How late is late in acquisition?
Evidence from a Mexican indigenous language[*]

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1. Introduction

Upper Necaxa Totonac (UNT) is a member of the Totonac-Tepehua family, a genetic group with no demonstrable ties to any other Mesoamerican language. Approximately 3,000 people speak this polysynthetic language in the Mexican state of Puebla. The situation of the language is critical because although some children are still learning UNT as their first language, most of the UNT speakers are forty years old or older. Therefore, we are possibly working with the last generation of native UNT speakers.

1.1 Locative Constructions in Upper Necaxa Totonac

An extraordinary diversity has been documented of the conceptualizations of spatial relations encoded in the languages of the world. In recent years, it has been of special interest how spatial events are grammaticalized in different languages; even more interesting results its acquisition. In this paper we will consider a Locative Construction (LC) as the preferred response to the question *where is X?* This *X* corresponds to a *figure* located in a *ground*. If we see *Picture 1*, the *figure* will be the man and the *ground* will be the roof of the house. The corresponding question in English will be *where is the man?* There could be different answers: *he is at the house*, *he is standing on the roof of the house*, *he is standing on the top of the house*, etc. The answers may vary according to the speaker preferences.

Picture 1

One of the many interesting characteristics of UNT is the way it expresses location. As this language does not have prepositions (e.g. the equivalent to *in*, *on*, *under*, *beside* in English) it uses at least three different strategies to encode location. These are the following: i) a locative clitic, ii) posture verbs, and iii) body part terms.

The locative clitic (nak=) is the closest device to a preposition; it is used to introduce locative noun phrases. The meaning of nak= is vague, it could correspond to the full range of English spatial prepositions. It is frequently iterated and may be attached either to the noun itself, to a modifier of the noun, or to a phrase-initial deictic element (Beck 2004).

The second strategy to encode location is a series of posture verbs. UNT has four different posture verbs: wiːɬ 'sit', yaːɬ 'stand', maːɬ 'lie', and wakáɬ 'be high'. In their stative form, these verbs are commonly found in locative expressions. The generic choice (i.e. the one selected when no particular posture or position needs to be expressed) is wiːɬ 'sit', corresponding to 'there are' or 'it is' existential type sentences in English (Beck 2004). In the case of LCs, the posture verbs inform not only about the existence of an object, but they also can inform about the configuration of a *figure*, i.e. 'sitting', 'standing', 'lying', 'being high'.

The body part terms can appear as nouns in independent expressions or as prefixes incorporated to the verb. The full form (for example, tʃaːn 'shin') consists of two morphemes: a base (tʃaː-) and an empty morpheme (-n or ni̱- if the base is not vowel-final). The base is the combining form that can be attached to the verb. Body part terms are inalienable possessed nouns when they appear as independent words, and therefore when they are not incorporated to the verb they have to be marked for possession. There have been identified 75 terms referring to human body parts and around a dozen more general expressions. The majority of body parts have one or more partonymic uses, e.g. lakán 'face' also means 'planar surface', a̱kpún 'crown of head' has as extended meaning 'top of object', ʔeːn 'back' can also refer to 'the roof of a house' (Beck 2004). In the case of LCs, the body part terms act as relational nouns to inform the specific part of the *ground* where the *figure* is located.

According to Klint (2004) the adult-like Locative Constructions in UNT always consist of a posture verb, a body part term and optionally the locative clitic. Using again *Picture 1* to exemplify, we would ask *ja: tʃu: tʃiʃkú̱?* 'where is the man?'; and we would have as answer the sentences in (1).

