

**From roots to edges:
First steps into the acquisition of verb morphology in Tzotzil**

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1. Introduction

Studies of language acquisition have devoted much attention to the way children acquire open-class units and word order, but the study of the acquisition of closed-class morphemes has received considerable less attention. Early studies of language acquisition were mostly done on English where children's first productive combinations involved two words rather than combinations of morphemes. In fact, the period of early combinations has been currently referred to as the "two-word period" where children (learning English) first learn word order as a syntactic device and semantic relations such as Agent and Patient (R. Brown 1973). Morphosyntactic devices such as inflection are expected to be acquired later (Wexler 1996). However, as we look at acquisition crosslinguistically, studies in typologically different languages show that children learning languages with complex morphology (i.e. Turkish (Aksu-Koc & Slobin 1985), West Greenlandic Eskimo (Fortescue & Lennert Olsen 1992), Mohawk (Mithun 1989), Tzotzil Mayan (de León 1999b), Tzeltal Mayan (P. Brown 1998), Inuktitut (Allen 1996; Crago & Allen 2001), or even Japanese (Clancy 1985)) may use early combinations which consist of an open-class unit plus a closed-class item (see Peters 1985, 1995, 1997). The early grasp of closed-class units in these languages shows a much earlier acquisition of

grammatical morphemes than the English counterparts at about MLU 2 (R. Brown 1973).¹ Such is the case of Mayan Tzotzil.

The acquisition of verb morphology in a predominantly agglutinative language like Tzotzil underlines a question prominent in the current debate about morphological development and verb acquisition: what is the relative importance of putative cognitive-semantic forces vs. language-specific patterns? This question is particularly interesting in the context of a language (1) with high morphological productivity, where verb roots and morpheme boundaries are highly stable, (2) that is syntactically head-marking (arguments are cross-referenced in the verb), and (3) where discourse patterns and high argument elision leave the verb in a salient position in the utterance.

In this paper, I give a view of the early acquisition of verb morphology exploring the patterns and possible motivations guiding children into the morphological structure of the Tzotzil verb. Contrary to structural predictions about the complexity of inflection in linguistic development (Wexler 1993, 1996) I will show that Tzotzil children start learning inflection and derivation before MLU 2. I will argue that factors of perceptual saliency (Pye 1983; Pye, Pfeiler, de León & Brown 2007; Slobin 1973) play a central role in the early acquisition of verb morphology in this Mayan language.

2. The study: subjects and data

Tzotzil is a Mayan language with about 350,000 speakers. Research for this study was carried out in the hamlet of Nabenchauk, in the municipality of Zinacantán, Chiapas, México, a village with about 3000 inhabitants. In this community, Tzotzil is spoken by virtually all of the population, and it is learned as a first language in quasi-monolingual homes. The data come from longitudinal linguistic and ethnographic research based on a case study of two girls from the beginning of their one-word utterance productions to the period of their early word combinations. Both girls were first-born children. For one child, Tinik, data come from a period of six months (roughly 19 to 25 months old) through biweekly six-hour visits. For the other child, Cande, data also cover a period of six months (roughly 18 to 24 months old). Production data for this second child were obtained during periodic one-week visits every four to six

¹ MLU stands for *Mean Length of Utterance* (Brown 1973). I roughly follow Brown's criteria for measuring mean length of utterance, counting productive combinations of morphemes (free particles, bound affixes), roots, and non analyzable words. The combination count does not include third person singular Absolutive, since the corresponding marker is null in Tzotzil, and we cannot tell when children have a distinct null category. There is an overt marking for 1st and 2nd person. Productivity of morphemes is measured by their occurrence in at least three uses, with different roots.

weeks in Spring and Fall 1995-96, and during four-week stays with the family in the corresponding winters and summers. The two children were audio and video recorded in natural interaction with members of the family. For Tinik, transcriptions were made by her father, and checked for reliability by the researcher with the child's mother. In the case of Cande, transcriptions were made by the researcher and checked for reliability with the child's caregivers.

3. Tzotzil early “words”: Bare roots without morphology

I will start by showing the first productions of the two girls of the study in their period of “one word” utterances.² Around age one and a half most of Tinik's and Cande's utterances consist of CVC verbal roots to refer to events before, after or at the moment of their occurrence. Look at examples in (1).

(1) Early utterances

- i. Cande (1;6) warns her mother that a little girl is going to fall off a roof. She says *p'aj!* ‘fall!’ (= *ta x-O-p'aj* (ICP-3B-fall) ‘it falls’).³
- ii. Tinik (1;7) notes that her cousin turns upside down and cries *nuj!* ‘face down!’ (= *nuj-ul* (face down-STAT) ‘it is facing down’).
- iii. Tinik (1;7) has been exploring the plastic case of my video batteries, after I lock it, she hands it to me saying *jam!* ‘open!’ (= *jam-o-∅* (open-TIMP-3B) ‘open (it)’).
- iv. Cande (1;8) has been trying unsuccessfully to open a small can of ointment. She approaches the adults nearby and says: *jam!* ‘open!’ (= *jam-o-∅* (open-TIMP-3B) ‘open (it)’).
- v. Cande (1;8) is given an orange to play with, but she wants to eat it instead. She hands it to her mother, and she says *cho'!* ‘peel!’ (= *cho'-o-∅* (peel-TIMP-3B) ‘peel (it)’).
- vi. Cande (1;8) wants to eat ripe peaches from the tree. She points with a reaching gesture at them and says *k'an!* ‘want!’ (= *ta-j-∅-k'an* (ICP-A1-3B-want) ‘I want (it)’).
- vii. Tinik (1;8) picks up a necklace bead and gives it to her father saying *xoj!* ‘Thread! (insert)’ (= *xoj-o-∅* (insert-TIMP-3B) ‘insert (it)’).

As we can see, Cande and Tinik produce requests that consist of utterances with the form C(onsonant)V(ocal) C(onsonant) that corresponds to the canonical form of the verbal root in Mayan languages (Kaufman 1990).

The production of the CVC roots is intriguing since adults rarely pronounce them in isolation. As shown in the adult equivalent forms presented in

² The children's ages is given in years, months, and days (years; months.days).

³ I am using the sign (=) to indicate adult equivalent forms of the children's productions.

parenthetical utterances included in Example (1), verb roots are mostly produced with inflectional and derivational morphology.

The use of these non-finite forms apparently confirms Wexler's (1993, 1996) universalist proposal that children take a time to produce verbal inflections and that, at the beginning they use an unmarked, or non-finite form of the verb. Wexler's point could apparently be reinforced by Tzeltal (a closely related Mayan language) acquisition data where children also produce bare roots (P. Brown 1996). However, adult Tzotzil does not have non-finite CVC forms of the verb, (the infinite form is CVC-*VI*) and roots almost always occur with verbal inflections or with derivational affixes. Elsewhere I explain how some interacting factors of a prosodic and discourse nature in the speech directed to children and between adults may contribute to the children's isolation of the root (de León 1998, 1999a). P. Brown has also argued that discourse patterns of dialogic repetition may also contribute to the isolation of the root in Tzeltal. In both cases, we argue that factors related to the structure of the maternal language plus properties of the input orient the child to extract the intact root.

