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**FROM SENSITIVITY TO AWARENESS: THE MORPHOLOGICAL KNOWLEDGE OF BRAZILIAN CHILDREN BETWEEN 2 AND 11 YEARS OLD AND THE REPRESENTATIONAL REDESCRIPTION MODEL**

**Porto Alegre**

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To Gustavo, my love.

To Ademir, Vilma, Davi and Melina, the source of my strength.

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**ABSTRACT**

The present work is dedicated to the study of the Brazilian Portuguese children morphological knowledge and its relation with levels of mental representations as postulated by the Representational Redescription model (Karmiloff-Smith, 1992). The data consists of regularized verbal forms, changing of inflectional suffixes and lexical novelty taken from spontaneous speech, which I call *morphological variant forms*, and on three morphological tests, which involve derivation of nonce words, extraction of nonce base from derived nonce words, inflection of nonce verbs and judgment of words as well as an explanation of why these verbal forms are incorrect. The survey of the responses shows morphological knowledge from sensitivity – morphological variant forms – to linguistic awareness – morphology tests. This means that all levels of representations – Implicit, Explicit 1, Explicit 2 and Explicit 3 were at least suggested by the data. I believe that this work consists on the very first step towards an explanation of the mental representations that underlie morphological knowledge and of the morphological knowledge that children produce.

Key words: language acquisition, linguistic awareness, morphology.

# RESUMO

O presente trabalho dedica-se ao estudo do conhecimento morfológico de crianças falantes do Português Brasileiro e à sua relação com os níveis de representação mental postulados pelo modelo de Redescrição Representacional (Karmiloff-Smith, 1992). Os dados consistem em formas regularizadas, trocas de sufixos flexionais e inovações lexicais, oriundos de fala espontânea, os quais eu chamo de formas morfológicas variantes, e de três testes de morfologia, os quais envolvem derivação de palavras inventadas, extração de bases inventadas a partir de formas derivadas também inventadas, flexão de verbos inventados e julgamento de palavras, assim como explicação de por que tais formas são incorretas. O levantamento das respostas mostra o conhecimento morfológico da sensibilidade – formas morfológicas variantes – à consciência linguística – testes de morfologia. Isso significa que todos os níveis de representação mental – Implícito, Explícito 1, Explícito 2 e Explícito foram, no mínimo, sugeridos pelos dados. Eu acredito que este trabalho seja um primeiro passo em direção a uma exploração das representações mentais que subjazem ao conhecimento morfológico e do conhecimento morfológico que as crianças produzem.

Palavras-chave: aquisição da linguagem, consciência linguística, morfologia.

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# 1 INTRODUCTION

Investigating language acquisition is a very interesting task. Since my first professional experience, with 2 and 3 years old children in a Kindergarten, I have been interested in child language. In the interface that joins language acquisition and morphology, I found the object of my research: overregularization. This phenomenon produced an amazing debate that is still productive. Different theories try to explain why children produce verbal forms that they never heard before and which processes are involved in the regularization of irregular forms. In my Graduation research I analyzed regularized verbal forms, bringing together gerativism and sociointeracionism, in an attempt to explain why children produce these kinds of verbal forms and why these forms do not persist in a child's repertoire. In this sense, I proposed that gerativist rules governed the production while the interaction with adults provided children a mechanism of feedback that prevents the persistence of overregularization in their speech.

In my Master's research, I proposed a description of overregularization under the light of Optimality Theory. In this analysis, the explanation for why children produce regularized verbal forms was that, in the acquisition of regular and irregular verbs, irregular verbs are sometimes analyzed as regular ones, which is expressed in the theory by the ranking of faithfulness constraints over antifaithfulness ones. However, after studying a bit of cognition, I drew the conclusion that this kind of analysis is limited and just shows language acquisition as a snapshot, regardless the trajectory of the cognitive development. This conclusion, in addition to the aspiration of knowing more about the morphological knowledge of children, lead me to a new research, which brings together Linguistic and Cognitive Psychology, in the search for an explanation of what kind of mental processes underlie the morphological knowledge expressed by children.

The link between Linguistic and Cognitive Psychology is not new. However, there are not many studies about the morphological knowledge of children in Brazil that are constructed under this perspective. In this sense, I deemed that a work that looks at morphological productions, elicited through tests, could be a good way to analyze the mental representations that underlie language.

Studying linguistic awareness and cognition lead me to the theories developed by Karmiloff-Smith, one of the most recognized names in Cognition studies in the world. Her Representational Redescription model (RR) (1986, 1992) consists of a hypothesis in which the mind works via a reiterative process of redescription of knowledge in different formats,

from implicit to explicit. Besides, she proposed a marriage between Nativism and Constructivism that is very ingenious to me and in which she conciliates some domain-specific predisposition with domain-general processes to explain cognitive processes like language acquisition, for instance. In order to study this model in deep, I went to the University of London with a CNPq scholarship, and I spent four months studying with Professor Karmiloff-Smith there.

The main goals of the present work are to describe the morphological knowledge presented by a group of children, Brazilian Portuguese speakers, with ages between 2 and 11 years, from sensitivity to awareness, and to relate this knowledge to the mental representation levels postulated by the Representational Redescription model by Karmiloff-Smith (1992). To reach this goal, I bring data from spontaneous speech and from three morphological tests especially developed to the present work, that is, from anecdotic data and from systematic research. I intend to do a qualitative and not a quantitative analysis of the data, with a semi-experimental approach, since the objective of the data is to illustrate the behavior revealed by the mental representations.

The specific aims are expressed by several guiding questions: 1) Are the tests efficient in showing children's capability to apply morphological resources to nonce words[1]? 2) Do young children show morphological awareness in these tests? 3) Does the children's performance improve across ages? 4) What are the most frequent suffixes used in Test 1? 5) Do children show the same preferences of adults when choosing suffixes? 6) Are children capable of extracting the base from derived nonce words and of inflected nonce verbs? 7) Are children capable of judging as incorrect verbal forms that do not belong to adult grammar, but that are produced during language acquisition? 8) Are children capable of providing adequate explanations of why these forms are incorrect? And, most important: 9) Are the data (morphological variant forms and test responses) evidence of representational redescription? 10) Does the Representational Redescription model explains the data?

This work is divided in five chapters. Some basic morphological concepts that are mentioned throughout this work are given in the first section of chapter 1 — Theoretical principles. Among the concepts, I approach the notion of productivity, which will be briefly worked in the Test 1 response analysis with the suffixes survey. In the second section, I bring

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[1] Nonce word is a made up word used for "the nonce", to meet a need that is not expected to recur. In this case, nonce words are coined words used with the purpose of presenting a word which does not belong to the known vocabulary of the children in order not to involve processes like memory in the children's application of his/her morphological resources to the nonce words and in order to not to involve semantics in this process – just morphology.

some studies about morphological knowledge that will be important to the analysis of my data. Berko's (1958) famous study on inflection and derivation of English morphology with nonce words is described in this section. My previous study about morphological variant forms is in this same section as well. After looking at the evidence of children's morphological knowledge, the notion of linguistic awareness and pertinent themes about it are explored in section 2.3. One of the most important subjects in this section is the age of emergence of linguistic awareness. To discuss this, several authors and their different opinions are mentioned. After linguistic awareness, I move to morphological awareness, which studies conclude that there are few researches about. The conjunction of morphology knowledge, linguistic awareness and morphological awareness leads to a model that can explain how the mind deals with those ideas. In section 2.5 I present the Representational Redescription model. The following section, 2.6, is dedicated to a brief explanation about some ideias from the theory which is the future of the RR model – Neuroconstrutivism.

