CHAPTER 8

Verb Specificity and Argument Realization in Tzeltal Child Language

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I. INTRODUCTION

How do children learn a language whose arguments are freely ellipsed? The Mayan language Tzeltal, spoken by an indigenous population of Mayan Indians in southern Mexico, is such a language. The acquisition pattern for Tzeltal is distinctive in at least two ways: (a) verbs predominate even in children's early production vocabulary, and (b) these verbs are often very specific in meaning. This runs counter to the patterns found in most Indo-European languages, where nouns tend to predominate in early vocabulary and children's first verbs tend to be "light" or semantically general.

In this chapter I explore the idea that noun ellipsis and semantically "heavy" verbs are related: the "heavy" verbs restrict the range of possibilities that their nominal arguments can refer to and so allow recovery of "missing" nouns. The particular proposal I explore here is this: the predominance of semantically specific verbs in Tzeltal children's first transitive verb combinations is related to patterns of argument ellipsis in the adult language, and it suggests a different verb-learning strategy for Tzeltal children than for children learning English. The data on which this analysis is based are samples drawn from a longitudinal corpus of the spontaneous production of four Tzeltal children, interacting with caregivers, recorded between the ages of roughly 1 and 4 years.

In what follows, section 1 reviews the earlier findings for Tzeltal child language in light of claims in the literature about how children learn verbs. This establishes the problem to be explained. In section 2, I sketch the linguistic background for Tzeltal and survey earlier work on argument realization in child and adult speech, to establish the plausibility of my proposed solution to the problem. Section 3 takes up my candidate explanation: it spells out what I mean by semantic specificity in

Tzeltal verb meanings and presents the results of testing my hypothesis that Object (henceforth O) arguments will be realized differently with transitive verbs of different semantic "weight." Section 4 discusses the findings in the light of Mayan language typology, and section 5 assesses the theoretical implications of these results for theories of word learning and of the pragmatics of argument realization.

1.1. Explaining Early Tzeltal Child Language

Two characteristics of early child language production in Tzeltal are strikingly different from that reported for the majority of children learning Indo-European languages. First, Tzeltal is very much a "verb-friendly" language for learners, with verbs predominant in the children's early vocabulary even at the one-word stage. A study of two Tzeltal children's initial productive vocabulary development[1] showed that they do not have a big burst in noun vocabulary (as measured by their spontaneous productions) before they have a burst in verb vocabulary (Brown, 1998a, 1998b):

> New verbs and nouns appear together from the earliest recordings, at first in roughly equal numbers in each session. For both children, ... before their MLU exceeds 1.5, new verbs outnumber new common nouns (not including proper names) in their cumulative production vocabulary....And by the time morpheme combinations are frequent,...still well before the MLU 2.0 point, new verbs outnumber all new nouns, including proper names. (Brown 1998b: 720)

This picture is generally at odds with acquisition patterns in the Indo-European languages, where most child language studies have concentrated. The Tzeltal child data are actually more in line with the picture emerging for Korean and Chinese (Choi, 1997, 1998; Tardif, 1996, 2006), as well as for other Mayan languages (de León 1999a, 1999b, 2001; Pfeiler, 2003a, 2003b), so perhaps Tzeltal is not so exotic after all from a broader perspective than that of Indo-European.

Second, among Tzeltal children's very early verbs are many semantically specific ones; in fact, for transitive and positional verb roots, semantically general verb types are outnumbered by semantically specific ones in the children's speech. This contrasts with the general tendency observed in children learning Indo-European languages to depend in their early productions on a rapidly increasing noun vocabulary with heavy reliance on just a few general verbs like 'make', 'do', 'give', and 'get' (Clark, 1993).

By *semantic specificity* I have something quite precise in mind. A typological characteristic of Mayan languages (and in fact, many other Amerindian languages) is that many basic-level transitive and positional verb roots incorporate into their semantics features of the arguments with which such verbs can co-occur. There are, for example, many different verbs for eating, or carrying, or breaking, or setting something down, or tipping something over, depending on the shape, substance, position, or orientation of the objects corresponding to the internal or (sometimes)

to the external arguments. These specific verbs are basic-level in the sense of being monomorphemic, in frequent everyday use, and not specialized to a particular register. Sometimes there is a superordinate term for the semantic domain (e.g., there are nine specific verbs in the eating domain but there is also a verb meaning 'eat anything'). Often there is no superordinate term (e.g., there is none for verbs for different kinds of 'cut', 'break', 'carry', or 'be-positioned'). However, it is these specific verbs that appear prominently among the earliest words in Tzeltal children's vocabularies (e.g., *lo'* 'eat soft things', *we'* 'eat tortilla-like things', *k'ux* 'eat crunchy things'), whereas the superordinate terms (where they exist, e.g., *tun* 'eat anything') do not. This kind of semantic specificity is restricted to transitive and positional roots; intransitives are all semantically general in the sense that they do not place restrictions (other than, in some cases, animacy) on what their single argument can be.

1.2. The "Light Verb" Hypothesis

The appearance of many specific verbs among the earliest words in Tzeltal children's vocabularies conflicts with the presumption that it is easier to learn general (or "light") verbs (like 'give', 'get', 'do', 'make', 'want'), based on (putatively) universal meanings, than it is to learn verbs with language-specific meanings (Clark, 1993; Goldberg, 1995). Of course, even though Tzeltal children produce many semantically specific verbs among their first verbs, it is possible that initially they have overgeneralized "light" meanings for these verbs; this, however, does not appear to be the case. I have examined the contexts in which specific verbs are used in order to see whether the children attend to the specificity of such verbs from when they first start using them (at the one-word stage), or whether the semantics of their early word use shows evidence of biasing from universal (general) concepts. The evidence from the children's production (although comprehension might be a different story) suggests that these verbs are semantically specific, restricted to an appropriately limited set of contexts, from the beginning of production. For example, Lus (2;0), complaining that the dog has carried off her lollipop, says *lut bel tz'i'* 'the dog carried it off', using the verb *lut*, which means 'carry long thing in mouth'; she does not overuse this verb for carrying off (or stealing) non-long things or carrying them not in the mouth.²

