Discussion


Michael Tomaselloan,*, Nameera Akhtarb

aMax Planck Institute for Evolutionary Anthropology, Inselstrasse 22, D-04103 Leipzig, Germany
bDepartment of Psychology, University of California, Santa Cruz, CA 95064, USA

1. Introduction

Naigles (2002) claims that there currently exists a paradox in the study of child language acquisition, which she then proceeds to resolve. But there is no paradox.

1.1. Infant statistical learning

The supposed paradox is that even prelinguistic infants find abstract patterns in speech-like stimuli with relative ease in statistical learning experiments, whereas children struggle well into the preschool years to find abstract syntactic patterns in experiments involving meaningful language. But the obvious point is that the findings on statistical learning are about infants’ skills of auditory perception, not language processing. Thus, infants find patterns in other kinds of auditory stimuli, for example, musical tones (Saffran, Johnson, Aslin, & Newport, 1999), and they even show the same ability with sequentially presented visual stimuli such as colored lights turning on and off (Kirkham, Slemmer, & Johnson, in press). And then there is the fact that tamarin monkeys find patterns in speech-like stimuli in much the same way as human infants (Hauser, Weiss, & Marcus, 2002). These facts (the latter two not cited by Naigles) are of crucial importance in establishing just what is going on in the statistical learning experiments, namely, that all kinds of primates, including humans, are incredibly skillful at finding patterns in all kinds of perceptual stimuli.

These pattern-finding skills comprise a necessary component in children’s acquisition of language – children could not learn the meaningful syntactic constructions of a natural language without them – and so their existence in prelinguistic infants is among the most important discoveries in recent years in the study of child language acquisition. But nobody, not even Naigles, thinks that infants in the statistical learning experiments are processing language, and so it is a bit odd to compare infants’ ease of perceptual pattern finding in these studies with their difficulties in finding patterns among meaningful syntactic constructions a year or more later. There is no paradox.

* Corresponding author.
E-mail addresses: tomas@eva.mpg.de (M. Tomasello), nakhtar@ucsc.edu (N. Akhtar).

0010-0277/02/$ - see front matter © 2003 Elsevier Science B.V. All rights reserved.
doi:10.1016/S0010-0277(03)00048-9
1.2. Learning syntactic constructions

One part of Naigles’ attempted resolution is a critique of studies – many of them ours – which find that children do not make abstractions across syntactic constructions until relatively late in the acquisition process (often after 3 years). She thinks they make abstractions earlier – which helps resolve the paradox – but she does not present this research clearly and accurately. Succinctly put, there are five different methods that all converge on the conclusion that children’s early language revolves not around abstract categories and rules, but rather around specific lexical items and expressions (with some early constructions containing some abstract slots). Naigles discusses four of the five methods (the fifth is not yet published), and her most general and important criticisms are two. The first is that children are not learning the meaning of the experimental verbs in the way that experimenters want them to and think they are. The second is that the experiments sometimes produce unwanted priming effects. While these criticisms are valid in some cases (especially some of our earliest studies), they do not hold uniformly across all the different kinds of studies – and they do not hold at all for two of the methods.

1.2.1. Spontaneous speech

As Naigles reports, children’s early language looks item-specific in basically all of the world’s languages that have been studied (see Tomasello, 2000, for a brief review). For example, children learn certain kinds of syntactic constructions with some verbs, other kinds with other verbs – sometimes with little or no overlap between them. And the learning process looks piecemeal in the sense that the constructions used with some verbs are much more complex and advanced than those used with other verbs. One methodological point that Naigles does not note is that since Tomasello (1992) was a diary study in which a relatively complete record of one child’s entire language output was recorded (i.e. all new constructions were recorded), from this study we can make claims with some confidence about what the child did not do. This is important in establishing the item-specificity of early language since these data characterize the structure of each construction not only positively but negatively as well. Nevertheless, data from spontaneous speech are never definitive in identifying underlying cognitive or linguistic representations; experiments are needed.

1.2.2. Nonce verb production studies

The largest body of studies are nonce verb production studies in which children are taught a novel verb in one linguistic construction and encouraged to produce it in another. Depending on exactly how one counts, there are over a dozen such studies (with several times that many experimental conditions) done by a handful of different experimenters – although our labs have done most of those with the youngest children. The basic finding is very clear. No matter the kind of construction in which they learn the novel verb, and no matter how they are encouraged to produce utterances themselves with the novel verb, young children – below 3–4 years of age – are very conservative; they are loathe to use the novel verbs in constructions in which they have not heard them used. Even when the most generous scoring criteria are used (a child uses a novel verb creatively one time no matter how many times she uses it in the construction in which she heard it used), less than one-quarter of 2.5 year olds are productive with the novel verbs and it is not until after 3 years
of age that the majority of children can produce one syntactically productive utterance with the novel verb (see Tomasello, 2000, for a review).