In order to answer, from a comparative Mayan perspective, why children learning Tzotzil and Tzeltal mostly produce bare roots in contrast to K'iche' children that produce roots plus suffixes (Pye 1983: 592), we analyzed the correlation between the structure of the input with the early productions of children learning five Mayan languages: Q'anjob'al, K'iche', Tzotzil, Tzeltal, and Yucatec (Pye et al. 2007). For this purpose, we explored factors of the occurrence of the verb root in the input at the left and right edge of the verb. We use the term 'edge' to refer to the beginning or end of a verb. The verb root may appear at the right edge of the verb if there are no suffixes, and at the left edge of the verb if there are no prefixes as shown in (1).

(2) Roots and Edges in Mayan Verbs (from Pye et al. 2007:15)

Prefix + [Root] + Derivation + Suffix			
Left	Left	Right	Right
word			word
edge			edge

As shown in examples:

(2a) Root at the right verb (word) edge:

ch-i-och
 ICP-1B-enter
 'I enter'

(2b) Root at the left verb (word) edge:

och-an
 enter-IIMP
 ‘Come in’

We found a correlation between percentages of roots and of inflected stems at the right side of the verb (word) and sentence in the input with the forms of the children’s early productions.⁴ The input in Tzotzil and Tzeltal shows a high percentage of roots at the right side of word and sentence, in contrast to K’iche’, Q’anjob’al and Yucatec which exhibited more roots in combination with phrase final suffixes. This explains how children proceed to segment the input utterances across the five Mayan languages and the inter-family variations. Whereas in Tzotzil and Tzeltal children could easily extract the verb root from the input given its saliency in final position of word and sentence, input factors in the other three languages had an effect on children’s productions with a mix of verb roots, plus pieces of final parts of roots with suffixes (de León et al. 2005; Pye et al. 2007).⁵ Results from the comparative project reflect how language internal factors plus properties of the input may produce different outcomes in the Mayan children early productions.

The dominant production of non-finite bare verb roots in Tzotzil and Tzeltal early productions could support Wexler’s argument, although they do not correspond to infinitives in this language. However, the broader view given by the early productions of the other Mayan languages invalidate it as has been argued by Pye for K’iche’ (Pye 1992, 2001). Our comparative data indicates that it is critical to have a larger spectrum of languages from which to draw predictions (Pye & Pfeiler 2013). Our work with the Mayan languages has shown that perceptual saliency factors play a crucial role in the segmentation process (de León 2002; Pye et al. 2002; Pye et al. 2007) as predicted by Slobin in his “operational principles” (1973, 1985) three decades ago. Peters (1985, 1995, 1997) has further elaborated this claim in connection to the crosslinguistic acquisition of morphology.⁶

⁴ By distinguishing between the word and syntactic contexts we determined the degree to which children’s verb forms reflected features of the lexical and/or syntactic environment of the input language (Pye et al. 2007: 23).

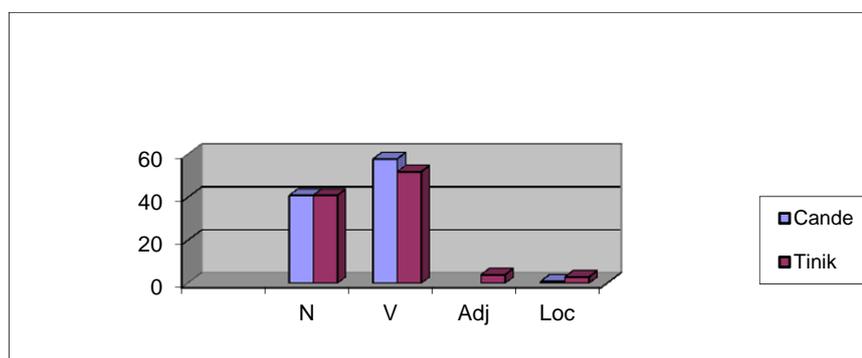
⁵ I will explore factors of the Tzotzil input in section 7.

⁶ Mithun (1989) finds that prosodic factors guide children in their early segmentation process in Mohawk, a polysynthetic language.

The composition of the early Tzotzil vocabularies at the one-word utterance period consists of a higher rate of action words (adult verb roots) than of other classes of words.⁷

As shown in Figure 1, early production data shows that young Tzotzil learners have a larger inventory of verb roots (action words) than of nouns (object words) and other word classes by the time of the 50 word mark (see de León 1998, 1999a, 2001c for discussion).

Figure 1. Verb roots (action words) and nouns (object words) in two subjects beyond the 50 word mark



The fact that verbal roots with action meanings predominate over other word classes could be questioned because, at this stage, children do not have morphology or syntax. However, the earliest combinations produced by both children consist of a verb root plus an aspectual clitic or other verbal suffixes (e.g. imperative suffix). This kind of combination dominates over any other kind of combination which shows that the verb is leading early morphological and syntactic development (de León 1999b). I will return to this point later, but let's first have a look at the Tzotzil verb complex to understand the strategies that Cande and Tinik follow in their morphological development.

4. The Tzotzil verb complex

The Tzotzil verb complex is schematized as follows:

- (3a) (Interrogative) (Negation) Aspect + (Auxiliary) Absolutive 1 + (Ergative) + {**ROOT**+ (Deriv)}+ (Applicative)+ (Status) +Absolutive2 (Plural) (Directional) (Aspectual Clitic)

For the purpose of the present paper, I should start by stating that inflectional affixes (aspect and agreement) are in preverbal and postverbal position in

⁷ Since our data is based on early one word utterance productions we defined children's word classes (verb and noun) on semantic terms by their approximation in form and meaning to adult forms. We supplemented this with information about the context of use. Hence 'action words' are equivalent to verbs and 'object words' equivalent to nouns.

contrast to modality and derivational affixes that are just in postverbal position. In 2b I show the verb template of the Tzotzil verb:

(3b) Aspect +Absolutive 1 + (Ergative) + {**ROOT**+ (Deriv)} + (Status)
+Absolutive2 (Plural)

Which can be schematized as:

(3c) INFLECTION + ROOT + DERIVATION + INFLECTION

a sequence which has been attested crosslinguistically (Peters 1985, 1995).

Tzotzil is an ergative language. Ergative agreement is used for the subjects of transitive verbs while absolutive agreement is used for the subjects of intransitive verbs. In addition to marking the subjects of intransitive verbs, the absolutive inflections mark the objects of transitive verbs. The ergative inflections are also used to mark nominal possessors.

Verb transitivity is a major focus of verbal inflection in all the Mayan languages. Both the agreement inflections and the status suffixes mark transitivity. Mayan verbs are also inflected for aspect and mood. In addition, the verbs carry what Terrence Kaufman labels a ‘status suffix’ (1990). The status suffix differs considerably across the Mayan languages. In Tzotzil it marks verb transitivity and mood (imperative, subjunctive). Transitivity affects agreement marking through the division between ergative and absolutive agreement.

As observed crosslinguistically, in this language derivation is closer to the root than inflectional material. In (3b) Deriv (ation) refers to positional root class derivation, and also includes the causitimizer.

Primary stress is usually word-final, but the root also carries its own stress.