The Tzeltal data also go against the proposal by Anat Ninio (1996, 1999), based on English and Hebrew data, that children initially rely on semantically general—or "light" —"pathbreaking" verbs to break into argument structure when they begin combining words into sentences. Ninio claims that semantically light verbs (like 'do', 'make', 'give', 'go') are the first to start children off on syntactic learning, because their meanings involve little more than highly general relations between arguments. These are thus "pathbreaking verbs" that surface whenever there is a significant advance in verb syntax, leading the way "precociously" with a significant time lag until other verbs are used in the pattern. New syntactic learning,

Ninio argues, is initially item-based and lexical with later categorical knowledge based on a generalization from a few pathbreaking verbs (Ninio, 1996, 1999). So, Ninio's claim is that, although the young child may know some specific verbs, when combining words into new constructions she at first relies on general verbs. Other researchers have also argued for the primacy of semantically general verbs in initiating syntactic learning (e.g., Hollebrandse & van Hout, 1994, 1998; Goldberg, 1995, 2005; Goldberg, Casenhiser, & Sethuraman, 2004).

However, the Tzeltal children's few general-purpose (or "light") verbs do not appear to play this role. For two children whose early productions were examined in detail (Brown, 1998b), at least for transitive and positional verbs, semantically general-purpose verbs do *not* lead the way either in early morpheme combinations as a whole or in specific constructions. In fact, for these two children it is actually semantically specific verbs that play a dominant role in early combinations with transitive argument structure. In contrast, the children's early intransitive verbs are indeed semantically general—for example, 'exist', 'go', 'come'; these, however, are among the five most frequent verbs in adult speech and would be expected to appear early on frequency grounds alone.

A somewhat different approach to children's early light verbs is found in the work of Adele Goldberg. In early data from English-learning children (Goldberg et al., 2004), Goldberg has found that the most frequent and earliest acquired verbs correspond to the semantic prototype of the construction—that is, she finds overwhelming predominance of light verbs in their particular constructions (*give* in the ditransitive construction S V REC O; *put* in the caused motion construction S V O Obl; *go* in the intransitive motion construction S V Obl). Other verbs do occur in these constructions but much less frequently. The children's production matches the input, where light verbs predominate numerically in these constructions too. Goldberg's explanation is this: the fact that light verbs are semantically general means that they are widely applicable, across many contexts, and they code scenes basic to adults and children everywhere. Because they predominate in the construction, children come to associate the meaning of that verb with the constructional meaning.

Thus in Goldberg's picture of acquisition, the child moves from initially categorizing verbs on the basis of input utterances into what are at first verb-centered constructional categories (verb islands); these then get generalized to the construction according to their frequency in the language. So where light verbs are the most frequent, one would expect those meanings to predominate in the meanings of the construction—as they do, even in Tzeltal, for intransitives. The problem with generalizing this picture to Tzeltal is that for transitive and positional verbs, these early verb island constructions are not predominately made with light verbs.[4]

1.3. The Role of Frequency

Why do we find the predominance of semantically specific verbs in early Tzeltal child production? One obvious candidate for explaining their presence among

children's first verbs is frequency. Perhaps, just as general verbs are the most frequent ones in English, specific verbs are the most frequent ones in Tzeltal. But a check of verb type frequencies in a Tzeltal sample of child-directed speech (CDS)[5] indicates that this cannot be the whole story, a story that differs for transitive and intransitive verbs. Frequency may be the explanation for which intransitive verbs are first learned by Tzeltal children; these include the most frequent verbs in the language: *ay* 'exist', *ba* 'go', and *tal* 'come', in a way reminiscent of English. But, although the most frequent transitive verbs in adult Tzeltal speech are indeed also semantically general (e.g., 'want', 'see', 'give', 'do/make'), just as in English, these are not necessarily the transitive verbs that first enter into children's combinations. Rather, these are specific verbs (e.g., *lo'* 'eat soft things'), which are not among the most frequent 20 verbs in the language (see Brown, 1998b). So in what I discuss here, we leave aside intransitives and focus on semantically specific transitives that restrict the kinds of things they can take as patient (O) arguments.

The Tzeltal children's emphasis on specific verbs casts some crosslinguistic doubt on the core role of highly frequent general-purpose verbs in the early stages of language acquisition—at least as a universal strategy. Such a strategy may work well for particular kinds of languages; it may be a good one for learners of English and Hebrew. But it does not seem to be for Tzeltal.

1.4. Argument Ellipsis: The Current Proposal

These two properties of Tzeltal child production data—many very early verbs, and among them many semantically specific ones—have prompted me to consider whether they might be related to another feature of Tzeltal as actually spoken: Tzeltal is a language with massive argument ellipsis.[6] One obvious potential consequence of semantic specificity in transitive verbs is that, for these verbs, the search space for arguments is radically reduced, and therefore overt noun phrase arguments may be even less often required in natural speech than they are for general verbs. If, for example, you say *ya jk'an jlo'* 'I want to eat (it)' using the verb *-lo'*, which is specific to soft foods like bananas, it may be much less often necessary in context to specify exactly what you want to eat. You do not have to look very far to see what the referent of the O argument could be. If, however, you say *ya kich'* 'I get (it)', using the light verb *-ich'* with which a very wide range of arguments is possible, it may be more often necessary to spell out what it is you intend to get. This might then be a semantic factor interacting with the pragmatic factors influencing argument realization in adult speech. If so, and if young children are sensitive to such properties of the input, perhaps the degree of argument realization could be a clue to young children that the meaning of the verb somehow incorporates (at least some features of) the meaning of its O argument. In other words, if a child at this age is able to make use of pragmatic information—what her interlocutor is assuming about what she (the child) needs to know—she may be able to reckon that if the

O argument does not have to be mentioned explicitly, she must be able to recover it either from the context (because, e.g., it is physically present and the focus of attention) or from verb semantics (because the verb actually means 'eat-squishy-things', for example, and in her small child world there are not many different candidates for squishy things to be eaten).