(1) a. tʃiʃkú̱   **yaːɬ**   **nak=iʃ–ʔéː–n**   tʃik
        man   stand   LOC=3POS-back-PTN   house[1]
        'the man stands on the back of the house'

    b. tʃiʃkú̱   **ʔeː–yaːɬ**   (nak=)tʃik
        man   back–stand   (LOC)=house
        'the man stands on the back of the house'

In (1a) we can see the above-described three strategies that UNT uses to encode location. The posture verb informs about the configuration of the *figure* (the man), in this case it is standing. The locative clitic introduces the noun phrase, which informs about the location of the *figure*. As we mentioned, the clitic does not give any specific information. Conversely, the body part term in the same noun phrase informs the exact place of the *ground* (the house) where the *figure* is located, in this case it is located at the 'back' of the 'house'. The sentence in (1b) contains essentially the same information as (1a) but in a more synthetic form. This time the body part term is incorporated to the verb stem as a prefix. In this type of sentences, the clitic can optionally introduce the noun phrase presenting the general *ground* of the locative relation (to indicate that the clitic is not mandatory in these constructions we used curved brackets). Although individual variation, adults prefer (1b) where all the elements are compounded in only one verb phrase.

1.2 The Acquisition of Locative Constructions

Previous research about the acquisition of the strategies used by children to encode location includes a classic study by Johnston and Slobin (1979). They elicited data from children aged 2, 3, and 4, speakers of adpositional languages such as English, Italian, Turkish and Serbo-Croatian. The researchers proposed a series of linguistic factors responsible for the time of acquisition: i) prepositional systems are more difficult than postpositional ones; ii) the lexical diversity delays the acquisition; iii) clear etymology facilitates the acquisition (e.g. *back* and *front*); iv) complex morphology delays acquisition; and v) homonymy supposes difficulty of acquisition. They found the use of the first adpositions in all children as early as 2 years old; as children aged their inventory of adpositions grew. They also found a consistent order of acquisition (in/on/under > beside > back/front in objects with clear features > between > back/front in objects with unclear features). Another interesting result is that children speaking Turkish and Italian -languages with richer adpositional systems- acquire more notions in an earlier stage, in comparison to English and Serbo-Croatian children.

Another interesting study is the one made by Bowerman and Choi (1997); they studied the acquisition of English and Korean. Their findings support the language-specificity hypothesis, the usage-based approach and the typological bootstrapping theory. For this paper, we will mention only the results on the acquisition of Korean; results of English are essentially the same as the ones described above. Korean uses locative verbs that must distinguish meticulously between caused and spontaneous motion and encode two sets of path categories that often do not coincide. Elicited data from children aged 2 to 3;06 years old and adults revealed the use of specific locative verbs from the first productions. This means that children acquire first the language-specific terms, which are taken

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[1] Abbreviations: LOC=locative, 3=third person, POS=possessive, PTN=partonymic, CLS=classifier.

from the input. Concurrently, the early acquisition of this strategy of locative verbs is related to typological bootstrapping. One interesting detail is that children did not solve the task as adults did; children used fewer words and more generalizations than adults.

In a similar study, Jensen de López (2004) studied the acquisition of Zapotec, a Mesoamerican language that uses body part terms as relational nouns to encode location. This researcher worked with a spontaneous longitudinal corpus of a child aged 1;03 to 2;09 years old. She found that the employment of a specific frame of reference with a specific locative body-part term depends on pragmatics, the canonical functionality of the object of designation, geometry, schematization, as well as on the social position of the particular speakers employing and extending the system. The interesting result is that the very first constructions with body part terms as locatives are complete predicates, i.e. a construction with a clitic, a body part term and a noun. The author found very few body parts in her corpus, thus she expects that the acquisition of this strategy occurs after the age of 2;09.

In summary, it is clear that children acquire strategies to encode location at an early stage. The acquisition of adpositions begins around age 2; the acquisition of locative verbs takes place between the ages of 2 and 3;06; and body part terms are acquired after the age of 2;09 years old. We think that this order of acquisition could be due to the degree of complexity of the different strategies. Adpositions usually do not require any inflectional mark so we consider them as less complex. Verbs usually require inflectional marks, thus we expect children to master them a little later. Finally the use of body part terms as relational nouns seems to depend on a variety of factors, including both morphosyntactic inflection as well as socio-pragmatic information; we therefore consider this strategy the most complex, and as a consequence acquired later than the other two strategies.