Naigles lodges two criticisms of these experiments. The first is that the children are not learning the meanings of the verbs the way the experimenters want them to, and since some verbs cannot be used in some constructions children are doing what they should do with these verbs given the meanings they have attached to them. But the first point is that older children do not have this problem at all; they are quite productive with the novel verbs. Why aren’t they misled about the verb’s meaning in the same way as the younger children? Furthermore, in several studies that Naigles does not cite (e.g. Brooks & Tomasello, 1999; Tomasello & Brooks, 1998) younger children participate in control conditions in which they hear the novel verbs used in the same target constructions that are being pulled for in the experimental conditions (typically, the English transitive construction). And the younger children have no problems in this case. Also, in some of our studies (e.g. Akhtar & Tomasello, 1997; Dodson & Tomasello, 1998; Tomasello, Akhtar, Dodson, & Rekau, 1997 – the latter two not cited by Naigles) we tried to make sure that during training children get a transitive meaning from the syntax of the model without hearing the verb in the transitive construction itself; for example, we say to them “Look at what Ernie’s doing to Bert. It’s called dacking.” But this still does not help them to use the novel verb creatively in the transitive construction.

The other criticism is that because children are hearing and learning the novel verb multiple times in one construction, the verb’s usage in this construction becomes entrenched (primed) and this inhibits them from using it in a novel construction. This is possible, but again it must be noted that if this effect is indeed at work, it does not hold for older children who are productive with the novel verbs. And there are no data to suggest that younger children are more subject to priming effects than older children.

### 1.2.3. Weird word order studies

The priming explanation does not work at all for the weird word order studies (Abbot-Smith, Lieven, & Tomasello, 2002; Akhtar, 1999). In these studies children hear novel verbs used in weird word orders (e.g. “Ernie the car dacking”) and then later are encouraged to use them with new characters. Older children tend to correct these novel word orders, saying things like “Bert’s dacking the tree” whereas younger children are much more likely to continue using the novel word order. On the surface priming could be a problem here also since children hear the weird word order multiple times (though again it doesn’t seem to bother the older children), however there is an important control condition that Naigles neglects to mention. Children are also given known English verbs in weird word orders exactly the same number of times (e.g. “Ernie the car pushing”), and even the youngest subjects correct these to SVO order almost all the time. This effectively rules out priming as the sole explanation of the findings in the main experimental conditions.

### 1.2.4. Nonce verb comprehension studies

With the nonce verb comprehension studies, the issue is again verb meaning (and possibly priming) in the sense that in most comprehension experiments children have to first learn the verbs and then act them out in response to requests to do so. Perhaps during learning they do not learn the right meaning. But because we were worried about this ourselves, in Akhtar and
Tomasello (1997) we used a new method. We did not really teach the verb at all in any construction. What we did was teach the activity that one does with an apparatus and two characters: on repeated occasions one character acted in a particular way on another on this apparatus, with the characters being manipulated on many occasions by the children themselves. The children thus knew the game. Then, on their first hearing of the novel verb, we pushed the apparatus in front of them in preparation for a new round of the game, handed them two characters and told them “Make Ernie meek Bert”. The only question here was which character was made to be the agent and which the patient; the children knew the game. But again the pattern of results was the same: the older children did this well, whereas the younger children were basically at chance. We believe this study is a particularly strong demonstration since (i) it does not involve children having to produce just-learned words or overcome other performance demands, (ii) there are no priming effects, and (iii) there is no question of problems with intended verb meaning.

1.2.5. A priming study

Finally, we have one study that is still in press that looks at priming directly (Savage, Lieven, Theakston, & Tomasello, in press). Following Bock and others who have studied priming in adults (e.g. Bock & Griffin, 2000), we looked for evidence of structural priming in young children. The basic idea is that children look through a book containing pairs of pictures. For each pair they first hear (and in some conditions produce themselves by repeating) one described with, for example, a passive sentence (e.g. “The car got smashed by the tree”); then they are asked to describe the second picture of the pair. The second picture contains different characters and different actions, and so the question is whether children will also use a passive sentence for this picture even though there will be very low lexical overlap with what they just heard for the first member of the pair (if they are going to construct a passive sentence it will have to be something like “The balloon got popped by the pin”). The answer is, once again, older children are subject to such structural priming effects, but younger children – below 4 years of age – are not. However, and importantly, in other experimental conditions the younger children were subject to priming effects when the sentence they heard/used for the first member of the pair contained pronouns and other closed class morphemes that they could repeat in their own sentence for the second picture (e.g. in both cases “He got VERBed by it”). This is actually relatively direct evidence that children’s underling representations contain specific lexical content, in this case pronouns as arguments and some closed class morphemes constitutive of particular syntactic constructions.