In this chapter, I argue that the semantic specificity of Tzeltal verbs is indeed a possibly crucial ingredient in Tzeltal children's early transitive verb learning. This is for two reasons:

- Concreteness: Tzeltal verb semantics is relatively concrete, specific, "nouny." So whatever makes concrete nouns relatively easy to learn in other languages may also make these Tzeltal verbs easy to learn: their referents are more concrete, the range of contexts they apply in is more easily delimited.
- Redundancy: Information about the O argument's referent is carried both in the verb and in the Object NP. When the latter is ellipsed, this information is still carried in the verb.

In this language, one therefore might well expect more NP ellipsis with semantically specific verbs, both in the input and in children's speech. The specific hypothesis to be tested is the following:

> For Tzeltal adults and children, the O argument of a transitive verb is realized lexically less often when the verb is specific (like *lo'* 'eat soft things'), and more often when the verb is general (like *ich'* 'get'). Or to put it the other way around: we will find more ellipsis of O arguments with semantically specific verbs.

Before considering this hypothesis, we need some background information about what the Tzeltal child needs to learn about the structure of transitive sentences in Tzeltal, and about constraints on argument realization.

2. BACKGROUND

2.1. The Basic Tzeltal Transitive Sentence

Tzeltal is a VOS language with obligatory aspect marking that is different for transitive and intransitive verbs, and with ergative/absolutive person cross-referencing on the verb. Argument structure (at least transitive vs. ditransitive vs. intransitive) is therefore always morphologically coded in the input.

The minimally required morphology for transitive verbs is given in (1) and exemplified in (2); overt subject and object NPs are optional:[a]

1. ASPECT + ERG + VERB STEM + ABS (+ OBJ NP) (+ SUBJ NP)
2. ya   s-nutz-on   (tz'i').
    ICP   3ERG-chase-1ABS   (a dog)
    'It is chasing me.' ('A dog is chasing me.')

Core arguments are obligatorily cross-referenced on the verb; thus (2) is perfectly grammatical with no overt NPs expressed. Arguments may be overtly realized in two additional ways: by overt pronouns (which in adult speech are emphatic, and relatively rare), as in (3), and by a full noun or noun phrase, as in (4).

3. jo'on   ya   s-nutz-on   (te tz'i'-e)
    1/me   ICP   3ERG-chase-1ABS   (ART dog-CL)
    '(It's) me it (the dog) is chasing.'

4. ya   s-nutz-0   y-ajwal   te tz'i'-e
    ICP   3ERG-chase-3ABS   3ERG-master   ART dog-CL
    'The dog is chasing its master.'

2.2. Argument Realization in Tzeltal Adult and Early Child Language

Tzeltal nominal arguments can be freely ellipsed if their referents are clear in the context. Alternatively, for first and second person they can be expressed by an independent pronoun; in adult speech this is used only for special emphasis. Or they can be realized lexically, with a full NP.

How do Tzeltal children realize arguments in their early productions? Some examples from a child of 26–29 months, with MLU less than 2.0, are given in Table 8.1 to give a sense of the range of argument realization patterns in young children's productions.

No examples were found in these early child data where both A and O are lexical. Otherwise, children from about the age of 2;0 produce utterances with all of these argument realization patterns. What then constrains their argument ellipsis?

One important candidate is preferred argument structure (PAS), the tendency to ellipse arguments according to a universal pattern—to provide only one new (informative) argument per clause, usually in S or O position (Du Bois, 1987, 2000; Du Bois, Kumpf, & Ashby, 2003). But do children know about PAS? Could they use it as a clue to verb meaning? An affirmative answer is suggested by the work of Shanley Allen for children learning Inuktitut (Allen, 2000, and this volume; Allen & Schröder, 2003), and Pat Clancy for Korean (Clancy, 1993, 1996, 2003). They

TABLE 8.1

Examples of Child Utterances with Overtly Expressed Lexical NPs (MIK, 2;2—2;5)*

Child Speech	Adult Target
Ellipsed [=Null] O and A:	
ya _tzak	ya j-tzak
ASP grasp	ICP 1E-grasp
'(I) grasp (it).'	'I grasp (it).'
Only O is lexical:	
_pet i _tz'i'-tik	ya j-pet i j-tz'i'-tik
hold.in.arms this dog-1pl.incl	ICP 1E-hold.in.arms this 1E-dog-1pl.incl
'(I) hold (our) dog.'	'I hold our dog.'
Only A is lexical:	
_s-we' _papa-tik	ya s-we' j-papa-tik
3E-eat father-1pl.incl	ICP 3E-eat 1E-father-1pl.incl
'(Our) father eats (it).'	'Our father eats (it).'
A is pronominal, O is lexical:	
_lo' lo'bal jo'on	ya j-lo' lo'bal
eat banana I	ICP 1E-eat.soft.things banana
'I eat a banana.' OR:	'I eat a banana.' OR:
'I eat my banana.'	ya j-lo' j-lo'bal
	ICP 1E-eat.soft.things my-banana
	'I eat my banana.'
O is pronominal, A is null:	
_lutz jo'on	ya a'-lutz-on
cuddle I	ICP 2E-cuddle-1A
'(You) cuddle me.'	'You cuddle me.'

* Abbreviations: O = Object of Transitive; A = Agent of Transitive; _ Indicates missing cross-referencing and aspect morphemes which are obligatory for adults.

have demonstrated in detail the importance of pragmatic factors influencing argument ellipsis in child language. Similar findings come from Tzeltal, my analysis of the early child samples for two children showed some evidence that they are already sensitive by age 2;4–2;5 to the PAS constraints on argument realization: they are two to three times more likely to represent the O argument lexically than the A argument (Brown, 1998a). Narasimhan, Budwig, and Murty (2005) have found the same to be true of Hindi children.