After constructing the theoretical fundaments of the thesis, I present, in the third chapter, the methodology applied to the collection of the data. In this chapter I explain how the data from spontaneous speech were obtained and how the tests were constructed. In chapter 4, the data are analyzed. I first analyze the data from spontaneous speech, and then the data from the morphological tests, relating them to the RR model. Finally, I discuss the age of emergence of linguistic awareness, bringing my analysis' results, and I comment on some methodological issues as well as plans for future research.

I highlight that this work consists of the first steps towards a trustable explanation of the mental representations that underlie morphological knowledge and of the morphological knowledge produced by children. There is much more to be done and I hope that this work opens doors to future researches.

## 2 THEORETICAL FUNDAMENTS

In the present chapter I trace the theoretic steps that guided the readings for this thesis and that also fundament most works on linguist awareness. For a matter of economy, I will only bring those works that I think are the most relevant given the goals of this thesis, and that seem more appropriate for the development of my arguments. In this chapter I will approach some aspects of the morphology of the Portuguese language, so that I can explore the morphologic knowledge expressed by children from 2:0 up to 10:11 through spontaneous speech and morphological tests, which reveal from sensitivity to morphological resources of the language to intentional manipulation of data in offline[2] tasks and word judgment.

## 2.1 MORPHOLOGY

In this section I deal with some basic morphology concepts, but not to discuss them – since this is not an objective of the present work –, but to let the reader know what kind of linguistic phenomena and processes I am dealing with throughout this work. To do so I bring concepts from Katamba and Stonham (2006) and Lieber (2010), which are updated and present opinions of other important linguists, discussing divergent aspects that belong to the morphological analysis.

According to Katamba and Stonham (2006), *Morphology* is the study of word-structure. Some words are morphologically simple, like "boot" (in English) or "flor" ("flower", in Portuguese) and cannot be segmented, but some of them are complex, like "desk-s" and "un-happy" (in English) or "casa-s" and "in-feliz" ("house-s", "un-happy", in Portuguese) and can be broken down into smaller units that are themselves meaningful. To refer to the smallest, indivisible units of semantic content or grammatical function we use the expression *morpheme*. To verify if a sequence of sounds is actually a morpheme we can check its grammatical or semantic value. But, as Katamba and Stonham verify, this is problematic for some linguists like Aronoff (1976), who says that some morphemes do not have an identifiable meaning. It is the case of –*fer* in words like *prefer*, *infer*, *defer*, *confer* and

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[2] Offline tasks are those that require thinking and abstraction from a more regular usage of language, and that require more than just that which is processed during task execution.

*transfer*[3]. *–Fer* comes from Latin and it means 'bear, bring, send.' However, it is hard to identify a consistent meaning like 'bring' attributable to *–fer* in every usage of those verbs. For this reason, Aronoff (1976) considers that the word in its entirety must be meaningful rather than the morpheme *per se*. To Aronoff, all words must be meaningful when they occur on their own, but morphemes need not to be so. Some morphemes have a transparent, unambiguous meaning, like the prefix *ex-* or *pre-* (which exist in Portuguese as well with the same meaning), while others, like *fer-*, do not.

Katamba and Stonham state that the central technique to identify morphemes is based on the notion of *distribution*, that is, the total set of contexts in which a particular linguistic form occurs.

These authors (2006, p. 25-26) also assert that the analysis of words into morphemes begins with the isolation of *morphs*, which are physical forms representing some morpheme. In addition, "if different morphs represent the same morpheme, they are grouped together and they are called *allomorphs* of that morpheme."

There are several kinds of morphemes: Roots, stems, bases, affixes. Let's first see how Katamba and Stonham differentiate roots, stems and bases.

The *stem* is that part of a word that exists before any inflectional affixes are added. Examples of stems provided by Katamba and Stonham are "cat-s" and "worker-s"[4] (in which "cat" and "worker" are the stems and –s is the inflectional affix.)

In the word "cats", the plural mark –s is added to the stem "cat", which is also a bare *root*, that is, the irreducible core of the word. In the word "workers", the same inflectional –s suffix is attached to a complex stem consisting of the root "work" plus the suffix –er, which is used to form agentive nouns from verbs. In this case, "work" is the root, whereas "worker" is the stem. Likewise, in the Portuguese examples "flores" (flowers) and "trabalhadores" (workers), we have the root "flor" plus the inflectional suffix –es and the root "trabalh-" plus a thematic vowel –a, plus the suffix dor- and the inflectional suffix –es. The stems are "flor" and "trabalhador". A word that contains more than one root is called a *compound word*.

Finally, a *base* is any unit to which affixes of any kind can be attached to. The affixes added to a base may be inflectional or derivational ones.

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[3] In Portuguese, we can exemplify this kind of morpheme with *–ferir*, in words like *preferir*, *inferir*, *deferir*, *conferir* and *transferir*.
[4] Examples in Portuguese are "flor-es" (flowers) and "trabalhador-es" (workers), in which "flor" and "trabalhador" are the stems and –es is the plural allomorph.

Another kind of morpheme is called *affix*. Katamba and Stonham (2006, p. 44) define an affix as "the morpheme that only occurs when attached to some other morpheme or morphemes such as a root or stem or base." There are four types of affixes:

- Prefix: this is an affix attached *before* a root, stem or base. Examples: re-, un-, in- (in English); pre-, ex-, re- (in Portuguese);

- Suffix: this is an affix attached *after* a root, stem or base. Examples: -ly, -er, -ist, -ed (in English); -or, -ista, -inho, -r (in Portuguese);

- Infix: this is an affix inserted inside the root itself. There are no infixes in Portuguese.

- Circumfix: it consists of two parts – a prefix and a suffix – that together form a new lexeme from a base. This kind of affixation is a form of *parasynthesis*, which is characterized by the simultaneous presence of these two morphemes attached to a base.

Lieber (2010, p. 108) considers that there are two types of morphology: Inflectional and derivational. The differences between them are:

| Inflection | Derivation |
|---|---|
| never changes category | sometimes changes category |
| adds grammatical meaning | often adds lexical meaning |
| is important to syntax | produces new lexemes |
| is usually fully productive | can range from unproductive to fully productive |

Mattoso Câmara Jr. (1977) instantiates some distinctions about inflection and derivation. Rocha (2003, p. 193) summed up these distinctions in the following way:

| Inflection | Derivation |
|---|---|
| Regularity – inflectional morphemes are presented in a regular and systematic way. | Irregularity – derivational morphemes are presented in an irregular and assystematic way. |

| Agreement – inflectional morphemes are required by the nature of the sentence. | Non-agreement – derivational morphemes are not required by the nature of the sentence. |
| Non-optionality – inflectional morphemes do not depend on the speaker's choice to be used. | Optionality – derivational morphemes can be used or not, depending on the speaker's choice. |

Another important concept in Morphology is *productivity*. Katamba and Stonham (2006) consider productivity in terms of generality, saying that the more general a word-formation process is, the more productive it will be assumed to be. They point out two key aspects of productivity. One of the aspects points out that productivity is a matter of degree and not a dichotomy, with some processes productive and others unproductive. Probably no process is so general that it affects all bases to which it could potentially be applied to, without exceptions. The truth is that some processes are relatively more general than others. The other aspect is that productivity is subject to the dimension of time, and processes are very general in a determined point in time but less general in a subsequent period. In the definitions below, I present examples from Rocha (2003) to illustrate productivity in Portuguese.