1.3 Research question

The aim of our research is to discover the age of which Upper Necaxa Totonac speakers acquire the adult-like Locative Constructions. In other words, we would like to answer the question *when do Upper Necaxa Totonac speakers acquire the adult-like Locative Constructions?*

The hypothesis we have is that the acquisition of LCs by UNT speakers is going to be late. We arrived at this hypothesis because of the complexity of the adult constructions in UNT, which combine at least two and optionally three strategies in the same sentence. The literature in the previous section describes the acquisition of one strategy at the time, the adpositions being the earliest and the body part terms the latest. We think the explanation of this order of acquisition is the degree of complexity. In the case of UNT constructions the complexity seems to be greater because of at least two factors: the use of a body part term as a relational noun and the accumulation of strategies in a single sentence.

2. Methodology

2.1 Participants

A total of 24 children ages 4 to 12 participated in this study. The children were grouped according to the school grade as follows: five children in Pre-school, ages 4 to 5; five children in Grade 1, ages 6 to 7; seven children in Grade 3, ages 8 to 9; and seven children in Grade 5, ages 10 to 12. The interviews were made at the Kinder-garden and the Elementary school of the community of Patla, Jopala (Puebla State).

2.2 Procedure

We used the *Topological Relation Picture Series* (*TRPS*) task (Bowerman & Pederson 1992) to elicit the Locative Constructions in Upper Necaxa Totonac. This task consists of 70 pictures displaying a static locative relation between two entities *figure* and *ground*. The children were asked *where is X?* As we mentioned before, the *X* corresponds to the *figure* of the picture. Below we can see some examples of the stimuli.

Picture 2   *Picture 3*   *Picture 4*

In each picture we can see two entities, usually the smallest one is the *figure* whereas the biggest is the *ground*. Thus the corresponding questions were ja: tʃu: tʃitʃí? 'where is the dog?'; ja: tʃu: pelóta? 'where is the ball?'; ja: tʃu: ʔawátʃa̠? 'where is the boy?'.

The entire elicitation session was conducted in UNT; an assistant (a native speaker) and a researcher (the author or a colleague) did the interviewing. All the interviews were videotaped and transcribed. There was a training session where the assistant explained to the children how to respond to the questions. The pictures used in this training session do not belong to the main series of pictures; however, they displayed the same kind of relations.

In order to obtain responses as much descriptive as possible a gap information was created. The assistant was sitting with the child and they were both facing the researcher. The child was told that the researcher, who was asking where the *figures* of each picture were, was not able to see the pictures, thus the child had to make an effort to be as clear as possible for the researcher to know the exact place of the *figures* in the pictures.

3. Results

We obtained a large number of answers, however, not all the children's responses corresponded to Locative Constructions. We excluded all the sentences that did not include at least one of the three UNT elements to encode location; that is, all the sentences without the locative clitic, a posture verb and/or a body part term were not analyzed. We also excluded all the sentences that were not stative. Although active constructions also express locative relations, they were not analyzed for this paper because we wanted to analyze exclusively the three locative strategies. We decided that analyzing verb morphology of active constructions would be topic of a larger study.

Consequently, we analyzed 206 sentences for the 4-5 age group with an average of 41 constructions per child; 321 sentences for the 6-7 age group with an average of 64 constructions per child; 420 sentences for the 8-9 age group with an average of 60 constructions per child; and 333 sentences for the 10-12 age group with an average of 48 constructions per child. As a result of our analysis, we found five different groups of constructions. The types of children's responses are the following:

I)   Adposition
II)   Posture Verb (+Adposition)
III)   Body Part Term (+Adposition)
IV)   Posture Verb + Adposition and Body Part Term
V)   Body Part Term and Posture Verb (+Adposition)

Although all constructions are grammatical, these five types of responses can be subdivided as well into two groups: children-like constructions and adult-like constructions. The first three types (I. Adposition, II. Posture Verb, and III. Body Part Term) correspond to the children's preferences. The last two types (IV. Posture Verb + Adposition and Body Part Term, and V. Body Part Term and Posture Verb) correspond to the constructions that adults prefer. We will describe each group and give examples in the next sections.