This work shows that even very young children attend to PAS constraints. Thus the child from about 18 months appears to be a little Gricean, able to assess how explicit to be in relation to what can be presumed in the context. Because already at the two-word stage Tzeltal kids attend (in some sense) to PAS constraints, we may infer that they are sensitive to to some degree to the informational status of utterances, to given versus new information, and to what can be presumed in context as understood vs. what needs to be spelled out lexically. Therefore it seems not unreasonable to suggest that children could attend to degrees of argument realization in utterances in relation to semantic specificity.

The question of whether, in addition to pragmatic factors, semantic factors like verb specificity also play a role in argument realization is of course a complicated issue to assess, partly because children vary individually in their word-learning strategies, but also because pragmatic reasons for argument ellipsis might be expected to obscure any effect (if in fact there is any) of semantic specificity. Such pragmatic factors include recency of mention, presence in context, query, contrast, person, and animacy—things that affect the pragmatic saliency of information at any point in the discourse (Allen, 2000, this volume).

Despite these reservations, I wanted to see if Tzeltal children's realization of arguments is related to the semantic specificity of the verb, because if indeed it turns out that verb specificity enhances the degree of O argument ellipsis in Tzeltal, this might be an important factor in the predominance of verbs in children's early utterances. There are two reasons for why this might be so:

- Because with a lot of ellipsis, verbs predominate numerically and "stand out" in the input.
- More controversially, because with relatively nouny semantics (object property features encoded in the verb), it is somehow easier to learn the semantics of transitive verbs in Tzeltal than in Indo-European languages.

So let's look at how O arguments are realized in Tzeltal.

3. REALIZATION OF O ARGUMENTS WITH TRANSITIVE VERBS OF DIFFERENT SEMANTIC WEIGHT

3.1. Hypothesis

Recall the hypothesis to be tested: for Tzeltal adults, and children, the O argument is realized lexically less often when the verb is specific (like *lo'* 'eat soft things'), and more often when the verb is general (like *ich'* 'get').

3.2. Data

The data examined consist of an adult sample of parental input utterances to Tzeltal children aged 3;7 to 3;8, and data from four children (Lus, Xan, Mik, and Xaw) at

an age (3;4–3;9) when they are talking in fully grammatical sentences. (See Table 8.2 for details.) All samples are drawn from naturally-occurring conversation in the children's own homes."

3.3. Method

First I selected samples of naturally occurring speech of about 800 utterances from the input speech of three adults, and 800 utterances for each child, and coded them for (a) grammatical transitivity, (b) syntactic role of arguments—Agent of transitive verb (A), Subject of intransitive verb (S), and Object of transitive verb (O), (c) whether the O arguments of transitive verbs were realized lexically, pronominally, or null (ellipsed), and (d) semantics of the verb. The verbs were classified into one of three semantic categories: general, specific, and "other," those that do not fit into either category. Setting aside the "other" category, where semantic specificity makes no predictions about how the O argument will be realized, I then checked whether semantically specific transitive verbs are more likely to get null O argument realization than semantically general verbs.[10]

Semantic Weight. Verbs were categorized as semantically "heavy" or "light" on language-internal grounds: "general" (or "light") verbs are those able to apply to a wide range of arguments. For these there are no selection restrictions on O (or virtually none); these are the classic light verbs in the literature: for example, 'give', 'put', 'get', 'do', 'make'. Many other Tzeltal verbs are equally indifferent as to the nature of their O arguments: you can, for example, 'look at', 'see', 'search for', 'fear', 'want', almost anything, regardless of its specific properties. "Specific" (or "heavy") verbs are language-specifically restricted to particular kinds of O arguments; they can only apply to certain classes of arguments in Tzeltal. For example, as mentioned earlier, the eating verbs are "heavy" in Tzeltal: each verb subcategorizes for a particular class of things eaten. This trait appears similarly for verbs of carrying, holding, breaking, inserting, opening,

TABLE 8.2

Tzeltal Child Data Summary

Child	Age	Number of Verbal Utterances in Sample Coded	Number of Coded Utterances with Transitive Verbs
XAN	3;4	557	268
LUS	3;9	601	272
MIK	3;7	856	340
XAW	3.9	723	343
ADULTS	[to children 3:7–3;8]	504	282

positioning, and many others. Note that some "heavy" verbs may be specific in what O arguments they take by virtue of being specific about other things—for example, specific manners or places where the action occurs; *lut* 'hold/carry long thing in mouth', or *lik* 'hold/carry by handle from above', might appear to involve manner as much as O object restrictions. Yet restricting what you are talking about to what you can hold in your mouth or by a handle from above places obvious restrictions on what the O argument can refer to (a small object, a bucket or bag with a handle on top, respectively). In contrast, "other" is a hodge-podge set of verbs that select in ways that do not restrict what the O argument can refer to except perhaps on very general grounds like animacy or instrument, and they are not members of the crosslinguistically classic set of general verbs. They provide no basis for predicting how their O arguments would tend to be treated; for this reason they are set aside and the analysis compares only general versus specific verbs as defined earlier.

Examples of verbs in each category found in the data examined are given in Table 8.3. Note that, because of the language-specific restrictions on multiple features of these semantically specific verbs, their glosses are necessarily shortcuts; many of these would require a line or two to specify exactly what the restrictions on the O object are.