There are some constraints on productivity. As Katamba and Stonham assert "although there is no limit to the number of words that can be produced in a language, not every conceivable word that could be formed is allowed." According to Katamba and Stonham, there are some factors that limit productivity. They use the cover term "blocking" for these factors:

- Phonological factors: Blocking can be motivated by phonological considerations, such as number of syllables or type of segment or sequence of segments that end a base. In Portuguese, Rocha (2003, p. 136) exemplify this factor with the addition of the suffix –eiro to a base that already ends with the sequence of sounds –eiro, like "dinh**eiro**", which do not derive "dinheir**eiro**" to form an agentive.

- Morphological factors: The morphological properties of a base may prevent the application of morphological rules. One example of this factor is that native morphemes behave different from foreign morphemes in English (the suffix –ant, as in *defant*, is added to bases of French origin). Another aspect of this

factor is that morphemes belonging to different paradigms take different affixes. Rocha (2003, p. 137) explains that from "violino" (violin) one cannot form "violin**eiro**", although the base satisfies the requirements to add the suffix –eiro, because "violin**ista**" (violinist) is based on a paradigmatic relation with words like "pianista" (pianist) and "clarinetista" (clarinetist).

- Semantic factors: Semantic considerations can also prevent the application of affixes to a base. One example, given by Katamba and Stonham (2006, p. 80) is the use of –un, which is supposed to be used with "positive" adjectives, like "happy" or "clean" and not with "negative" adjectives, like "sad" or "dirty". Rocha does not consider this factor in Portuguese.

- Aesthetic factors and the adoption of words: There are cases of word-formation that are inhibited by vague aesthetic factors. Katamba and Stonham comment that some words are well-formed, but their adoption has nevertheless suffered resistance. They recall that in the 1970s, the word "stagflation" was coined to refer to the combination of economic stagnation and a high level of inflation that afflicted world economy. This word is not used anymore because some commentators consider it "ugly". In other words, due to aesthetic factors, this word failed to get a firm foothold in the English language. Rocha does not consider this factor in Portuguese.

Lieber (2010, p. 64) identifies, in addition to the factors already identified by Katamba and Stonham, other kinds of restrictions on productivity. They are:

- Categorial restrictions: Almost all affixes are restricted to bases of specific categories, like –ity and –ness, which attach to adjectives; -ize, which attaches to nouns and adjectives; and un-, which attaches to adjectives or verbs. In Portuguese there is the suffix –ção, which attaches to verbs to form nouns.

- Syntatic restrictions: Sometimes affixes are sensitive to the syntactic properties of their base, as the suffix –able, which generally attaches to transitive verbs, specifically verbs that can be passivized (love – loveable[5]).

- Pragmatic restrictions: Some affixes can be restricted to pragmatic uses. Lieber provides an example from Bauer (2001), in which there is a Dyirbal suffix –

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[5] Example from Lieber (2010).

ginay, which means "covered with", that is used only on bases that denote things that are "dirty or unpleasant". In Portuguese, the suffix –eco denotes diminutive, but it is generally used with a pejorative meaning ("livreco" (little book) is a low quality book).

Lieber (2010) also identifies some factors that contribute to productivity. They are transparency, frequency of base and usefulness.

Transparency is related to processes that can be easily segmented, such that there is a one-to-one correspondence between form and meaning. In a transparent process, an affix is attached to a base and the phonological form (the pronunciation) of both morphemes stays the same, as far as the meaning of the derived word is exactly what one would expect by adding the meaning of the affix to that of the base. It is the case of "commonness", "oddness", "timidity", "grammaticality" (in English) and "comemoração", "afirmação", "açucareiro" and "pianista" (in Portuguese).

Frequency of the base is related to the number of bases that might be available for affixes to attach to, resulting in new words. As Lieber (2010, p. 63) states, "if an affix attaches only to a limited range of bases, it has less possibility of giving rise to lots of new words, and it will therefore be less productive". The suffix –esa in Portuguese only attaches to male nouns which generally end with -es (like "português" (Portuguese) or "príncipe" (prince), eventhough this last example does not end with -es) to form their female counterparts.

Finally, with respect to usefulness, a process of word-formation is useful to the extent that speakers of a language need new words of a particular sort. Lieber comments that it is always useful to be able to form a noun meaning "the state of being X" from an adjective, whatever it is that X means. For this reason, the suffixes –ness and –ity are highly useful affixes. In Portuguese, it is useful to form nouns meaning "the action resulting from X, being X a verb". For this purpose we use the suffixes –ção and –mento, and they are very useful affixes.

In brief, Morphology is the study of word-structure and this implies that it is possible to identify pieces inside a word that are smaller than the word *per se*. These pieces, called morphemes, are irreducible and are generally meaningful. The physical realization of a morpheme is called a morph, and the different realizations of morphs consist of allomorphs. There are several kinds of morphemes: Roots, stems, bases and affixes. Affixes may occur before a root (stem or base) and are then called prefixes, if they occur after a root (stem or base), they are called suffixes and if they are inserted inside a root, they are then called

infixes. When prefixes and suffixes are added at the same time we have a phenomenon called parasynthesis. The affixes may be inflectional or derivational one. Moreover, they may be involved in processes relatively more or less productive, depending on some restrictions and on factors like transparency, frequency of the base and usefulness.

When talking about productivity, two concepts are fundamental: That of transparency and that of simplicity. According to Clark (1993), a word is transparent when children know the meaning of its elements (roots and suffixes), and a word is simple when the elements, combined or not, demand changes or demand minimal changes to its form. Still according to this same author, when children coin up new words, one of the factors that affects the chosen forms is transparency. Between two options, the most transparent one will be the one made up by roots that are more familiar and by affixes that are better known from among many other words.

As to the simplicity of the forms, Clark says that this concept is related to the typology of the language being acquired. Children adapt themselves to the typological features of the language to which they are exposed to since a very early age. The simpler the structures of a language are, earlier will the children be able to apply them to coined words. The simpler options are also transparent, but the opposite is not necessarily true. Transparency is a condition for productivity. Clark (1993) points that, to be productive, a word form must be transparent, although not all transparent forms are also productive. To this author, productivity is a factor that leads children to choose, from among two or more transparent options, which ones to use in a specific moment. Unless there is some reason to do the opposite, children, just like adults, choose the most productive options available. The productivity of the morphological resources of a language is better verifiable in coined words (Clark, 1993).

I will mention productivity when I present the results of the morphological tests.

I hope that the data brought in the present work shows how the notions of transparency, simplicity and productivity brought by Clark (1993) and Katamba and Stonham (2006) can be verified.

These morphological concepts will be mentioned in this thesis and these explanations may be useful to understand certain considerations of the data analysis.

2.2 MORPHOLOGICAL KNOWLEDGE

In this section I bring some considerations on the morphological knowledge that children demonstrate — both in the implicit and explicit levels —, based on the studies of some important researchers and also on some notions that I will develop during the present work and that I have already developed in previous ones.