Examples in (4) illustrate the possibilities of the verb complex with transitive, intransitive and positional roots.⁸

(4) Intransitive

(4.1) *mu l-a-och tal*
NEG CP-2B-**enter** DIR
‘You did not enter (towards me)’

(4.2) *ch-i-bat xa*
ICP-1B-go CL
‘I am going’

(4.3) *bat-em-on*

Transitive

(4.5) *mu x-a-s-mey-ik to*
NEG NT-2B-3A-**hug**-PL CL
‘They still don’t hug you’

(4.6) *ta x-a-j-maj*
ICP NT-2B-1A-hit
‘I hit you’

(4.7) *ta x-a-maj-on*

⁸ Examples are transcribed in practical orthography with symbols which are roughly equivalent to English except that j=/h/, x=/š/, and ’ indicates glottal stop.

- | | |
|--|--|
| <p>go-PERF-1B
'I have gone'</p> <p>(4.4) <i>och-an-ik</i> <i>tal</i>
enter-IMP-PL DIR
'Come in (towards me)'</p> | <p>ICP NT-2A-hit-1B
'you hit me'</p> |
|--|--|

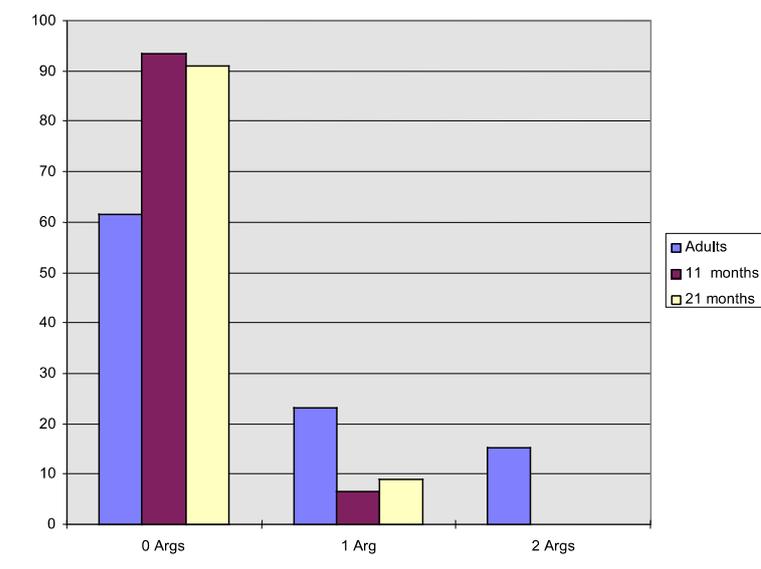
Positional predicates

- | | |
|--|--|
| <p>(4.8) <i>ch-i-chot-i</i>
ICP-1B-sit-INC
'I sit'</p> | <p>(4.9) <i>chot-ol-on</i>
sit-STAT-1B
'I am seated'</p> |
|--|--|

As shown, the verbal root (in boldface) can occur with different affixes which not always makes it perceptually available to the child.

It is important to remember that given the non-obligatory expression of lexical arguments in this language, a high percentage of the normal utterances consist of the verb complex itself without the presence of nominals. Elsewhere I have argued that given the properties of adult speech and of speech addressed to children, the young learner is exposed to an input with a higher rate of verbs than of nominals (1999a, 1999b, 2001c). Figure 2 shows the actual rates of verbs and expressed nominal arguments in speech between adults, and to a child at 11 months and at 21 months.

Figure 2. Percentages of clauses with 0, 1, or 2 arguments in adult directed speech (adult-adult), and child-directed speech (adult-11 months, adult-21 months)



Note: (Arg: (nominal) arguments)

As shown in Figure 2 clauses with no explicit lexical arguments predominate both in speech directed to children and to adults. Clauses with one argument are

below a 10% for children, and under 30% for adults. We find no clauses with two arguments in child directed speech. The input is heavily loaded with verbs in contrast to nominals which undoubtedly contributes to the early preference for verbs over nouns.

Taking into account that the early productions of one “word” utterances consist of a high rate of verbal roots and that children hear an input where the verb complex occurs without nominals, with inflected and/or derived verbal roots, the question is what mechanisms children follow to process, analyze and acquire the verb morphology in this Mayan language?

5. Obligatory verb morphology

Tables 1, 2, 3, and 4 illustrate the different kinds of obligatory affixes that appear with the root. The order is presented in (3b). Table 1 shows the aspect affixes.

Table 1. Aspect affixes in Zinacantec Tzotzil⁹

NEUTER	INCOMPLETIVE	COMPLETIVE	PERFECT
<i>x-</i>	<i>ta x- ~ ch-</i>	<i>l- / i- /0-</i>	<i>-oj/-em</i>

As shown in Table 1, there is a set of prefixes for neuter, incompletive, and completive, and a set of suffixes for perfect aspect. Perfect suffixes fall in the group of “status” suffixes and distinguish roots on the basis of transitivity (see Table 3). In contrast to suffixes which are pretty stable in form, we find variation in the contexts for aspectual prefixes, which pose more complexities to the young learner. The aspectual prefix *x-* may assimilate to *s-* when followed by a fricative (*s*) or an alveolar affricate (*s* or *tz*). We also find variation between the regular use of neuter aspect with intransitive verbs, in contrast to its use with transitive verbs where it may not be marked in the context of ergative pronouns (Haviland 2007: XXXI). In the case of the incompletive aspect the form *ta x-* may contract into *ch-* (*ta x-a-mey-on -> chameyon*). The completive aspect also shows variation according to person and use of ergative or absolutive pronoun.

In sum, prefixed aspectual forms are subject to contextual variation according to person and form of prefixed pronouns.¹⁰ Tzotzil learners, in fact, learn prefixed aspect much later than any suffixed forms such as status (aspect and mood), derivational suffixes, and absolutive suffixes, which are pretty stable in form (see examples 4.1, 4.2, 4.5, 4.6, 4.7, 4.8).

⁹ There is a great dialectal variation in aspect marking in Tzotzil; the system described here is specific to the variety of Zinacantán.

¹⁰ See Martínez Alvarez (2012) for the system and contextual variation of aspect marking in Huixtán Tzotzil. He also notices morphophonemic variation and differences across person.

Table 2 shows pronominal affixes. The ergative prefixes mark both agents of transitive verbs and possessors of nouns. There are two sets of ergative markers, one occurs before vowel initial stems and the other set occurs before consonant initial stems. The absolutive markers signal the subject of intransitive predicates. The two absolutive sets (prefixes and affixes) are in complementary distribution due to phonotactic reasons (Haviland 1981: 221, 2007: XXXI).

Table 2. Tzotzil pronominal affixes

	ERGATIVE			ABSOLUTIVE		
	<u>_V</u>	<u>_C</u>	Plural	Prefix	Suffix	Plural
1	<i>k-</i>	<i>j-</i>	<i>-tik</i> (incl) <i>-otik</i> (excl)	<i>i-</i>	<i>-on</i>	<i>-otik</i> (incl) <i>-otikotik</i> (excl)
2	<i>av-</i>	<i>a-</i>	<i>-ik</i>	<i>a-</i>	<i>-ot</i>	<i>-oxuk</i>
3	<i>y-</i>	<i>s-</i>	<i>-ik</i>	\emptyset -	\emptyset	<i>-ik</i>

Zinacantec Tzotzil children are therefore hearing the ergative forms systematically prefixed both in transitive verbs and nouns. By contrast, these children hear the absolutives with verbs both as prefixes and suffixes, and also as suffixes with stative predicates (see example 4.9). This poses an interesting question in the acquisition process, since in other Mayan languages where acquisition research has been done absolutive affixes are either prefixed (K'iche') or suffixed (Tzeltal), or may be distributed according to facts of split ergativity as is the case with Yucatec (Pfeiler 2002).