3.1 Constructions with Adposition

These constructions have the clitic nak= as the only locative device. In the children's productions, this morpheme preceded a bare noun (2a-b), a possessed noun (2c), or a numeral classifier (2d). In general the production of this adposition was constantly accurate, it always preceded a noun phrase. In any case there is not really a place for mistakes as the meaning of this particle is quite general; we mentioned before that it only indicates location and it does not encode any particular spatial relation.

(2) a. nak=ʃká:n
         LOC=water
         'on the water'

     b. nak=mésa
         LOC=table
         'on the table'

c. nak=iʃ–tʃík
LOC=3POS–house
'in its house'

d. nak=a̰ʔ–tín   paréd
LOC=CLS–one   wall
'on one wall'

3.2 Constructions with Posture Verbs

As we mentioned above, posture verbs in UNT inform about the configuration of the *figure* in a locative relation. However, these verbs can also correspond to pure existential meanings (the equivalent to 'there is/are' in English). Therefore, in this group we included constructions with at least two locative devices: one of the four posture verbs (wi:ɬ 'sit', ya:ɬ 'stand', ma:ɬ 'lie', and wakáɬ 'be high') and the clitic nak=. If the children used the clitic in addition to the verb, we could be sure that the children produced a Locative Construction, and not only an existential sentence. Here the locative information is distributed in two phrases: a verb phrase and a noun phrase.

In general, the production of the verbs was quite accurate; this is, in accordance to adult language. The meaning of each verb was precise most of the time, indicating the right configuration of the *figure*: 'sit', 'stand', 'lie', 'be high'. Regarding the morphosyntax, again there was not so much room for mistakes. As we mentioned before, we only included stative sentences in our corpus; these forms of posture verbs are not inflected for tense, aspect or mood. Furthermore all the sentences refer to third person singular subjects (i.e. the *figures* of the pictures); in UNT this corresponds to a zero morpheme. Hence, the stative verbs do not have expressed morphology, which means that children do not have to work with overt inflection when they use these forms, therefore morphological complexity should not be an issue in this case.

Nevertheless, we observed some variation related to the word order, some times children preferred to produce the verb in initial position (examples 3a-b) and other times they preferred the verb in final position (examples 3c-d). UNT is a free word order language; although the adult preference is verb initial, any order results grammatical.

(3) a. ya:ɬ   nak=lúʃṵ
        stand   LOC=rag
        'it stands at the rag'

   b. wakáɬ   nak=lásu
        be.high   LOC=rope
        'it is high at the rope'

   c. nak=kuláɬ   wi:ɬ
        LOC=cage   sit
        'it sits at the cage'

   d. nak=ʃká:n   ma:ɬ
        LOC=water   lie
        'it lies on the water'

3.3 Constructions with Body Part Terms

The criterion to include a construction in this group was the presence of a body part term. There was a little more variation in these answers with regards to the number of elements. The most accurate response should include four elements: the adposition nak=, a possessive morpheme, a body part term and the partonymic morpheme (as in examples 4a-b). The inclusion of the adposition is important because this morpheme introduces a locative phrase, however, the absence of nak= is not ungrammatical if we have enough context to know that the sentence is referring to location. For instance (4c) includes a body part term in the appropriate context can be considered as related to location (for example a picture showing a ball under a chair, the corresponding *Picture 3* above). In contrast, the inclusion of a possessive morpheme is crucial. We mentioned before that possession is an inflectional category of body part terms, thus all these terms have to be possessed. The sentence in (4d), an actual child's answer, would be

considered ungrammatical if produced by an adult. Examples like this one show us that even though children produce the body part terms as relational nouns, some times the inflectional morphology of the terms is not accurate. In other words, children acquire early the terms used to point out the exact part of the *ground* where the *figure* is located, but for some children it seems to take time to produce them always in the correct way. Although ungrammatical, this kind of responses was included in our analysis.