TABLE 8.3

Semantically General/Specific and "Other" Verbs in Tzeltal

General ("Light")	Other	Specific ("Heavy")
ak' 'give, put'	*al* 'tell'	*boj* 'cut [with machete or knife]'
a'y 'feel, hear, experience'	*bislun* 'fix, make (it) work' [inanimate O]	*busk'in* 'tip out, spill [small objects, from container]'
ich' 'get, bring, take'	*butz'* 'kiss, suck on'	*chotan* 'stand (it) up [four-legged object]'
il 'see'	*chol* 'line up in a row'	*chejpan* 'stand (it) up [sack]'
k'abu 'look at'	*chon* 'sell'	*jatz* 'rip [cloth, paper]'
k'an 'want'	*chuk* 'tie up, put in jail'	*jojk'an* 'hang up [from handle/strap]'
le 'search for'	*ik'* 'take with' [animate O]	*ok'esan* 'play [noise-making object or wind instrument]'
lok'ta 'photograph'	*ixlan* 'play with' [inan. O]	*kuch* 'carry [on headstrap or back]'
mulan 'like (it)'	*jel* 'exchange, trade' [inan. O]	*k'ok* 'break off, pluck [e.g., fruit, from stem]'
pas 'do, make'	*jip* 'throw something'	*k'ux* 'eat [crunchy things]'

(continued)

Table 8.3 *(continued)*

General ("Light")	Other	Specific ("Heavy")
xi' 'fear (it)'	*jojk'o* 'ask'	*lik* 'lift/carry [by handle, from top]'
	joyinta 'encircle'	*lim* 'spread out [cloth object]'
	kananta 'look after, protect'	*lo'* 'eat [soft things like bananas]'
	k'ej 'put away' [inan. O]	*luch* 'hit [with head], charge, gore'
	lajin 'finish'	*metz'an* 'lay it down [on its side]'
	lo'lo 'tease' [animate O]	*nap'* 'stick onto sticky surface'
	lok'es 'take out' [inan. O]	*nuj* 'invert, place upside-down [bowl-shaped object]'
	mak 'cover' [e.g., with cloth]	*pay* 'boil [in water]'
	maj 'hit'	*pet* 'carry [in arms]'
	man 'buy' [inan. O]	*p'ij* 'break [stems of plants]'
	mayli 'wait for'	*set'* 'cut [rope/wire with e.g. scissors]'
	mil 'kill, ruin'	*tam* 'pick up small thing fallen to ground'
	na' 'know'	*tek'an* 'step on [two-footed]'
	nak 'hide (it)'	*ti'* 'eat [meat], bite'
	net' 'push against'	*tik'* 'insert [through narrow opening]'
	nit 'pull [on rope/string]'	*toch* 'rip, break off [e.g. bark, plaster]'
	nutz 'chase' [animate O]	*top'* 'break [e.g. pottery or glass]'
	otzes 'insert, make (it) enter'	*tuch* 'stand upright [long thin object]'
	paj 'compare'	*tuy* 'cut [meat]'
	poj 'steal, take away from'	*tzak* 'take in hand, grasp'
	s-tak' 'be able to'	*tz'ot* 'twist-insert [long/thin object]'
	tzaj 'choose, sort'	*tz'ap* 'insert [long sharp object]'
	tzob 'gather together'	*tz'it* 'wipe clean [bowl, with finger]'
	tz'ibu 'write' [inan. O]	*tz'us* 'close [hinged thing like door]'
	ut 'tell, do'	*t'uxan* 'make fall [from standing-up stance]'
	wo' 'toast [in front of fire]'	*uch'* 'drink'

3.4. Results

Rates of argument realization in each of the three possible forms (null, i.e., cross-referencing alone, vs. pronominally, vs. lexically) in samples of adult input speech during the course of everyday interaction, and in the children's samples, are shown in Figure 8.1.

As this figure shows, semantically specific verbs do indeed receive overt O arguments less often, that is, they have a higher rate of argument ellipsis than general verbs in Tzeltal. This is true for the adults somewhat more ($p < .01$) than for the children ($p < .05$). There is considerable variation across the children: for two of them the results are like those of the adults, significant at the $p < .01$ level; for the other two the effect is weaker. We must therefore conclude that this pattern is variable across children at this age, and sensitive to pragmatic factors (topic, presence of referent in the discourse context, etc.) as well as to semantic ones.

Yet these results are striking in light of the many different factors conditioning the overt realization of arguments. In addition to the obvious fact that pragmatic saliency makes it often unnecessary to mention the argument of general verbs as well as of specific ones, several other complications might lead one to expect a messier picture. One is that there is, under certain conditions, a *tolerance for redundancy*. In the adult sample it is clear that speakers sometimes keep using the lexical noun representing the O argument even on repeating the verb four or five times in the same context. In some cases these are idioms where the NP is never ellipsed even on repetition; these idioms were omitted from the counts (e.g., *pas choke* 'make a crash [cars]'; *nup'betik sk'alel* 'blow on his fire' [i.e., get him angry]; *laj yo'tan*, 'his heart finished' [i.e., 'he is done']). But in addition, when stating a general rule one often repeats the noun: e.g., *ya stuy jk'abtik* 'it slices our
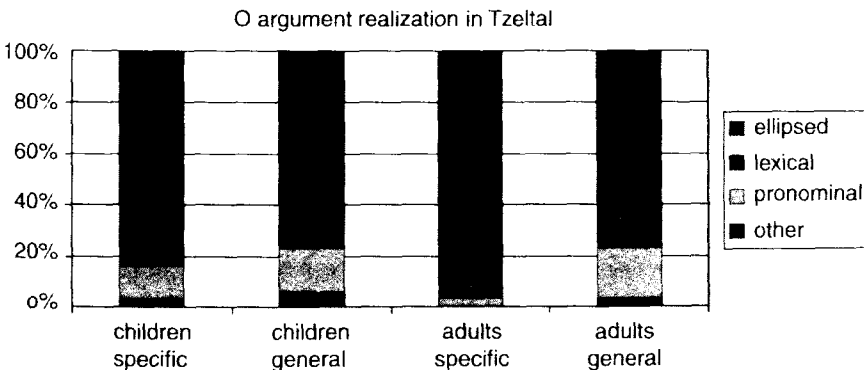

FIGURE 8.1. O argument realization in Tzeltal, for adults and children.

hands', *net' bel jk'abtik* 'it pulls away at our hands', *xat' jk'abtik* 'it splits our hands', *lajin jk'abtik* 'it finishes off our hands' are all comparable ways of stating the rule that *lamina* (corrugated iron) can cut you. There are thus various reasons for using the explicit O argument noun even when it's obvious in the context, which could obliterate any effect of specificity. There are also other reasons for *not* needing to specify the O argument—even semantically general verbs may have, in practice, in the limited contexts applicable to these children, only a handful of possible arguments, obvious in context.