There are several suffixes occurring in postverbal position: inflectional (mood and aspect) and derivational (causative, inchoative, and stative positionals). Some of the inflectional suffixes denoting verb class fall into the category of "status" suffixes (Kaufman 1990). Kaufman (1977) coined the term 'status marker' to describe the suffixes typically found on verbs in Mayan languages. The Mayan status suffixes simultaneously mark distinctions in transitivity, aspect and modality, derivational status, phrasal position and clause type, although the status suffixes in most Mayan languages only mark a subset of these distinctions (Kaufman 1977, 1990).

K'iche' illustrates the different functions of the status suffixes that indicate modality, transitivity, as well as position within the phrase (medial vs. final) (Pye 1992). Tzotzil does not have general suffixes that mark transitivity or position within the phrase, as is the case for other Mayan languages; although suffixes for modality (imperative), and aspect (perfect) distinguish between transitive and intransitive verb roots or radicals. Table 3 shows Tzotzil "status" suffixes with examples.

Table 3. Verbal classes and status suffixes in Tzotzil

	INTRANSITIVE	TRANSITIVE
ASPECT (perfect)	<i>-em</i> <i>bat-em</i> 'X has left'	<i>-oj</i> <i>s-ti'-oj</i> 'X has been eaten'
MOOD		
imperative	<i>-an</i> <i>lok'-an</i> 'get out!'	<i>-o</i> <i>k'el-o</i> 'look!'
subjunctive	<i>-uk</i> <i>ak'-o ve'-uk</i> 'Let it eat'	<i>-uk</i> <i>ak'-o il-uk</i> 'Let it see'

Apart from Transitive and Intransitive roots, Mayan languages are characterized for their Positional root class. This root class is particularly elaborate in Tzotzil where about one third of the verb roots belongs to this group (Haviland 1992, 1994). Positional roots do not inflect as transitive and intransitive verbs unless they are derived with their specific derivational morphology.

Table 4 shows derivational suffixes for statives, inchoatives, and causatives for this root class.

Table 4. Derivational morphology of the positional root class

FORM	FUNCTION	EXAMPLE
-VI	stative	<i>kot-ol</i> 'to be on four legs'
<i>-i</i>	inchoative	<i>kot-i</i> 'to stand on four legs'
<i>-an</i>	causative	<i>kot-an</i> 'to stand (X) on four legs'

This means that Tzotzil learners are hearing both inflectional suffixes of the "status" kind that distinguish between transitive and intransitive verb roots at the level of mood and aspect, and derivational suffixes particular to positional roots. They are processing both roots and radicals through status suffixes, but also through derivational processes typical of the class of positional roots.

There are also two frequent verbal suffixes that add arguments: the applicative *-be* that adds a third argument for monotransitive roots, and the causative *-es* that adds a causer to intransitive verbs. This is summarized in Table 5.

Table 5. Argument adding suffixes

	TRANSITIVE	INTRANSITIVE
Applicative	<i>-be</i>	
Causative		<i>-es</i>

Some examples are given in (5) and (6).

- (5)a. *ch-a-tik'-be* 'put (it) in X'
 b. *l-i-y-al-be* 'he said (X) to me'
 c. *ch-a-maj-be* 'you are going to hit (X) for you'
- (6)a. *mu x-a lok'-es* 'don't take it out!' (lit. 'don't cause it to get out')
 b. *ch-a-muy-es* 'you put it up' (lit. 'you cause it to go up')
 c. *ch-a-p'aj-es* 'you throw it' (lit. 'you cause it to fall down')

In spite of the possibilities of combinations of pre and postverbal elements, it is important to mention that only some aspectual prefixes show morphophonemic and morphotactic variation with the root. The rest of the inflectional and derivational affixes don't show any morphophonemic variation, this is specially clear with suffixes. This fact contributes to the perceptual transparency of the borders between these elements. Transitive and intransitive roots are also indexed by their corresponding ergative and absolutive pronouns. On the other hand, transitive, intransitive, and positional classes have pretty regular morphology. The child hears the verbal complex, where the root remains stable, and where verbs are highly frequent and salient because there is a high rate of nominal argument elision. Given these facts, what steps does he/she follow to learn Tzotzil morphology?

6. Early verb morphology: Ends come first

I have already said that children's first productions are mostly bare roots. The next observed step is that the two girls of the study develop their verb from end to root. Figures 3 and 4 clearly illustrate the large rate of verb root plus postverbal morpheme combinations over any other kind of combination in the two girls of the study. This rate remains high throughout the period of MLU 1.25 to 2.5. In fact, the first combinations produced by the children by MLU 1.25 consist of the verb root plus the aspectual enclitics *xa* 'completive' and *to* 'incompletive' which occupy the last place of the verbal complex (see (3b)).¹¹

The following examples illustrate the first combinations (V+X) produced by the two children around one year and eight months old.

- (7) ROOT + Aspectual Enclitic
- a. *laj xa* 'it already finished' (lit. finish already)
 b. *p'aj xa* 'it already fell down' (lit. fall already)
 c. *lok' xa* 'it already got out' (lit. go out already)
 d. *k'an to* 'I still want (more)' (lit. still want)
 e. *oy to* 'there is still (more)' (lit. still exist)

¹¹ Haviland calls them "tense particles" ("partículas de tiempo"). They have an aspectual value in the sense that they provide the speaker's perspective of an event at the time of the utterance (the aspectual value doesn't need the specification to the time of utterance, which corresponds more to a tense value). They can also have a spatial meaning (1981: 22.29). For the purposes of the present study I will call them "aspectual enclitics" given the fact that they provide the speaker's perspective.

The use of these clitics in the children’s production has an aspectual value which resonates with the aspectual contrast of complete/incomplete in adult Tzotzil.

This early combination is illustrated with the light gray column in Figures 3 and 4 with the formula V + X for MLU 1.25.