(4) a. nak=iʃ–pá:–n
     LOC=3POS–belly–PTN
     'on its belly'

   b. nak=iʃ–laká–n
     LOC=3POS-face-PTN
     'on its face'

   c. iʃ–tampí–n
     3POS-base-PTN
     'its base'

   d. *nak=ʔé:–n
     LOC=back-PTN
     'on back'

3.4 Constructions with Posture Verb + Adposition and Body Part Term

These constructions belong to the adult-like group; they contain the three locative devices that we have been describing in this paper. It is important to notice that the information is contained in two separate phrases. As we have being explaining, the verb phrase informs about the configuration of the *figure*. The corresponding noun phrase is actually a construction type III) Body part term; where there is an adposition introducing the phrase, plus the corresponding inflectional morphology for the relational noun. All these elements show the exact place of the ground where the figure is located. We did not find considerable variation in these sentences.

(5) a. ya:ɬ   nak=iʃ–pá:–n   séra
     stand   LOC=3POS–belly–PTN   candle
     'it stands on the candle's belly'

   b. wakáɬ   nak=iʃ–kíɬ–ni̠   kutʃílu
     be.high   LOC=3POS–mouth(exterior)-PTN   knife
     'it's high on the mouth of the knife'

   c. wi:ɬ   nak=iʃ–ʔé:ɬ–ni̠   kíwi̠
     sit   LOC=3POS–mouth(interior)–PTN   stump
     'it sits in the mouth of the tree'

   d. ma:ɬ   nak=iʃ–laká:–n   paréd
     lie   LOC=3POS–face–PTN   wall
     'it lies on the face of the wall'

3.5 Constructions with Body Part Term and Posture Verb

Finally, the preferred adult-like constructions represent this group. These constructions include two of the UNT strategies to encode location: a body part term and a posture verb. These constructions, unlike the ones in the previous group, consist of only one phrase; which is a verb phrase with the body part term incorporated as a prefix. Within the verb phrase, the body part indicates where the *figure* is located within the *ground;* and the verb expresses the configuration of the *figure*.

In this group all the sentences used verb initial, as preferred by adults. We observed few variations in the noun phrase indicating the ground, some of them included the clitic nak= (examples 6a-b), and some of them did not (examples 6c-d). As this clitic is optional, no ungrammatical cases were identified; other than this small variation, sentences practically had the same structure.

(6) a. a̠ʔa–yá꞉ɬ   nak=ḵíw̠i
     ear–stand   LOC=tree
     'it stands on (the ear of) the tree'

   b. laka–má꞉ɬ   nak=paréd
     face–lie   LOC=wall
     'it lies on (the face of) the wall'

   c. ʔeɬ–wí꞉ɬ   aʔ–tín   ḵíw̠i
     mouth(interioir)-sit   CLS-one   stump
     'it sits on (the mouth of) the stump'

   d. kiɬ–waḵá̠ɬ   kutʃílu
     mouth(exterioir)–be.high   knife
     'it's high on (the mouth of) the knife'

It is important to point out that the meaning of constructions type IV and constructions type V is not different. The difference is related to the morphosyntactic disposition of the elements: analytic in the case of type IV and synthetic in the case of type V. We consider constructions in this last group the most complex as all the components have to be 'packed' into a single phrase.