There are two ways to check the linguistic knowledge of a child: Either she tells us or we infer it from his or her productions. Understanding how grammar develops in the mind of children means searching for the origin of language itself and that of the mind, since we discover so much based on how language behaves in someone acquiring it. Parents and psychologists, interested in how the knowledge of a child develops, began studies based on diaries in the end of the 19$^{th}$ century and in the beginning of the 20$^{th}$ century (Ingram, 1989), in which they tried to record their children's productions, so as to define the trajectory of their development. With a broader goal of outlining the normal development of children, studies with ampler samples and more scientific rigor were first developed in 1926 — and are still developed today. In the second half of the 20$^{th}$ century emerged longitudinal studies, where researchers followed a child's development throughout the years. All these studies make up a concise body of research devoted to reveal the knowledge developed by children.

### 2.2.1 Studies on Morphological Knowledge

One of the main studies on children morphology, in this sense pioneer, is that of Jean Berko (1958), on the English language. In this study, the author says that she is beginning to discover what is learnt by children exposed to the morphology of English. To test the knowledge of morphological rules, a coined material was used, based on the premise that, if a subject can give the correct plural endings of a coined name, for example, then he or she has internalized a functional system of plural allomorphs of English and is able to generalize it to novel cases and choose the right form. If a child knows that the plural of "witch" is "witches", she can have simply memorized the plural form. But if she tells us that the plural of "glutch" is "glutches"[6], then we have an evidence that he or she effectively knows, although unconsciously, one of the rules that the descriptive linguist would also add to his or her own grammar. The questions that guide Berko's work are: If a child has knowledge of

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[6] Coined words.

morphological rules, how does this knowledge evolve? Is there an evolution of the simpler and more regular rules to the more irregular and complex ones that are completely adequate to describe English? Berko says that it is evident that language acquisition is more than the accumulation of trained enunciations, as we are all capable of saying what we do not train to say and what we have never heard before.

To test this kind of knowledge in children, Berko started examining children's effective vocabulary. Consequentially, she selected the 1,000 more frequent words in the vocabulary of 1st graders, taken from real exchanges, compositions, letters and documents alike. This list was then examined to check for morphology features of English that were more commonly present in a 1st grader's vocabulary. From that, the author would decide on what type of extensions she could expect a child to be able to produce. Every inflectional morpheme of English was present.

According to Berko, from the real vocabulary of children there could be an estimation of the types of morphological rules children could be expected to know and, from these items, a test could then be designed. Based on the children's vocabulary, a test was designed to explore the ability of children to apply morphological rules to novel words. The child was asked to think, derivate, compose and, at last, to analyze compound words. To test the usage of morphological rules of different types and under varied phonological conditions, a series of coined words was invented, following the rules for possible combinations in English. The subjects were 12 adults (7 men and 5 women), all of which had a graduation degree. All of them were English native speakers. The children were between 4 and 5 years old — 12 girls and 7 boys. Older children were also interviewed, with ages ranging from 5 to 7 years.

From cards with images, as Berko describes, a description was given and, soon after, a text was read. One example is the image of two animals that look like birds. The description is: Plural. An animal that looks like a bird, and two of them. The text following is: "This is a wug /wΛg/. Now there is another one. There are two of them. There are two _____." The test has cards with information on plural, past tense, derived adjectives, third person singular, singular and plural possessives, comparative and superlatives adjectives, progressive and derived or compound agentives and compound words. The author says that every child understood the nature of the task.

Berko's results revealed that boys were as good as girls, even a little better, with no evidence to support the common claim that girls have a better hold of language. This test seems to show that boys and girls at this age range have the same ability to deal with the

morphology of English as represented by these items. As for age, 1$^{st}$ graders were significantly better then preschool children.

The general goal of Berko's study was to verify if children have morphological rules. The author believes that, asking for real words, it could be possible to get to a process no more abstract then route memory. But researchers can be sure that coined words are new to the children and that, if they could provide the correct morphological item, it is because they know something more than the individual words of their vocabularies: They have extension rules that make them able to deal with new words. It is for this reason that in my own tests I used coined words (see section 3.2.2.)

One interesting aspect of Berko's work is that of the formation rules for the third verbal person singular and of the possessive, which are better learned or learned before the same formation rules of plural nouns — the addition of the final 's'. According to the author, the morphological rule implies meaning, and forms that are phonologically identical can be learned in different moments if they have different functions. These forms are not simply the same phonological rule, as its different functions modify the percentage of correct answers. Maybe children learn better because they have more verbal endings than nominal ones in /s, z, š, ž, č, ĵ/, and it is possible that children hear more possessive then plural nouns. It is also possible that for English, as explained by Berko, the plural noun is less important or more redundant than inflections. This conclusion is a bit surprising, as nouns must always come in a singular or plural form and that there are ways to avoid inflection of the possessive.

The picture that emerges from these results, according to Berko, is of consistency, regularity and simplicity. Children do not treat new words according to idiosyncratic patterns. They do not give form to new words based on patterns that appear less frequently. Their best performances are with forms that are more regular and that have fewer variants. With morphemes that have too many allomorphs, they can deal with the forms bringing up the most common ones before being able to deal with allomorphs that appear in a limited distribution.

Consistency, regularity and simplicity seem to guide the development of language in children. Slobin (1971) ponders that when a child starts to add two words together, one can start researches on her active grammar. Children language structures itself from this point on, which can soon be characterized by hierarchical structures that tend to be regular. The structures change with age, and they do not always relate to the old structures.

The regularization of irregular forms is one of the central points of this thesis, as it reveals a structured knowledge of the morphology of a language. They are forms that children has never heard before and that show, as ponders Slobin (1971), that children have their own

system, which is not a direct copy of that of adults. In the stage in which they produce this type of form — and certainly in later stages — many of the utterances of children, although consistent with their system, do not relate directly to the forms of adults, and do not seem to be imitations of adult utterances (SLOBIN, 1971.)

One interesting point, according to Slobin, is that children speech diverts from adult speech, and does so in a systematic way — which allows us to think that these diversions are built creatively by children based on a partial analysis of language and under cognitive tendencies inherent to their mind. The creative contribution of children is clearly revealed in the overgeneralization of inflections, where deviant utterances consistently appear. To some children, this tendency to regularize goes on in school, and is noticed in a series of languages[7].

The author also says that, from a traditional psychological point of view, it is expected to find that children start using some regular forms correctly — like "walked" and "helped" — and that they extend this rule to irregular verbs. The question is that in every case studied, the first past tenses used are correct verbal irregular forms — "came", "broke" and "went", and so on. Apparently, these irregular verbs in the past — which are the most frequent ones in adult speech — are learned as individual vocabulary items in a very early stage.

So, as soon as children learn only one or two past forms, as Slobin explains, they immediately substitute the correct past forms with their incorrect overgeneralizations of regular forms. Even if the correct forms have been produced for months, they are excluded from children speech by the overgeneralizations and may not come back for years.

The crucial point here, according to Slobin, is that the strong verbs (irregulars), although frequent, do not follow a regular pattern and, evidently, children are especially sensitive to patterned regularities. As soon as the pattern is noticed, children will try to apply it as broadly as possible, producing, then, words that are regular, even if they have never heard them before. One can be impressed with the bias of children to generalize, make analogies, look into regularities — in sum, to search for and establish order in their own language. Slobin (1980) believes that very early, in the two-word stage, regularity and originality can be noticed in children utterances.