Figure 3. Cande’s early verb and noun combinations at three periods

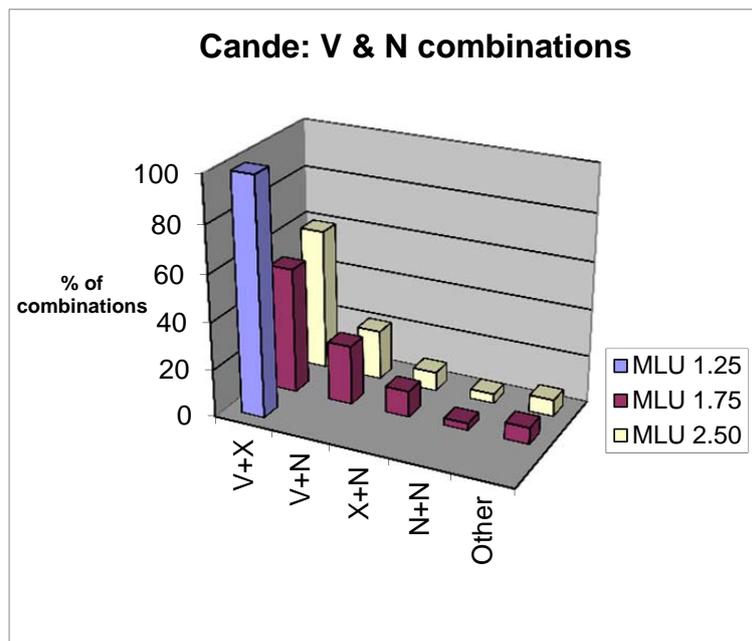
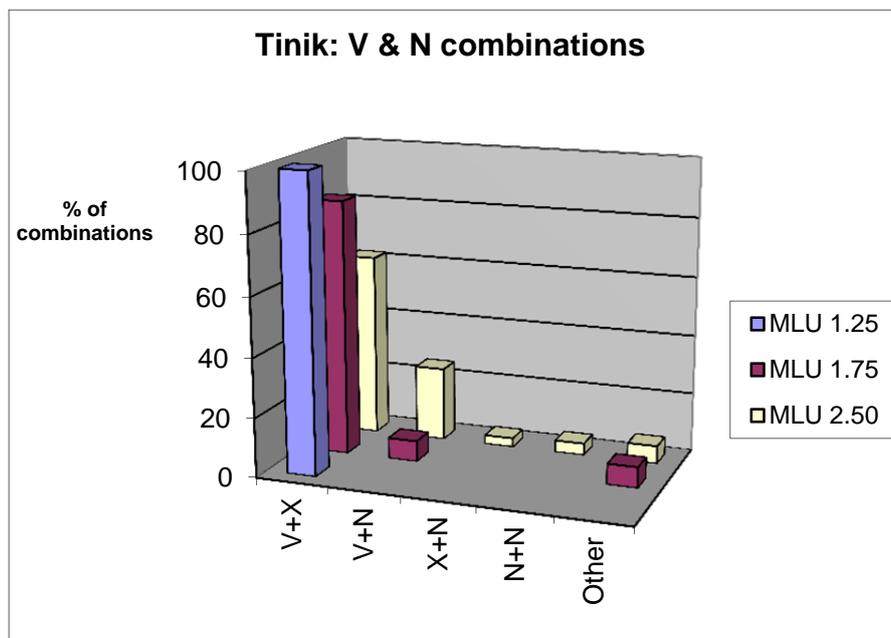


Figure 4. Tinik’s early verb and noun combinations at three periods



Figures 3 and 4 also show combinations of V + X for MLUs 1.75 and 2.50 as the highest of all the combinations produced by the two children of the study.

In MLU 1.75 the first productions of verbal morphology occur with imperative suffixes for transitive roots. By MLU 2, the girls use the imperative suffixes with intransitive, transitive roots, and derived transitive radicals. I did not register any errors in which children would apply the imperative suffix across root classes, with the exception of the verb *ve* ‘to eat corn products’ which is irregular in adult Tzotzil. This suggests that the children are distinguishing verb classes by transitivity through the corresponding status suffixes, in this case through imperative suffix before they reach MLU 2. Table 6 illustrates the first productions of verbal suffixes of Tinik in the period of 1;7 to 2;0 (MLU 1.75 to 2.25).

Table 6. Examples of Tinik’s productive use of imperative suffixes (1;7-2;0 years)

Transitive	Positional
<i>tam-o-∅</i> ‘pick up (it)!’ pick-TIMP-3B	<i>kot-an-o-∅</i> ‘stand (it) on four legs!’ stand on four legs-CAUS-TIMP-3B
<i>jam-o-∅</i> ‘open (it)!’ open-TIMP-3B	<i>pach-an-o-∅</i> ‘put(it)-bowl on surface!’ bowl-CAUS-TIMP-3B
<i>poj-b-o-∅</i> ‘steal (it) (from him)!’ steal-APPL-TIMP-3B	<i>chot-an-o-∅</i> ‘sit (it)!’ sit-CAUS-TIMP-3B
<i>baj-o-∅</i> ‘close (it)!’ close-TIMP-3B	
<i>tik’-o-∅</i> ‘put in (in)!’ put-TIMP-3B	Intransitive
<i>pas-o-∅</i> ‘do (it)!’ do-TIMP-3B	<i>lok’-an</i> ‘get out!’ go-IIMP
<i>jat-o-∅</i> ‘tear (it)!’ tear-TIMP-3B	<i>bat-an</i> ‘go!’ go-IIMP

When the two children initially started to add the imperative suffix, the phonotactics of the combination indicated that they were pronouncing the root with its own accent, and then they added the suffix as a separate syllable with its own accent. This is consistent with the adult pattern where the root carries its own stress, and the accent falls on the last syllable (CVC-‘V, CVC-‘VC). In the case of the children’s productions, however the suffix consisting of a vowel or a vowel plus consonant was pronounced as a separate syllable (CVC-!V, CVC-!VC).¹²

Thus, their productions sounded as follows:

- (8) [net’] [!o] ‘press’ (when showing a button used to open a box) (Cande) (1;9)
 [lap] [!o] ‘put (it) on’ (offering a shawl) (Cande) (1;9)
 [jam] [!o] ‘open (it)’ (asking godmother to open a plastic case) (Tinic) (1;8)
 [lok’] [!an] ‘get out’ (asking the dog to get out of the kitchen) (Tinic and Cande) (1;8))

The border between the root and the imperative suffix is perceptible especially because the children pronounced the isolated root first and then they added the

¹² I am using the sign ! to indicate a highly accented syllable.

suffix, as a new analyzed part, that constitutes its own syllable with its own accent and stress. Tinik, actually went through a very short phase where she used a filler low vowel (æ) for the imperative status suffix. This point is interesting in contrast to the acquisition of K'iche' where Pye indicates that the children first used syllables that combine part of the verbal root with parts of the status suffix (1992). This pattern is also described by Mateo (2005, 2010) in his study of the acquisition of Q'anjob'al. The Zinacantec Tzotzil children of the study start with intact forms of roots and then add the aspectual enclitics and the status suffixes.

The explanation of how children extract the root and analyze the suffixes was presented in another study where I examined a sample of speech addressed to Cande when she was 0;11.15 months and at 1;4 (de León 1999). I indicate that in both periods we see more than 60% of the roots carrying stress and 30% of the verb roots in final stressed position I also showed that 44% of the utterances consisted of imperatives (de León 1998, 1999a). Table 7 gives a profile of the position of the root in the different kinds of utterances of the analyzed sample.

Table 7. Frequency of speech act types/sentence types in Child Directed Speech

Speech Act type	Sentence type	Tzotzil example	Translation	%
Warning	Declarative	<i>chajach'</i>	'you (will) slip over'	17%
Request	Interrogative	<i>mi chalo'?</i>	'do you want to eat soft food?'	15%
Directive	Pos. Imperative	<i>lo'an!</i>	'eat soft food!'	44%
	Neg. Imperative	<i>mu xajach'!</i>	'don't slip over!'	24%
TOTAL				100%

(Child age: 0;11.15 and 1;4)

What is important here, independently from Speech Act type and Sentence type, is that children basically hear more utterances (66%) with the root in final stressed position than utterances with suffixed roots (44%). Although the main phrasal stress falls in the last syllable (*lo'an* 'eat-soft food'), the root itself carries its own stress (Haviland 1981:14). Furthermore, a large proportion of imperatives occur in frames that contrast the different patterns of suffixation for Transitive, Intransitive, and Positional verb roots. These may serve as cues to the Tzotzil learner that there are formal (and perhaps semantic) subclasses of verbs.

