their language (e.g., Abbot-Smith et al. 2001). We have also replicated children's insistence on using familiar words in the canonical order from the age of two years on (e.g., Akhtar, 1999). We have argued here that between three and four years of age, children become more sensitive to the semantic/syntactic roles of words relative to word order. For this reason, they correct non-canonical verb clauses (e.g., Akhtar, 1999) but are far less likely to correct non-canonical adjective phrases. Future research could focus on direct tests of this interpretation.

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