Slobin (1980) is one of the authors that say that the great productivity of human language — the ability to produce and understand uncountable novel sentences — demand that we speak in terms of grammatical rules formation, and not in terms of learning a great number of specific combinations of words. According to the author, there are many levels of

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[7] For information on regularizations in other languages, we suggest SLOBIN (1985).

evidence to support the rules perspective, from *weak* to *stringent*. The simpler type of evidence comes from the analysis of natural behavior — in this case, children's spontaneous speech. For example, in the elementary stage of two-word utterances, regularities can already be detected, since not all the possible word combinations occur, and certain word orders are less frequent. The most primitive type of evidence to rules, according to Slobin, is the regularities of behavior. The author explains that later in its development, the child will show a normative sense to rules, that is, he or she will be able to judge if a certain utterance is correct in relation to a certain linguistic model. Accordinf to Slobin, that is what linguists call "grammar sense". Various stages of evidences of grammar sense emerge with age, showing crescent linguist awareness by the child. We can be sure that children have a rules system if their production is regular, if they extend these regularities to novel examples, and if they can detect deviations in their own speech and in the speech of others. In other words, I am back to what I said in the beginning of this section: Linguistic knowledge can be verified implicitly or explicitly.

Boweman (1982), on the overregularization of inflectional morphology of English — plural and past tense —, explains that children proceed the following way: They first produce correct cases of plural forms and of past tense. Some of these forms adapt to the pattern shared by a great number of forms (like "shoes", "dogs", "walked", "jumped"), others belong to small patterns ("swam", "rang"), and others are irregulars, that is, they are not predicted by rules ("feet", "mice", "went", "broke"). In a later stage, the correct but irregular forms or the ones that belong to a small pattern, are partially or completely obscured by incorrect forms that adapt to more general patterns like, for example, "feet-foots", "mice-mouses", "went-goed", "broke-braked."

The most commonly accepted interpretation for this sequence of events is, according to Bowerman (1982), that the usage at first correct is due to the learning of forms as individual cases, isolated from others. After acquiring some examples of a regular pattern, children begin to recognize their systematicity and abstracts rules that allow them to create novel examples. When these new rules are working, children apply them in such a way that it seems they are not aware that there are cases in which the rules do not apply. From this point on, the overregularized forms substitute the irregular ones. When the irregular forms are again in the children's speech or regain strength, it can be inferred that they are not isolated anymore, like independent unities, but integrated in a system.

For Bowerman (1982), the difference between the children's understanding of plural forms and the past tense before and after the overregularization stage is typically

characterized in terms of the concept of *analysis*. At first, forms are unanalyzed by children — that is, children are not aware that *shoes* and *jumped*, for example, are compound of two units, *shoe* and the *–s* plural, and *jump* plus *–ed*. The beginning of the overregularization errors indicates that the analysis is then established. To Bowerman, two aspects of this analysis are especially important in the understanding of errors that appear in spontaneous speech. The first refers to relations between linguistic forms in the developing children's grammar: It is the hypothesis that children are able to acquire parts and portions of language and use them correctly without being aware of how they are interrelated. Errors occur as a result of the efforts of children to integrate what had been previously separated. The second important aspect of the analysis refers to the comprehension by children of the internal structure of a certain form or of a certain group of forms: It is the hypothesis that forms that are analyzable inside the adult system as complex, that is, as having subunities with independent combinatorial potential, may be used correctly by children even if they are not aware of their internal structures.

What happens, according to the author, is that as the linguistic repertoire of children expands, their implicit awareness of how the various parts of the linguistic system are related to each other does also expand. In the meaning of the words that children know, they begin to find smaller semantic unities through which the combinatory patterns act. The evidences lie in their creation of novel lexical items, structured following the same pattern. The overregularization errors produced by children cannot be considered as lack of knowledge due to the initial stage of incorrect use (BOWERMAN, 1982.) The author also adds that errors point to the importance of the bias of children to find structure and regularity in their environment, independently of any clear and present gain.

In a previous work (LORANDI, 2007), I looked with more detail to the so-called 'errors' of morphological regularization, and as it showed that this type of production cannot be considered an error because it does not refer to lack of knowledge, as Bowerman (1982) points out and as I also support (LORANDI, 2007), I suggested a new terminology for these type of children speech productions: *morphological variant forms* (see section 2.2.3.)

The study of a language's morphology does also implicate looking to the smallest unities of meaning of a language: The *morphemes*. The morphemes, as they carry meaning, are linked to Semantics and, as they are composed of arrangements of phonemes that, in their turn, may change meaning, are linked to Phonology. So, I understand that the study of morphology is a study of interfaces. The morphemes are classified according to their function and position. If they carry the main meaning of a word, they are called *roots*. If their position

precedes the radical, we have *prefixes*; in the middle of the root, the *infixes*; and, after the root, the *suffixes*, as I have showed in the section 2.1. The morphemes are linked by paradigms, as explained by the *Curso de Linguística Geral* (1916/206) inspired by the ideas of Saussure. In a verbal paradigm, for example, we can have many roots that, although different in form, carry the same meaning. These variants of one same root are called allomorphs.

Following this line of reasoning, we know that morphemes may present variants. And what if children are capable of making different arrangements among the morphemes of a language that are not contemplated by adult grammar? Then children are creating novel morphological variant forms[8] — as they are created from the morpheme repertoire of language. I consider morphological variant forms not only the data of morphological regularization, but also those that involve flexional suffixes change and lexical innovation.

The study of morphological variant forms is brought to the present work because it represents one of the first manifestations of morphological knowledge by children. This type of knowledge usually appears in children's spontaneous speech around two years of age (TITONE, 1983; LORANDI, 2007.) Through the explanation of this data, I believe that it will be easier to understand why they are so considered.

### 2.2.2 Variant morphological forms — a study by Lorandi (2007)

Around the third year of life, children begin to show a new kind of data which are recognized as errors in their speech. They are called overregularizations. Brazilian young speakers produce regularized forms like "sabo" (I know it), "trazo" (I bring it) and "fazi" (I did it.) In my Master's dissertation (Lorandi, 2007), I developed a study about this kind of data, based on the Optimality Theory, specifically on Transderivational Antifaithfulness Theory, by Alderete (2001.) The reason why I decided to call this phenomenon morphological variant forms is explained in the next section. Before analyzing my data under the light of this theory, I described some studies about the past tense debate, which is about overregularization.

In Brazil, some researchers, like Rosa Attié Figueira, Irani Maldonade, Maria Fausta Pereira de Castro and Maria de Lourdes Fernandes Cauduro already study this children's

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[8] Other arguments, including why not using other terminology of the literature on the subject may be found in Lorandi (2007).

speech phenomenon, analyzing it in an interacionist framework, which brings Linguistics and Psychology together to better understand the social development of the child.

After studying the past tense debate[9] and the researches developed in Brazil, I got to the conclusion that a gerativist framework, and specially the Optimality Theory, would consist on a better explanation of the phenomenon because it would focus on the grammatical structures produced by children.

My analysis consisted of two parts: one descriptive and thre other explicative. In the former, I applied the contrast technique to show that the morphological variant forms do indeed present an adequate structure. Let's see one example of this analysis.

| | T (R + TV) | | IS (TMS + NPS) | |
|---|---|---|---|---|
| | R | V | TMS | NPS |
| If: fazer | faz | e | r | Ø |
| IS: faço | faç | Ø | Ø | o |
| PS: fazo | faz | Ø | Ø | o |

Chart 1 – Morphological Variant Form 1 – "fazo"
Source: Lorandi, 2007.