3.6 Frequency of children's Locative Constructions

Apart from the different types of children's constructions, the other important result we are interested in this paper is the age of acquisition of each type of construction. For a better presentation of the responses we documented from the 24 children who participated in the study, we condensed the results in four groups of age. As we indicated in the Methodology section, these groups were determined by the school grade: Pre-school - ages 4 to 5; Grade 1 - ages 6 to 7; Grade 3 - ages 8 to 9; and Grade 5 - ages 10 to 12. As a result in the *Graph* below, we will see four age groups and five types of constructions. The total frequency of constructions is given in percentage means. For each group it is shown the 100% of the total locative sentences of all the children in each group. For instance the youngest group (ages 4 to 5) produced a total of 206 locative sentences, which represents the 100%. From that total, 62% corresponds to constructions with an Adposition, 22% to constructions with a Posture Verb, 13% to constructions with a Body Part Term, 2% to constructions with Posture Verb + Adposition and Body Part Term, and finally 0% to constructions with Body Part Term and Posture Verb. The same reading can be made for the rest of the groups.
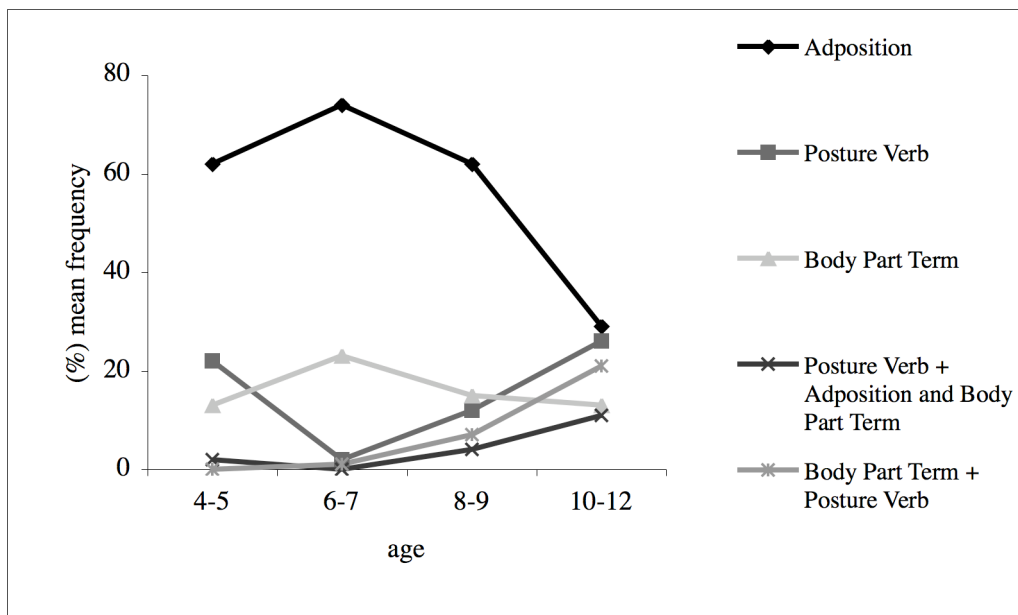
Graph 1. Frequency of children's Locative Constructions by age

In *Graph 1* we can see that the constructions with an Adposition are the most frequent in all the stages. The distribution of the Posture Verb constructions is interesting; it is the third most frequent in the middle stages (ages 6-9), but the second most frequent in the first (ages 4-5) and the last stages (ages 10-12). Conversely, the Body Part Term constructions are the second most frequent in the middle stages and the third most frequent in the first and the last stages. The adult-like constructions, consisting of the three locative devices, start to be frequent in the last two stages. In the same behavior, the preferred adult-like constructions, which combine two locative devices in a single verb phrase, occur more frequently in the third stage, and become the third more frequent in the last stage with an important increment in rate of recurrence.