Following the appearance of the imperative suffix of roots and transitive radicals children start using the morphology of positional roots. Table 8 gives examples of how Tinik at age 1;7 to 1;10 (MLU 1.75-2.5) proceeds in the acquisition of positional morphology. She starts by using the suffix *-VI* for positional stative with the forms *va'-al* 'standing on two feet', *chot-ol* 'seated',

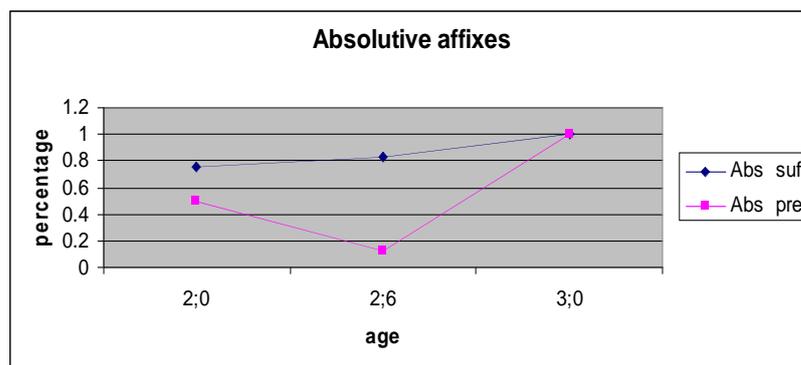
kot-ol ‘standing on four legs.’ It is interesting that she uses the positional morphology first with three roots that denote prototypical body posture of humans or animals: sitting, standing on four legs, and standing on two feet. It then extends to other positional roots (de León 2001a). Around 1;10 she productively uses the causative, stative, imperative, and inchoative with this class of roots.

Table 8. Development of Tinik’s positional morphology

1;7	1;8	1;9	1;10	1;11
- <i>an</i> causative	- <i>VI</i> positional adjective (stative)		- <i>o</i> ‘imperative’ - <i>i</i> inchoative	
1.75	2.25		2.5	

Around MLU 2.25-2.5 the girls start using argument adding suffixes: the applicative *-be* with transitive roots and the causativizer *-es* with intransitive roots. A little bit later they use the suffixes of perfect aspect for transitive and intransitive roots. Elsewhere I have reported that it is also noticeable that agreement affixes do not appear at this early time of morphological development (de León 1999a, 2002).

Figure 5. Object absolute prefixes and suffixes



As said before Zinacantec Tzotzil has absolute prefixes and suffixes and their use varies for phonotactic reasons. The data indicate that the two girls are learning the suffixes before the affixes as shown in Figure 5. The table shows that at 2.6 children are producing around an 80% of their suffixed absolutes in contrast to less than a 20% for the prefixed absolutes.

Around MLU 1.75, the girls use some verbs with the suffix *-on* of first person absolute to express object of transitive verb (de León 2002).

- (9)a. *pet-o-on*
 carry-TIMP-1B
 ‘carry me on your arms’
- b. *k’el-o-on*
 see-TIMP-1B
 ‘look at me’

Other uses of *-on* are in predicative constructions with nouns or adjectives such as:

- (10)a. *me'el-on*
old woman-1B
'I am a big woman'
- b. *k'ox-on*
small-1B
'I am young'

Predicative constructions with nouns and adjectives are also present in the children's production at this time, and marked correctly with the absolutive suffix, specifically the first person suffix *-on*. In any case, the use of the suffix indicates that the children are constructing the verb with post-verbal elements before the preverbal ones. The use of agreement suffix before the prefix has been reported in de León (1999) and systematically analyzed from a comparative Mayan perspective in Brown et al. (2013), Pye et al. (2002). What is clear here is that across all studied Mayan languages children learn first the agreement suffixes and later the agreement prefixes.

The suffix for first person plural also appears, before the prefix around MLU 2.

Examples from Cande at age 2.4 (MLU 2.75 and over) (03-29-97):

- (11) *bat-ik* 'Let's go'
go-1PL
- (12) *(ta)-(ø)-(j)-lok'-es-tik* 'We take it out'
ICP-3B-1A-take out-CAUS-1PL(INCL)
- (13) *(ch-i) vay-kotik* 'We (excl.) sleep'
(ICP-1B)-sleep-1PL(EXCL)
- (14) *(ta)-(ø)-(j-) kokon-tik* 'We pour (incl.) (them)'
(ICP-3B-1A)-pour-1PL(INCL)

Around and after MLU 2.75 (between ages 2 to 2.6), the children start adding person prefixes. The data indicate that Ergative prevocalic prefixes appear before the Ergative preconsonantal ones, probably because of the syllabification process and the perceptual salience of the syllable that results from the combination with the prefixes (see Table 2).¹³ Therefore, the combinations (without aspectual marker) in (15) appear before the combinations in (16).¹⁴

- (15)a. *k-uch- ø* b. *av-uch- ø* c. *y-uch- ø*
1A-drink-3B 2A-drink-3B 3A-drink-3B
'I drink' 'you drink' 'he drinks'

¹³ This result is also present in the early productions of children learning Tzeltal, K'iché, and Yucatec as reported in our cross-linguistic study of the acquisition of agreement (Brown et al. 2013)

¹⁴ The details about the learning process of the person affixes were investigated in de León (2002). A Mayan comparative study of the acquisition of person affixes was presented in Pye et al. (2002), see also Brown et al. (2013).

- (16)a. *ta-ø-j-k'an*
ICP-3B-1A-want
'I want'
- b. *cha-ø-a-k'an*
ICP-3B-2A-want
'you want'
- c. *ta-ø-s-k'an*
ICP-3B-3A-want
'he wants'

Lastly, the prefixed aspectual forms appear also somewhat late, a bit after person prefixes appear. As pointed out earlier, in contrast to the perceptual saliency of verbal suffixes, prefixes for aspect are the only ones that show morphophonemic and morphotactic variation. Their late acquisition clearly reflects the perceptual and analytical challenges to the young learner.

Table 9 shows the progression of the acquisition of morphology from MLU 1 to MLU 2.75 in the two girls of the study.

Table 9. Progression in the acquisition of Tzotzil verb morphology

MLU	PREFIXES	CANDE SUFFIXES	TINIK SUFFIXES
1			
1.25		Aspectual clitic <i>to/xa</i>	Aspectual clitic <i>to/xa</i>
1.5			
1.75		Imperative (TV)	Imperative (TV), Causative (P)
2.00		Abs.-on 1A Plural suffix for 1st. person Causative (P)	Abs.-on 1A Plural suffix for 1st. person
2.25		Imperative (VT, P) Positional+STAT (-VI)	Imperative (VT, P) Positional+STAT (-VI) Applicative - <i>be</i>
2.5		Perfect suffixes (TV, IV). Causative (I) Inchoative (P) Applicative - <i>be</i>	Perfect suffixes (TV, IV). Causative (I) Inchoative (P)
2.75	Person prefixes Emergence of aspect prefixes		

In sum, the first steps in the acquisition of verbal morphology in Tzotzil indicate that children first extract the verbal root which is then used as a slot to combine postverbal morphology (MLU 1.2-2.75), both inflexional and derivational, to acquire much later person and aspect prefixes. Both girls follow very parallel routes with some slight differences in the preference of some morphemes over other ones. However, the tendencies are very similar. The process can be summarized in Table 10.