In this chart we can see in the first and the second lines the structure of the regular verbal form, described by Mattoso Câmara Jr. in 1977. This structure consists on a theme, formed by a root plus a thematic vowel, plus inflectional suffixes: Tense and mood suffix and numeral and personal suffix. The structure is:

General structure of the verbal form (MATTOSO CÂMARA Jr., 1997, p. 104)

T (R + TV) + IS (TMS + NPS)[10]

Moreover, in the third line is the infinitive form, which is the basic form of the paradigm (LORANDI, 2007); in the fourth line is the intended structure, that is, the structure which is accepted by adult grammar; and in the fifth line is the produced structure, the form produced by children. These verbal forms were decomposed according to the general structure of the verbal form in order to check if the form produced by childred presented an adequate structure, with real Portuguese morphemes, following a pattern. And the conclusion was: The

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[9] Researchers like Pinker call "the past tense debate" the discussions about overrregularization.
[10] In Portuguese: T (R + VT) + SF (SMT + SNP).

form "fazo" presented the same root as the infinitive form and the same numeral and personal suffixes that the form accepted by adults.

This conclusion leads to the next step of the analysis. In this part, I analyzed the same morphological variant form from the Transderivational Antifaithfulness Theory (TAF) perspective. The Optimality Theory (OT) deals with the idea of Universal Grammar and a set of universal constraints, which evaluate a set of candidates to output according to a ranking, generating the optimal candidate, that is, the effective output. These constraints may be faithfulness or markedness constraints. The faithfulness constraints require identity between input and output and the markedness constraints impose restrictions to the surface form. In the Transderivational Antifaithfulness Theory there are faithfulness and antifaithfulness constraints, which are the opposite of each other. Moreover, this theory establishes a correspondence between outputs, but not between input and output. The antifaithfulnes is indicated by the signal "¬" and the optimal candidate is indicated by the signal "☞". The OT analysis is made in a tableau:

| Base | Candidates | $OO_{ROOT}Faith$ | $\neg OO_{ROOT}Faith$ |
|---|---|---|---|
| faz + affix | ☞ fazo | | * |
| faz + affix | faço | *! | |

Tableau 1: Morphological Variant Form 1 – "fazo"
Source: Lorandi, 2007.

In this tableau the constraint $OO_{ROOT}Faith$ requires identity between the base "faz +affix" and the output. The antifaithfulness constraint $\neg OO_{ROOT}Faith$ requires that the output is not faithful. A regularized form like "fazo" is faithful to the base because it presents the same root and, as this faithfulness constraint is the highest in the ranking, the candidate "faço" is ruled out, being the candidate "fazo" the optimal one. To get an irregular form, the language grammar, expressed by constraint ranking, assumes another order, with the antifaithfulness constraint being in a higher position in the ranking. This analysis draws the conclusion that children, at the moment of the production of a regularized form, are guided by the faithfulness to the base.

This kind of analysis, as McCarthy states (personal communication), explains grammar, but not grammar processing. To a static view of language, grammar this may be a good explanation. However, it does not explain how children actually produce a regularized form and it ignores a developmental trajectory perspective. In the present work I will suggest

an explanation of overregularization based on the Representational Redescription Model, by Karmiloff-Smith (1992).

### 2.2.3 Why Morphological variant forms?

As I said before, there is a stage in children's life when they produce regularized forms like the words in the Portuguese language "fazo", "sabo", "trazi" instead of "faço" (I do); "sei" (I know) and "trouxe" (I brought)[11] which literature tends to calls 'errors'. However, thinking about this child's language phenomenon I was led to rethink this terminology because it demonstrates, like Bowerman (1982) says, that children analyze forms in language and this is far from being an error.

Thinking about these regularized forms as an evidence of the on-going process of acquisition as well as a phenomenon which allows us see the transparency of the relationship between child and the language acquisition process, considering this sort of output as an error means stating that children are wrong when producing a form like "sabo" instead "sei" or that they have a wrong idea about the language's morphemes and use them in an incorrect way. This misconception is clarified when we analyze the structure of these forms, as we could check with the analysis of the verbal form "fazo" in the previous section.

This way of conceiving the regularization phenomenon highlights the importance of rethinking the terminology of regularized forms. As children demonstrate knowledge about language patterns in the use of morphemes, this cannot be considered an error[12], but another form of a given verbal form in the children's grammar. To fit the terminology to what these forms actually signify in the language acquisition process, I suggest the label **morphological variant forms**. This phenomenon analysis made us believe that these forms mean a progress in the process of morphological forms analysis, not a regression and not an error.

Apart from regularization, there are, in my conception of morphological variant forms, two other types of phenomena to which we can attribute this label: changes of inflectional suffixes and lexical novelty. Let's turn to these three phenomena in detail.

These data were obtained in children's spontaneous speaking. The children were between 2 and 5 years old (2:0 to 5:0). We highlight that this is a common observable

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[11] Portuguese is a rich inflectional language concerning verb and children tend to regularize different forms.
[12] Several researchers around the world still call this kind of phenomenon "error."

phenomenon in children speech, but which is difficult to elicit with a formal instrument of data collection because it is a very spontaneous production.

2.2.3.1 Morphological variant forms: Regularization

Morphological regularization consists in the application of a regular pattern to irregular language forms. It is the case of the data presented in Chart 2, in which we find, in the left column, morphological variant forms, and in the right column, the initial letter of the child's name and his/her age.

| Morphological variant form | Child's name and age |
|---|---|
| (eu) fazo | I., 3:6 |
| (eu) fazi | Fra., 2:6, 2:9, 3:0; M. 4:1; M. (2:6) |
| (tu) fazeu | G., 2:7; M. 4:1 |
| (tu) fazesse | J., 3:11 |
| (eles) fazeram | M., 4:1 |
| (ele/ela) fazeu | M., 4:4; M., 4:0 |
| (quando vocês) fazerem | M., 4:4 |
| (eu) trazeu | R, 3:11 |
| (eu) trazo | G., 3:4 |
| (eu) trazi | B., 3:1 |
| (ele) trazeu | H., 2:3 |
| (eu) sabo | R., 2:10; G., 2:7; A. 2:4;14[13], 2:4;21, 2:5, 2:6, 2:9, 3:0 |
| (eu) ponhei | G., 2:5, 2:8 |
| (ele) cabeu | Isd., 4:4; 5:0 |
| (se ele) sesse | J., 3:11 |
| abrida | J., 3:11 |
| tesse | J., 3:11 |

Chart 2: Morphological variant forms – regularization
Source: The author.

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[13] 2years: 4 months; 14 days.

By analyzing any of these data, we can clearly see that they present the morphological structure of a regular form of Portuguese: stem plus thematic vowel plus inflectional suffixes.

In addition, it must be noted that the stems used to create these regularized forms, which belong to the same paradigm, are the same. In other words, all forms which belong to the "trazer" paradigm show the root "traz-" and not the root "troux-" or "trar-", for instance, that also belong to this same paradigm. Another aspect that can determine the choice of this root is the frequency of linguistic input that the child receives (LORANDI, 2007.)