4. Discussion

We found a relation between the literature review we presented in the introductory section and the results shown in the previous section. To recall, we pointed out that children speaking different languages acquire diverse strategies to encode location at an early stage. The acquisition of adpositions occurs first in the development, around the age of 2; locative verbs are first used between 2 and 3;06 years old; and body part terms are acquired after the age of 2;09. As we mentioned, it could be that this order of acquisition is due to the degree of complexity of the different strategies. Adpositions usually do not require any inflectional mark so we consider them to be less complex. Verbs usually require inflectional marks, thus we expect children to master them a little later. Finally, the body part terms used as relational nouns, apart from require inflectional marks, additionally need the detection of metaphorical extensions, as well as socio-pragmatic clues. Thus we consider this strategy the most complex, therefore acquired later that the other two strategies.

In *Graph 1* we could see the overwhelming preference for the adposition nak=, especially in the first three stages. This strategy, according to the literature, was going to be first acquired. In the particular case of UNT this could be due to two reasons: first, nak= does not need any extra morphology, as long as it is used to introduce a noun phrase, there is no error in its use; and second, the semantics of nak= is quite general, thus children do not have to give a precise meaning of location if they use this clitic. The UNT adposition has no complexity in the morphology nor in the semantics, in addition, there are no other adpositions to contrast with. Therefore in this case our results go along with the expectations.

The locative verb strategy should be in second place of acquisition. If we recall the posture verbs in their stative form, could be equivalent to 'there are' or 'it is' type sentences in English, thus to make sure children used them not as existential but as posture verbs, at least the adposition nak= should be included in these constructions. Now then,

returning to *Graph 1* we can see that in the first stage the Posture Verb constructions are the second most frequent, this means that the strategy acquired after the adpositions is the verb, in accordance again with the literature.

The last constructions to be examined are the ones containing body part terms used as relational nouns. We see that in *Graph 1* the first stage shows them as the third most frequent constructions, after the adpositions and the posture verb strategies. This order matches the expectations of the literature, which suggests that the acquisition of relational nouns comes last. In the second and third stages body part terms become the second most frequent strategy, which means that children are working soon in strategies other than adpositions and single verbs. In the last stage the frequency of body part terms decreases in favour of the considerable increase of other strategies. This means that in the last stage the body part terms are less used as a single strategy and are now combined with other strategies appearing now as part of the adult-like constructions type IV) and type V).

5. Conclusion

To finish this paper and to go back to our research question, we would like to comment about the acquisition of the adult-like Locative Constructions. It is important to remember that the locative devices in Upper Necaxa Totonac include different kinds of information: the adposition introduces the *ground* in general, the posture verb indicates the specific configuration of the *figure*, and the body part term identifies the exact part of the *ground* where the *figure* is located. It is also worthy of note the fact that LCs include more than one strategy in a single phrase. As a consequence of the above-mentioned LCs characteristics, we expect them to be acquired late due to the precise information required and the complexity that the sum of strategies should represent. As we already know, these LCs correspond to constructions type-IV and type-V of our corpus. We also observed that percentages of use of these adult-like constructions increased as the age of children augmented. The percentages of use of the constructions with Posture Verb + Adposition and Body Part Term, from the total locatives sentences are 2% for the first stage, 0% for the second stage, 4% for the third stage, and 11% for the last stage. These numbers show us that children produce consistently the adult-like constructions until the age of 10 to 12 years old. The same distribution is observed for constructions with Body Part Term and Posture Verb, in the first stage there are not any examples, the second stage shows 1% of frequency, the third stage 7% and the last stage 21%. This means, again, that it is at the stage of 10 to 12 years old where children produce consistently the preferred adult LCs.

It is very clear that the structures that we called *child-like constructions* show considerably higher frequency than the ones we called *adult-like constructions*. As a conclusion we can say that the acquisition of adult-like Locative Constructions by Upper Necaxa Totonac children occurs late. However, this does not mean that children do not express locative relations at all. Our results show that at the beginning children prefer to use mostly one general strategy, then a second one more specific, and after that a third one even more specialized. At the same time we observed that children slowly integrated the strategies until they mastered the combination of them.

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