Table 10. Schematic development of Tzotzil verb morphology

MLU 1	VERBAL ROOT
MLU 1.2—2.75	← POSTVERBAL MORPHOLOGY
MLU 2.75	PREVERBAL MORPHOLOGY →

We observe that both girls construct the classes of verbal roots through the use of inflexional and derivational suffixes characteristic of each root class with a minimum of errors. I have reported that the errors that children made were with the verbs of “eating” where they sometimes interchanged suffixes for transitive to intransitive. However, these errors really reflect that this group of verbs have irregular patterns in Tzotzil. The “errors” the children make with these verbs are really tendencies adults show to regularize the affixation patterns of this set of verbs (1999b).

The early use of postverbal suffixes with few errors indicates that the highly regular morphology of this language and the perceptual salience of the border between root and morpheme in postverbal positions provide enough cues for these girls to learn Tzotzil verb morphology. The early use of the aspectual enclitics *to* ‘still’ and *xa* ‘already’ indicates that, at the beginning, the verb is not specified in terms of transitivity of type of root but through aspectual adverbs. A little bit later the use of imperative suffixes for transitive roots indicate that a cognitive notion of transitivity may be the initial trigger for the organization of classes (Slobin 1985), but always in connection with the reality of an input where the imperative suffixes are salient in the speech directed to children. In this case, input factors suggest that imperative suffixes provide the first cues to organize the verbal classes. The applicative *-be* appears a little bit later with transitive roots, and the causitivizer *-es* for intransitive roots, which suggests that the children are grasping the notion of transitivity through the acquisition of morphology at this early phase. We should also remember that at this same time the derivational morphology for positionals also blooms. To summarize, the first steps into verbal morphology before MLU 3, taken by the two Tzotzil learners in this study, involves inflection (imperative) and derivation (causative, inchoative, stative) and suffixed absolutes. Prefixed agreement marking and aspect prefixes are acquired later after this initial period (de León 1999b, 2002; Brown, et al. 2013). A brief look at an input sample reveals the stronger tendencies in the children’s early morphological development.

7. A look at the input

A closer look at the input reveals the perceptual saliency of the root and suffixed morphemes children are listening to. In de León (2005) I examine a sample of child directed speech where I look at the varieties of root plus morpheme combinations children are hearing.¹⁵ Here I distinguish transitive and intransitive roots. Figure 6 shows a high rate of transitive and intransitive roots

¹⁵ This input is based on 260 utterances directed to Cande at 2 years old. This data was further compared with other input data in our comparative project on Mayan acquisition (de León, et al. 2005)

visible in their basic CVC form at the right edge and left edge of the word and sentence in the input. Visible CVC forms at the right edge carried prefixed material only (*ch-a-ve* ‘you eat’ (IC-2A-eat)). Visible CVC forms at the left edge carried suffixed material only (*lok'-an* ‘go out’ (go-IIMP)). At a lower rate we have status suffixes (imperatives), transitive roots with the ergative prefixes and the plural suffix for both classes of roots. Overall verb roots dominate over other combined material. The frequencies in the input are pretty consistent with the children’s early productions.

Figure 6. Root and morpheme combinations in child-directed speech

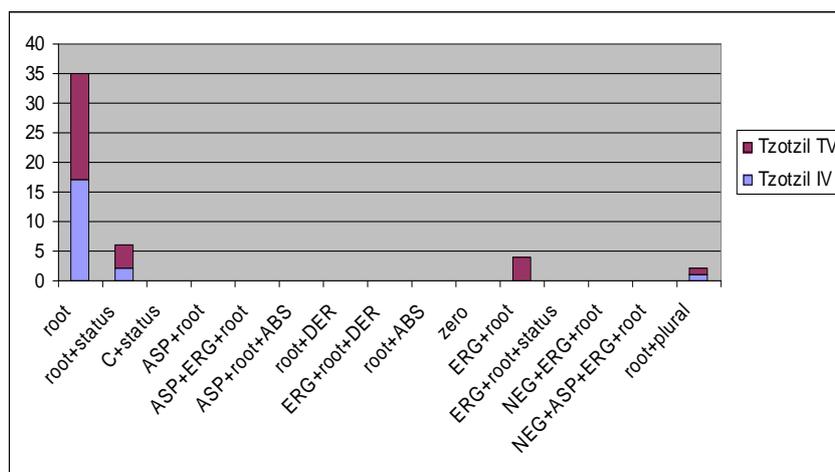
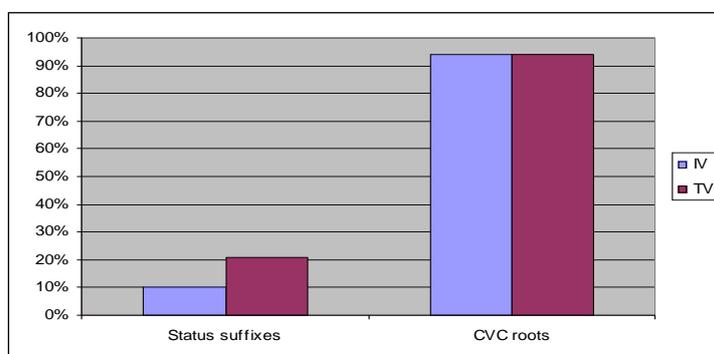


Figure 7 shows the rate of roots and imperative suffixes on the basis of transitivity distinctions. Although Transitive and Intransitive roots are used at a similar rate in the input, imperative suffixes for Transitive verb roots double the corresponding suffixes for Intransitive roots. This is consistent with our acquisition data. The children of the study first produce transitive roots with their corresponding imperative suffix.

Figure 7. Rates of TV and IV roots and status suffixes in the children of the study



The examined child-directed speech sample shows consistency with the early children’s productions from MLU 1.25 to 1.75. However it does not show the use

of the aspectual clitics early produced, or of the derivational morphemes acquired after MLU 2.25. It does present the use of ergative prefixes, which are lacking in the children's early productions. Perceptual saliency is clearly playing a role in the children's early productions. In fact, in Pye et al. (2002), Pye et al. (2007), Brown et al. (2013), we found that suffixed agreement markers of the absolutive kind were acquired before the prefixed ergatives. Overall, in Tzotzil, as in other Mayan languages (K'iche', Tzeltal, and Q'anjob'al and Yucatec) the acquisition of verbal morphology seems to be guided by factors of perceptual saliency.