2.2.3.2 Morphological variant forms: Changes of inflectional suffixes and lexical novelty

We also consider morphological variant forms the children's productions that involve changes of inflectional suffixes and lexical novelty. Chart 3 shows some examples.

| -ei (P1 IdPt2 1ª conj.)→ -i (P1 IdPt2 2ª conj.) | -i (P1 IdPt2 2ª conj.) → -ei (P1 IdPt2 1ª conj.) | -va (P1 IdPt1 1ª conj.) → -ia (P1 IdPt1 2ª e 3ª conj.) | -ia (P1 IdPt1 2ª e 3ª conj.) → -va (P1 IdPt1 1ª conj) | Ø → o (P1 IdPr) |
|---|---|---|---|---|
| boti (A.L., 2:1[14]) | comei (M., 3:0) | usia (H., 3:4) | conheciva (Isd., 4:6) | fizo (G., 2:7) |
| di (R., 4:10) | mexei (M., 3:0;15) | | duava (M., 4:4) | |
| pensi (H., 3:4) | enchei (J., 3:11) | | | |
| suji (A.C., 2:11; 23) | descei (O., 2:7) | | | |
| dobri (A.C., 3:2;15) | | | | |
| tomi (A.C., 3:7;6) (J., 3:0) | | | | |

Chart 3:  Morphological variant forms – changes of inflectional suffixes
Souce: The author.

In changes of inflectional suffixes there are the three conjugation classes involved, which are classified according to the thematic vowel: 1st conjugation (with thematic vowel –a), 2nd conjugation (with thematic vowel –e) and 3rd conjugation (with thematic vowel –i). According to the conjugation class, different inflectional suffixes and even different stems are provided to different verbal forms. Data in Chart 3 show changes between suffixes of 1st and

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[14] Child's name and age.

2nd or 3rd conjugations. It is important to highlight that the 1st conjugation in Portuguese is the productive one. These forms also evidence knowledge of morphological structure and coherency. In other words, these could be real forms of language because they present real morphemes of Portuguese. In addition, these forms do not present incoherence like changes between 1st and 2nd person, for example, which involve more than grammatical information, but a reference to the relation between speaker and addresser.

Young children are also able of coining words from structure that they already know. Chart 4 shows us some examples.

| Child's coined form | Child's name and age |
|---|---|
| surfador | Isd., 5:3 |
| massageira | Ra., 5:4 |
| remedieiro | Isb., 5:10 |
| balanceira (bola) | A.C., 2:10 |
| oscarzês (language spoke by Oscar) | Isd., 6:2 |
| amigosa | A., 8:1 |
| gala (galinha/chicken) | A.C., 2:10 |
| borrachar | A., 3:8 |
| xizar (to mark na "X" in an option) | A., 6:11 |
| vassourar | A.C., 3:11 |
| brinca (to put a earing) | C., 4:0 |
| filhou (it made kids) | P., 3:9 |
| demoreiro | I. 4:4 |

Chart 4: Morphological variant forms – lexical novelty
Source: The author.

Chart 4 presents some data which consist of forms created from structures that children already know, like "vassourar" from "vassoura" (broom), "demoreiro" from "demora" (delay), etc. What children do is to add derivational or inflectional suffixes to bases that they already know. These forms don't belong to adult grammar, but they are perfectly understandable.

Let's now take a look at some concepts about linguistic awareness and its emergence.

2.3 LINGUISTIC AWARENESS

One of the most used concepts of "linguistic awareness" in the literature is that of Turner and Herriman (1984, p. 12), who consider

> as a first approach, linguistic awareness may be defined as the ability to think about and manipulate structural features of spoken language, treating language itself as an object of thought, in opposition to the simple use of the linguistic system to understand and produce sentences.

The authors say that the question about metalinguistic awareness is that it cannot be solved by definition. The definition given above could only be seen as pre-theoretic, a working definition of a concept, which the proposal is to give some guidance in the recognition of relevant data. Ultimately, the question must be determined based on empirical considerations.

Pratt and Grieve (1984) add that metalinguistic awareness may be defined in a general level as the ability to think about the nature of language and language functions. The authors believe that it is hard to be more specific in the definition of the expression due to its nature, functions and typical age still be subject to a lot of debate.

Nedsdale and Tummer (1984) say that, although it is agreed that metalinguistic awareness[15] refers to the ability to think and manipulate structural features of spoken speech, there is considerably less agreement as to *how* and *when* metalinguistic awareness emerges and on *which* behaviors may be taken as indicators of this awareness.

Levelt et al. (1978) say that there are different ways to classify the linguistic awareness phenomena observed in children. The classification which one may get to will depend on the theory of structure and function in the conception of children language. But in an atheoretic preliminary level, there are two ways to structure the phenomenon in question. The first is to use the *criterion of explicitness* (Levelt et al., 1978, p. 2.) Some metalinguistic phenomena are at the border of awareness, while others are clearly the result of explicit thinking about language. As an example of the first, according to the authors, we have self-repairs, which frequently occur in regular speech and which can be observed in child speech. Restarts may show that a child was aware of what he or she started or if what he or she said was inappropriate or incorrect. These awareness phenomena are very ethereal, and many times they are not even noticed by the listener. For a speaking child, they can also pass

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[15] Although I do believe that metalinguistic awareness may be a redundant expression, we will translate each expression used the most faithful way. Related to my position about this terminology, I will use the expression "linguistic awareness." I also believe that a more thorough discussion about this terminology is not under the scope of the present work. To methodological questions like this, I suggest Poersch (1998.)

through the awareness flow without leaving any signs. We consider the criterion of explicitness very important and I will go back to it when considering the Representational Redescription Model, on which my analysis is based.

To Levelt et al. (1978) it is possible to find many levels of explicitness. Children not only correct themselves, but other people too. This demands not only awareness of linguistic problems but, at the same time, some skill to formulate what was wrong. Children play with language spontaneously, just like they play with anything else. In their games, language is taken in a different way than the conventional one — it is not so much a means of communication as it is an object of aware activity. Games with rhymes or word substitution can be observed very early in children. The different levels of explicitness can be simultaneously observed in every development stage. The authors question what it means to be aware of the way things are, and believe that even if someone admits that the linguistic awareness phenomena does change a lot, not only regarding explicitness, but also regarding content, this preliminary question must be answered. One question that has been especially prevalent in the literature is the one that says that linguistic awareness constitutes an implicit knowledge that becomes explicit. This notion, according to Levelt and colleagues, clearly refers to Chomsky's theory of linguistic competence. Competence is the tacit knowledge of language — it exists in the form of linguistic intuitions that may, some times, become explicit through questioning or other procedures and that can also take the form of linguistic judgments (with relation to sentence accessibility, etc.).

The question about the age of emergence of linguistic awareness, brought about by Pratt and Grieve (1984) and by Nesdale and Tunmer (1984), like that of explicitness pointed out by Levelt et al. (1978), is considered as one of the most important in the debate. It is also one of the main goals of the present work to look into these questions. Let's check different opinions about the age of emergence of linguistic awareness.

### 2.3.1 Studies about the emergence of linguistic awareness in the middle childhood

Pratt and Grieve (1984) consider that, as it is not possible to expect that children comment explicitly on the language they are acquiring — their limited language prevents them from doing so —, to reach evidences for linguistic awareness in very young children, researches must rely on inferences on what they may be saying or doing. Consequently, many evidences are based on casual observations of spontaneous comments instead of systematic investigation techniques using ways to elicit data. Such observations include speech repairs.