Nonetheless, the results clearly support the hypothesis: Tzeltal adults are indeed less likely to represent the O argument of transitive verbs lexically if it is a specific verb (like 'eat soft things') than if it is a general verb (like 'get'). So are Tzeltal children by around age 3;6, although to a lesser degree than the adults ($p < .05$).

It might be objected that this effect—less overt argument realization with specific verbs than with general verbs—could be due not to the nature of the verb semantics but to the well-known pragmatic constraints on argument realization: that arguments are less likely to be overtly realized when they refer to old (given) information, or to things physically present in the context, or to pragmatically prominent things. But there seems to be no reason to expect these contextual conditions to cluster with semantically specific verbs—no reason to think that a specific verb like *lut* 'hold/carry long-thin object in mouth' is more likely to be uttered in contexts where the object is given information, or is physically present, say, than a general verb like *ich'* 'get'. Rather, the richness of information carried in the verb seems likely to affect the probability of a felt need, in a given context, to explicitly spell out what the O argument refers to, even when pragmatic prominence would push in the other direction.

The pattern of argument ellipsis in adult speech offers the Tzeltal child the possibility of inferring from rate of argument ellipsis to verb semantics: object ellipsis suggests recoverability, not only from the context, but also from the verb meaning (specific vs. general). We may conclude that argument realization (the rate of Object NP ellipsis) could provide a clue to verb semantics (specific vs. general) for the Tzeltal child, and hence function as an aid to verb learning.

The finding reported here does not in itself establish that verbs are easier in Tzeltal because their semantic specificity is reflected in rates of argument ellipsis. But it does suggest a plausible link that could be explored in further research; namely, that the Mayan trait of coding certain object properties in verbs, instead of in nouns, may provide some of the basis for the earliness of Tzeltal children's verbs. This is because the reference of such semantically specific verbs is restricted to a relatively coherent set of extensions, delimited by the properties of the referents of the nominal arguments the verbs can take. For verbs like these, a child has to construct categories of verb meanings that are less diverse—are applicable to fewer contexts—than for semantically general verbs. In essence, in order to master the verb's meaning the child has to generalize from first hearing a word in a particular context to fewer different kinds of contexts: she has to divide the world up into

smaller categories of verb-relevant contexts. A corollary of this view is that because these categories are language specific, there is a large role for the input language in the learning process.

4. DISCUSSION: FACTORS INFLUENCING CHILDREN'S EARLY VERBS

4.1. Light versus Heavy Verbs in Early Child Verb Learning

There are two opposing proposals (see Bowerman, 2005) about the level of abstraction that children find easier in learning verb meanings: (a) general/ light verbs are easier because their meanings do not go beyond pure argument structure (see section 1.2), versus (b) semantically specific verbs are easier because there is less to extend, so children do not have to work so hard to figure out what the boundaries of the verb's semantic category are. The Tzeltal data examined to date make me lean toward the latter, at least for this language. But it may not always be the case. For example, we may speculate that in a language with obligatory NPs (like English), a light verb strategy is sensible; in a language like Tzeltal, with massive NP ellipsis, a heavy verb strategy is perhaps better. Expressing this proposal from the point of view of a child, it's as if a child learning English could be thinking: "Verbs are tricky, so I'll stick with a handful that are general enough to be most useful and let the noun provide the O object reference." Thus the young English-speaking child often says things like: "do my hair", "do my belt", "do my dress", "do my toy". The Tzeltal child, however, could be thinking more along these lines: "I'll stick to verbs that have clear well-defined contexts of use." So she says things like: "braid" (my hair), "tie" (my belt), "put-on-clothing" (my shoes), "insert-tightly" (my toy), and resists generalizing these verbs across contexts until she hears positive evidence in the input for each verb.

The findings (for adult input and for these four children) are consistent with the idea that the semantic specificity in Tzeltal verbs helps children to learn verb meanings, or at least to be conservative about generalizing verb meanings beyond the contexts where they are heard in the input. We might even want to consider the more radical claim that in Tzeltal, transitive verbs are easier to learn than in other languages because they are semantically "nounier" (more informationally rich about the object properties of arguments).[11]

4.2. The Influence of Typology

There is also something about the nature of Mayan noun and verb semantics more broadly of interest for theories of child word learning. Although, from an Indo-European perspective, nouns canonically label individuable things, whereas verbs mostly label activities, processes, or states, in Tzeltal and other Mayan languages neither verbs nor nouns fit this picture very well. On the one hand, it is at least arguable (cf. Lucy, 1992) that inanimate concrete nouns in

Tzeltal are predicate-like, and label unindividuated "stuff" or material properties of objects—for example, the same word *lo'bal* can mean 'banana fruit', 'banana tree', 'banana leaf', and so on. Thus noun semantics—at least for such inanimate nouns—omits individuating features; these nouns have to be individuated by a numeral classifier. On the other hand, as we have just seen, many verbs incorporate in their semantics specific features of the nominal arguments that can go with them. Like the specificity provided in numeral classifiers for nouns, such that the classifier can stand on its own for the whole NP, these Tzeltal verbs are like classifiers for actions because they apply only to actions with respect to specific kinds of objects (e.g., specific kinds of foods, places of carrying, positions, shapes, or orientations of O). This is a different kind of specificity from that provided, for example, by a manner component in verbs of other languages (e.g., English, German, and Dutch): the manner component qualifies/specifies the nature of the action/ motion/state, whereas verb specificity in Tzeltal qualifies/specifies what kinds of things the action can apply to (although it may implicitly thereby indicate manner). Hence its relevance for argument realization.