8. Conclusions

Researchers on the acquisition of morphology have found that the first grammatical morphemes children are likely to combine productively are salient in the sense that they are "(a) located in a prominent place such as the end of a word, (b) can sometimes carry stress, or (c) have more easily identifiable semantic content" (Peters 1995: 464). On the basis of morphology acquisition reported in languages of a synthetic kind such as Turkish (Aksu-Koc & Slobin 1985), West Greenlandic Eskimo (Fortescue & Lennert Olsen 1992), and Mohawk (Mithun 1989 quoted in Peters 1995), Peters notes that children tend to combine inflections before derivations, since the former tend to occur on the end (rather than in the middle) of words (1995: 468). However, this does not seem to be the general pattern. Acquisition data from Turkish (Aksu-Koc & Slobin, 1985: 846) and Sesotho (Demuth 1992, quoted in Peters 1995) indicate that children learning these languages acquire derivational suffixes very early. In this connection, Peters further adds that "in a language in which all affixal morphemes have approximately equal phonological salience it looks as though children tend first to acquire the most salient morphemes, which tend to be those occurring just next to the outer layer of inflections" [...] specifying that "when a language offers its learners derivational morphemes that have sufficient phonological content, children are capable of extracting and producing them very early" (1995: 468).

In this respect, Pye's work on the early productions of K'iche' is frequently quoted as a case where morphemes can straddle syllable boundaries (Pye 1992). K'iche' children produce the last syllable of the verb stem with the syllable of the status suffix that distinguishes transitive from intransitive verb classes. However, a little later K'iche' children show evidence of analysis of the suffixes, producing them with minimal errors. Pye argues that K'iche' children use the status suffixes appropriately and productively from the start of language acquisition. Tzotzil early productions provide an interesting contrasting picture to the K'iche' learning situation. The Tzotzil children of the study first isolated the intact root; they later proceeded to work at the right end of the verb root. As K'iche' children, they use their status suffixes at an early time (between 1.75 to 2.25) without errors. In

contrast to K'iche' children, Tzotzil children start to develop their verb category first through the use of the aspect clitic, and then break into morphology through the imperative status suffixes which guide them to distinguish productively transitive and intransitive root classes, long before they grasp the agreement system. Early acquisition of status suffixes has been documented in the Mayan languages at an individual level: K'iche' (Pye 1985, 1992), Tzeltal (Brown 1998), Tzotzil (de León 1999b, 2002), Q'anjob'al (Mateo 2005, 2010), Yucatec (Pfeiler 2002; Pfeiler y Briceño 1997, 1998). There also several studies at a comparative Mayan level (Brown et al. 2013; Pye et al. 2002; Pye & Pfeiler 2013).

From the point of view of the strategies that children use to acquire grammatical morphemes, Peters presents different possibilities which she synthesizes and further elaborates from previous work by Slobin (1973, 1985), MacWhinney (1978, 1985), and her own (1985).

In fact, Tzotzil children seem to proceed in a way consistent with Peters' predictions about children's early morpheme segmentation and combination (1995: 464, 1997: 181). Her predictions may be summarized as follows.

The early morphemes are expected to be those that:

- (a) *are frequent*: Tzotzil verbal roots occur in high frequency in the input both at the right and left word and sentence edge. Status suffixes are the most frequent morphemes in the input; Other postverbal material which appears early such as adverbial clitics do not appear in our analyzed input sample of child-directed-speech, but occur in adult to adult conversation in high frequency;
- (b) *are easy to segment*: the boundary between root class and inflectional and derivational suffixes is clear and allows for easy segmentation;
- (c) *have a fixed position relative to an open-class stem*: Tzotzil inflectional and derivational suffixes always have a fixed position relative to the verb root;
- (d) *have more easily identifiable semantic content* : the earliest morphemes to be combined in Tzotzil have a "one form-one meaning relation". Peters argues that in this situation children will produce few errors (1985: 1058). Our data seem to confirm this prediction. In general, Tzotzil inflectional and derivational morphemes are mostly forms with one single function and grammatical meaning;
- (e) *are located in a prominent place such as the end of a word* (Slobin 1973): The earliest morpheme combinations in Tzotzil acquisition consist of a verb root plus a clitic or suffixes for modality, transitivity or derivation. Since the verb complex can stand by itself without expressed lexical arguments, children hear inflectional and derivational morphemes at the end of the utterance, and consistently learn them.

It is noticeable that between MLU 1.25 a 2.75 (between 1;6 y 2;6 years old) the girls of the study produced postverbal suffixes productively and practically without errors. The pretty regular morphology that distinguishes verbal classes allows for an early analysis that suggests that there may be some distributional factors at play too (Maratsos & Chalkey 1980).

This point leads us to another theoretical question posed at the beginning of this study. Do Zinacantec Tzotzil children follow the cognitive tendencies in early verb learning or are they guided by particular factors of the input and structure of their native language? Slobin (1985) argued some time ago that children are oriented to transitivity in early experiences of “prototypical transitive manipulation”. Pinker’s (1984) “semantic bootstrapping hypothesis” has proposed that children are guided by semantic principles of Agent and Patient to learn language. This theories would also be compatible in explaining the early entry of Tzotzil children to transitivity distinctions. I believe, however that the Tzotzil children of the study are rather “bootstrapped” by the regular morphology of Tzotzil status suffixes which allows them to learn to distinguish transitivity in verb classes by two years old.

This is an important issue in the context of Mayan linguistics and in the analysis of Mayan morphology. Kaufman argued about the reality of the CVC root in Mayan grammars, and its regular organization of verbal classes through affixation (1990). The pattern of combination of two elements at the early word combination period in English suggested that children were guided more by semantic roles such as Agent and Patient (R. Brown 1973). In the Tzotzil case the two morphemes combination of root plus status suffixes and other derivational suffixes shows grammatical productivity before MLU 2.

The perception of morphology is probably guided by the particularities of agglutinative morphology as Peters has argued for languages with highly productive bound morphology such as Turkish, Western Greenlandic Eskimo, or Japanese (Peters 1985). In sum, typological factors (i.e. agglutinative), perceptual saliency, and Tzotzil structure are in interaction in this first stage of acquisition of Tzotzil verbal morphology.¹⁶

¹⁶ It is worth mentioning that children in other Mayan languages show a similar learning pattern of morphology. They seem to start with postverbal morphology, leaving prefixes at a later time (see Pye 1992, 2000 for K’iche’). Data for Pokomchi’, K’anjobal and Popti’ were provided at the II Seminar of the Acquisition of Indigenous Languages: Mayan Languages (CIESAS-Sureste) (Raxchee’ 2001; Pascual 2001a, 2001b). This seminar was organized by Lourdes de León (CIESAS-Sureste) with the participation of Carlos Castillo (Universidad de Yucatán), Lourdes de León (CIESAS-Sureste), Adán Francisco Pascual (OKMA; Guatemala), Barbara Pfeiler (Universidad de Yucatán), Clifton Pye (University of Kansas), Raxchee’ Augusto Tul (OKMA, Guatemala), and Roberto Zavala (CIESAS-Sureste).

Abbreviations

A (ergative, set A), APPL (applicative), B (absolute, set B), CAUS (causative), CL (clitic), CP (completive aspect), DIR (directional), EXCL (exclusive), ICP (incompletive aspect), INC (inchoative), INCL (inclusive), IMP (imperative), IIMP (intransitive imperative), NEG (negative), P (positional root), PERF (perfect), PL (plural), STAT (stative), TIMP (transitive imperative), TV (transitive verb), IV (intransitive verb).

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