Although there is only this one study using this methodology with young children, we believe it is especially telling because in this study children do not have to learn anything new; they simply use English verbs they already know in constructions they already know with those verbs. And priming is of course a widely accepted method for establishing the nature of underlying cognitive representations in Cognitive Science in general.

1.3. Preferential looking

Although we have argued that these various studies do not conflict with studies of children’s pattern-finding abilities in perceptual tasks (such as the statistical learning
experiments with infants), they may – and we emphasize may – conflict to some degree – and we emphasize to some degree – with findings from studies using a preferential looking methodology. In this method children hear a sentence such as “Ernie is gorping Bert” and are simultaneously exposed to two videos with different ongoing actions, only one of which matches the sentence. No method is perfect – not this one nor any of those outlined above – but we will not get into criticisms of the method itself or the studies done with it (we have done this already to some degree in Tomasello & Abbot-Smith, 2002). Here we simply point out that the most straightforward use of this methodology to test the questions being asked by the above-listed methodologies has never been done. That is, no one has ever simply presented children with the sentence “Ernie is gorping Bert” and two videos in one of which Ernie is doing something to Bert and in the other of which Bert is doing something to Ernie. This would be a direct test of English-speaking children’s understanding of the transitive construction, including its characteristic ordering of agent and patient.1

If such a study and/or related studies are done and the finding is that children show skills at a somewhat younger age than in the other methodologies listed above, that will be important, albeit not so surprising, information. It will not be so surprising because, for all the reasons Naigles enumerates, comprehension precedes production in many areas of cognitive development. This is especially true when looking measures are used to assess comprehension, for reasons that are not 100% clear (e.g. see Hood, Carey, & Prasada, 2000).

1.4. The situation as we see it

Presumably everyone would agree that the primary questions in the field are not about age but about process. In our view, all evidence points to the fact that young children’s syntactic constructions become abstract in a piecemeal fashion, mostly independently of one another, based on what they have heard in the input for each of the constructions (note that this is even true of the transitive and intransitive constructions studied in preferential looking studies; see Tomasello, in press; Tomasello & Abbot-Smith, 2002). In the beginning, there are no abstract linguistic categories such as agent and patient, much less subject and object, that cut across all of their language. This is a genuine empirical discovery about children’s early language, and, following in the footsteps of Braine (1976) and others, we are proud to have contributed to it (see also Lieven, Pine, & Baldwin, 1997; Pine, Lieven, & Rowland, 1998). Importantly, we are also now beginning to discover – using training methodologies – the precise amount and nature of linguistic experience children need to make syntactic abstractions in particular cases (for example, see Abbot-Smith, Lieven, & Tomasello, 2003; Childers & Tomasello, 2001).

It would also seem to be the case that even within a construction children may show evidence for abstract linguistic representations at different ages in different experimental
methodologies. For example, even we were surprised by how old children were before they showed effects from structural priming. One interpretation of this pattern of results is that the different methodologies are sensitive to different levels and types of construction strength (based mainly on token frequency of the construction in the child’s linguistic experience) and construction abstractness (based on type frequency, mainly with respect to verbs). And it is even possible for young children to have partially abstract knowledge of constructions. For example, children’s earliest representations of the English transitive construction may be based on an association between the number of arguments and the semantic feature “cause” (Fisher, 1996), as well as on knowledge about how specific lexical items (e.g. case-marked pronouns) combine with abstract linguistic categories (Childers & Tomasello, 2001). And so even within constructions development may proceed in a somewhat piecemeal fashion as well.

Naigles’ central claim is captured in her title: “Form is easy but meaning is hard”. But perceptual pattern recognition, as occurs in statistical learning experiments, does not involve linguistic form – only sounds (sometimes involving “speech-like stimuli”). The syntactic abstractions involved in language processing – as in the language learning experiments involving nonce verbs and the like – are concerned with complex linguistic symbols known as syntactic constructions, which comprise both a form and a function (Goldberg, 1995). What is hard for nascent language learners, apparently, is finding patterns in the way complex and meaningful linguistic symbols are constructed and used in the language they are learning.

Acknowledgements

We would like to thank Julian Pine, Fanklin Chang, Elena Lieven, Kirsten Abbot-Smith, Adele Goldberg, and Gina Conti-Ramsden for helpful comments.

References