A similar argument has recently been made for another classifier language, Mandarin (Tardif, 2006). Mandarin and English differ in how nouns and verbs are lexicalized with respect to which ones are general purpose and which are specific. As Tardif (2006:494) puts it:

> The main difference is that, in English, adults (as well as children) tend to use more general purpose verbs to approximate one's meaning and then use prepositions, nouns, and other parts of speech to more fully specify one's meaning. In Mandarin, verbs are used for very specific meanings (without the addition of distinguishing prepositions). In contrast, Mandarin nouns tend to be general, whereas they tend to be highly specific in English.

Tardif concludes (p. 478) that word-learning theories need to consider not only "cross-linguistic differences in specific features such as syntactic markings and inflections, word order, and differences in the extent to which manner and path are lexicalized with the verb itself,...[but] we need also to consider the nature of the words themselves and how they are organized into a coherent noun and verb lexicon in a particular language".

In short, we need a deeper linguistic understanding of what nouns and verbs are, and of crosslinguistic variability in where the referential load of a language is concentrated. The Tzeltal—and other Mayan—data make the same point (see also Brown, 2001; Bickel, 2002; Danziger, this volume; Rispoli, 1992, 1995; Uziel-Karl & Berman, 2000).

4.3. Other Influences on Verb Learning in Tzeltal

I am not, however, suggesting that semantic specificity is the only factor promoting early verb learning in Tzeltal. As I have discussed elsewhere (Brown, 1998a, 1998b, 1998c), there are several other factors contributing to the prominence of

verbs in child speech in this language, factors specific to Tzeltal and to the language-learning context in this community that have a bearing on how easy or difficult verbs are to learn, in comparison with nouns. In addition to the semantic facts (verb specificity) that we have been discussing, there are *structural facts* of Tzeltal, especially the verb initial position, morphological regularity, and morphological distinctiveness of verbs, which surely make verbs easier than in languages with more verbal irregularity. Then there are *discourse pragmatic facts*, like verb prominence in general due to frequent argument ellipsis, regardless of the semantics of the verb. In Tzeltal (as indeed in many languages), an utterance frequently consists of just a verb alone. Certain *interactional facts* also contribute to verb prominence in Tzeltal, in particular the prevalence of turn-adjacent conversational repeats—for example, Mother: "Did you feed the chickens?" Child: "(I) fed (them)"—where the response frequently repeats just the verb (Brown, 1998c).[1] Finally, there are *cultural facts* that favor verbs—for example, the absence of any practice of object-labeling for small children, as well as an emphasis on activities as opposed to objects in children's early socialization (cf. Gaskins, 2005, for a related Mayan society), are both likely to promote verbs in input utterances at the expense of nouns. All of these cumulatively could go against any cognitive bias in favor of early nouns, and contribute to the relative ease of verb learning in this speech community.

5. THEORETICAL IMPLICATIONS

What are the implications for theories of semantic acquisition of a language like Tzeltal, a language with a lot of concrete verbs in Tzeltal child language, and with more concrete/more nouny semantics for verbs than in other languages (like English)? Minimally, I suggest that we should add this to the possible learning strategies that have to be incorporated into theories of how children learn verbs. The evidence adduced here that patterns of ellipsis reflect the nature of verb semantics in Tzeltal supports the view that the language being learned can influence how the child proceeds in the word-learning task. We therefore need explanations for word-learning patterns that show how whatever is universal is quickly tuned to expectations concerning a specific kind of language—a phenomenon that has been called (Slobin, 2001) "typological bootstrapping". In short, typological properties make certain things easier to learn (Slobin, 2001); there is evidence that children's expectations can be quickly tuned in response to what has already been learned (Smith, 2001). This view is consistent with Gentner's position on children's word-learning processes: you do not need to postulate innate constraints on word-learning strategies, just a rapid system-seeking learner and a large role for the input language, especially for verbs (Gentner, 1982: Gentner & Boroditsky, 2001).

The argument that less overt O realization tells you that O is recoverable from the context, therefore that (other things being equal) the verb semantics is likely to be concrete—the idea that a transitive verb alone without nouns around it could be thereby easier to learn than one that has nouns around it—might seem to be

contrary to the spirit of syntactic bootstrapping. The bootstrapping argument is that noun semantics helps you get the verb semantics precisely because the syntactic frame indicates what elements of the scene are important for that verb—what participants are relevant to the scene. Yet, as Adele Goldberg (personal communication) points out, the child doesn't need the overt nouns to bootstrap the argument structure; she just needs to know what participants are relevant to the scene. This information can be provided either by overt nouns representing referents, or (in less detail) by pronouns or demonstratives or cross-referencing on the verb, or indeed by contextual knowledge (e.g., the O argument may be expressed sequentially, across turns). And in Tzeltal, once the child has the cross-referencing system mastered, ergative and absolutive markers also indicate how many arguments, and of what kind, a verb takes.[13]

The properties of Tzeltal child and caregiver speech do not really seem to conflict with syntactic bootstrapping. The learner needs the nouns to be overtly expressed more when there is less elaborate semantics in the verb (i.e., with "general" verbs), and that is precisely where you get them in Tzeltal, so the patterns of argument ellipsis visible in the input have something to help both specific and general verbs get learned. Specific verbs are thus not disadvantaged in relation to general ones; this may explain the early presence of many different semantically specific verbs in Tzeltal children's speech, along with the much more frequent (in the input) general verbs like 'give/put' and 'do/make'. The typological nature of Tzeltal, in contrast with a language like English, leads to a hypothesis to be explored in further research: the appropriate strategy for tackling a language like Tzeltal may be different from that for a language like English. In Tzeltal, an appropriate strategy is this: pay attention to the lexical semantics of verbs, as that will tell you what the arguments are. Hence, Tzeltal children launch early into verb learning. In English, however, the strategy is (arguably) this: pay attention to the argument structure, as that will tell you what the verbs mean. Hence, syntactic bootstrapping is a plausible starting point.

Finally, the Tzeltal data also have implications for theories of how argument realization patterns are acquired. Children's argument realization has been studied to date in terms of their developing sensitivity to pragmatic constraints (e.g., preferred argument structure, PAS). The Tzeltal data suggest that, at least for some languages, we also need to consider children's sensitivity to semantic constraints: namely, the preemption of explicit argument realization by specificity in the verb.

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NOTES

[1]In this study, samples coded for new vocabulary totaled about 30 hours (2,100 utterances) for one child and 50 hours (12,600 utterances) for the other (the great majority of these utterances were agreement tokens and other nonword communicative acts). A cumulative vocabulary list was compiled for each child listing every new word the child produced, either by parental report (for the first few words) or in the taped production data samples, until the point at which the child had produced 500 multimorpheme utterance types (age 1;3 to 2;3 for one child, 1;5 to 2;5 for the other). These data were drawn from a larger database collected over four and a half years in a rural hamlet of the highland community of Tenejapa, in Chiapas, Mexico. The data were videotaped every 6 weeks by me, and/or audiotaped monthly by the child's parents, in five extended families.

[2]In contrast, Bowerman (2005: 210) found that an American child overextended the relatively specific verb *kick* to actions that were kick-like in some respects but not done with a foot. Of course, it is possible that my production data samples and observations of Tzeltal child speech have missed the crucial moments when a child produces overextensions; it is also possible that overextensions of manner verbs like 'kick' are more likely than of theme-specific verbs like 'eat-soft-things'.

[3]Because, in Tzeltal, NPs are often ellipsed and arguments are cross-referenced on the verb, the comparison between Ninio's data and my data is not exact. The Tzeltal combinations in question include all morpheme combinations (e.g., participant cross-referencing morphemes, possessive markers, aspect, etc.), not just full-word combinations.

[4]Not only do the relevant constructions differ in Tzeltal and English due to massive argument ellipsis allowed by Tzeltal but not by English, but also some light verbs occur in many different constructions. Note that, for example, English *get* occurs in quite different constructions (*get* + O (*get the ball*), *get* + location (*get into bed*), *get* + attribute (*get tired/hungry/excited*). Similarly, Tzeltal *ak'* 'give/put' occurs in different constructions: transitive ('give/put' + O), ditransitive ('give/put' + REC + DO, 'give O to me'), 'give/put' + V ('let/make V happen'), and so on. Which construction is supposed to achieve priority in helping the child assign meaning to the verb?

[5]The sample consisted of all the input by four adults (two parents, two aunts) to two children during four sessions; approximately 800 verbal utterances were coded. Note that in this community children are raised in extended households, and child care (and hence input speech to small children) is contributed by a number of adults, as well as by elder siblings.

[6]Two clarifications are in order. First, although Tzeltal has massive argument ellipsis, core arguments are cross-referenced on the verb. I talk about these Tzeltal NPs as 'arguments'; I think they probably share properties of argumenthood

with the cross-referencing markers. This is a grammatical issue not yet resolved for Tzeltal, but nothing rests on this for my discussion here. Second, by ellipsis I mean omission of arguments that are recoverable in the context, and where the argument could have been expressed. This excludes arguments omitted for purely syntactic reasons (as in, e.g., *I want to go*).

That is, the same set of person markers cross-references the subject (S) of intransitive verbs and the object (O) of transitives; a different set cross-references the subjects (A) of transitive verbs.

Interlinear glosses use the following abbreviations: ART, definite article; ICP, incompletive; CMP, completive; ERG, ergative; ABS, absolutive; CL, clitic.

The data for this study come from a large longitudinal corpus of audio and/or video-taped naturally occurring interaction in five Tzeltal families, collected in the rural hamlet of Majosik`, in Tenejapa, Chiapas, Mexico (see note 1). The community consists of mostly nonliterate Mayan corn farmers. Some people are partially bilingual in Spanish and Tzeltal, but Tzeltal is overwhelmingly the language of the home and almost the only language children hear until they go to school.

All verbal utterances were coded. For this analysis, the following principles were followed: (a) I excluded from the counts utterances that are exact repetitions of the previous utterance, or formulae (idioms with fixed argument realization), and (b) I counted all codeable utterances with transitive verbs, except for those with ditransitives or complex verb constructions (these involve distinct constructions and probably different argument ellipsis patterns). Actually, there are only a few semantically general ditransitive verbs ('give/put', 'do/make') in the data examined, but in principle almost any transitive verb can be construed ditransitively in this language (Brown, 2004, 2007). In my samples there are almost no lexically expressed recipient arguments with ditransitives; cross-referencing on the verb is mostly sufficient for this argument. Complex verbs were excluded because many general verbs occur with complements that are ellipsed according to different constraints: for example, 'want' + V, 'give'[=cause] + V, 'be able to' + V.

They are not only semantically nounier; they are also in some respects morphologically nounier than verbs in other languages. For example, the same ergative/absolutive morphology is used with both nouns and verbs (see note 13 and chapter 2, this volume).

For analogous facts of interactional style with a bearing on verb learning, see Clancy (1996) on referential strategies for Korean, and Kuntay and Slobin (1997) on "variation sets" in Turkish.

It is not at all clear from the literature whether cross-referencing markers on the verb could be used in syntactic bootstrapping. To the extent that they are available to the child as markers of participants, presumably they could be, although like Tzeltal pronouns they indicate only the person and number of the argument, not its semantics. But in this respect, Tzeltal verbal cross-referencing of participants is not very helpful. Although it is obligatory and therefore frequent in the input, and it is learned relatively early, not only is it phonologically minimal (mostly nonsyllabic), but the same markers are used both for arguments of verbs

and possessors of nouns (if ergative) or predication with nouns (if absolutive). This double dose helps children learn the meanings of the affixes (first, second, third person, and plurals), but it won't help with syntactic bootstrapping, I think, at least not until the child has the complete paradigm, including aspect markers, around the age of 4 (Brown, 1998b).

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