The authors mention the work of Clark and Andersen (1977), which says that metalinguistic awareness plays an important role in children's ability to monitor the adequacy of their speech and to correct their own speech productions. Clark and Andersen suggest that, if children correct their own productions spontaneously when they make a mistake, then there must be some type of monitoring involved, which implies some level of awareness of the rules of language. On the other hand, Pratt and Grieve (1984) say that unless children effectively comment on something about the language, it is hard to know if corrections of this nature appear more like results of tacit knowledge of the children on the rules of the language then as aware knowledge of the rules themselves. In chomskyan terms, this results from an underlying competence or of a tacit knowledge that allows for the production of grammatical sequences without necessarily implying an awareness of the rules involved. In my own opinion, this counterpoint of theses authors goes against what they said previously, when declaring that one cannot expect that children comment explicitly on the language they are acquiring, as their limited language makes it impossible for them to do so. If this is true, then we have to find ways to elicit data that shows linguistic awareness or look for another theory, which explains linguistic awareness without the need of a verbal report of knowledge.

As for the differences between tacit knowledge and explicit knowledge, Tunmer and Herriman (1984) say that, in order to develop a conceptual structure to study the emergence of linguistic awareness in children, it is essential to first distinguish between four concepts that develop outside generative linguistics: *Tacit knowledge*, *linguistic competence*, *linguistic intuitions* and *explicit formulation*. Tacit knowledge refers to the unaware knowledge that speakers have of the group of rules that determine the grammatical acceptance of the sentences of a language. The greatest task of linguists is to develop a system of rules, or a grammar, that represents the knowledge of language of a speaker, which linguists following Chomsky, according to the authors, have been calling *competence*. This knowledge is unconscious in the sense that speakers are not aware of the rules they follow when producing and understanding sentences.

The authors believe that not only speakers are incapable of observing the rules that are used during speech production and comprehension, as they are typically incapable of bringing out these rules to conscious level when thinking about what they said or heard. When judging the linguistic system, which is usually collectively referred to as *linguistic intuitions*, speakers are generally incapable of providing explicit formulations of the underlying rules to their judgments.

As linguists should infer the rules of the judgments that speakers make, as well as the utterances they produce and understand, linguistic intuitions are an important part of the data that linguists analyze when building theories of linguistic competence.

Although linguistic intuitions involve metalinguistic abilities, for these authors they must not be equaled to them. This is an important point to have in mind when evaluating studies that look into the development of metalinguistic abilities in children. It is completely possible that children are able to do metalinguistic operations without being able to make judgments as those of adults, explicit, on the structure and function of language (that is, linguistic intuitions.)

The speakers of a language, according to Tunmer and Herriman (1984), have little or no knowledge of how their linguistic competence is represented in their cognitive system; but speakers do have access to these linguistic rules embodied in the underlying subprocesses of sentence production and comprehension, in which the "access" is defined as the ability to make aware judgments based on operations of this internal mechanism. It is this knowledge that has been referred to as *tacit* knowledge.

The problem involving *tacit* knowledge of the rules of a language, as Pratt and Grieve (1984) state, does also avoid that one gets to clear conclusions of the more formal evidences. In the previously mentioned Berko (1958) study, children revealed some level of knowledge of the rules concerning change in pluralization and verb modification to the past tense. With pluralization, children were able to give a final /-s/ to coined words (for example, *wug - wugs*), which they had never heard before. But for Pratt and Grieve, this cannot be taken as evidence of metalinguistic awareness in children, because the task was not meant to elicit explicit discussion of the changes made to the coined words. Moreover, the development of children may reflect some tacit knowledge of the rules of languagem more specifically then their real awareness of grammatical structure. Some authors disagree with this position, as we will see later on.

Pratt and Grieve (1984) comment that, although there is anecdotal evidence of children observation suggesting that some awareness of language develops very early, there is no support from systematic research. In some cases, systematic investigation suggests that young children do not have specific metalinguistic abilities under verification. Pratt and Grieve say that the results of a series of studies using judgment tasks (de VILLERS and de VILLERS, 1972; GLEITMAN et al., 1972; SCHOLL and RYAN, 1975) show the problems that may be found when children below 5 years of age are invited to judge the grammaticality of sentences. Although ingenious attempts to conduct a child to what is demanded by a task,

young children tend to focus more specifically on the content of a sentence than on its grammatical structure. But the failure to elicit grammatical judgments from small children does not necessarily mean that they are unable of making them. Even if it is the case that syntactic awareness is not yet developed, it is also possible that the techniques used are not sensitive enough to elicit grammatical judgments from small children. So the authors understand that part of the challenge of future research is to find alternative ways to access the metalinguistic awareness of children. That is what many works do, as we will see later on.

All these previous conceptual distinctions will give, as Tunmer and Herriman (1984) believe, the necessary support to evaluate the three views of the nature and development of metalinguistic abilities in children. Each view is distinguished in a general level by the ages in which metalinguistic awareness usually appears. The first view shows that metalinguistic awareness emerges in the beginning of the language acquisition process; the second, that it emerges around the time when formal studies begin; and the third view shows that metalinguistic awareness emerges after the child was introduced to formal studies.

As to the first view, that metalinguistic awareness develops along language acquisition, Tunmer and Herriman mention the model proposed by Marshall and Morton (1978), in which the normal processing of language precedes without awareness of the linguistic structures generated by the mental mechanisms involved in the production and comprehension of language. These mechanisms, whose content is a "mysterious apparatus," are different from EMMA[16], an "Even More Mysterious Apparatus", which monitors the results of the first linguistic processes. The EMMA are, beyond that, defined as any services that monitor the results of the computations of the components of the first performance system without being themselves part of this mechanism. Metalinguistic awareness, on the Marshall and Morton view, can be defined simply as one of EMMA's working. That is, metalinguistic awareness is the result of the operation of error detection mechanisms that have access to subparts of the output of the basic production and comprehension systems. One consequence of this explanation of metalinguistic awareness is that there may not be awareness levels, whether EMMA works or not. In this view, Marshall and Morton (1978) support that metalinguistic awareness develops itself together with language acquisition. In essence, the authors say that it would be a paradox to children to be "aware" of language without such awareness having any useful function. As a solution to this paradox, they try to

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[16] To a more profound reading on this subject, I suggest Tunmer and Herriman (1984) and Marshal and Morton (1978).

place metalinguistic awareness inside the system, saying that it plays an essential role in language acquisition, in the way of feedback mechanisms that monitor language output.

However, to Tumer and Herriman (1984), the argument can be thought of "backwards." If children indeed develop the ability to think consciously and manipulate structural characteristics as a result of acquiring language, then how to explain the big differences in metalinguistic abilities observed in children in their middle childhood (age ranging from 4 to 8 years), differences that contrast with the relative awareness with which children in this age range perform basic linguistic activities? Similarly, if children in this age range are metalinguisticaly aware, although having acquired language (a process that, according to Tunmer and Herriman, is complete at 4 or 5 years of age[17]), and if, as Marshall and Morton (1978) say, EMMA operates in a way that there are no awareness levels, then why do so many children have difficulties when learning to read, a skill in which the metalinguistic abilities are taken as having a more important role?

These questions deserve careful thinking, for, in my view, the fact that children present different levels of difficulty when learning to read is independent of the fact that linguistic awareness develops along with the language acquisition process as, even if someone was to hold the point that linguistic awareness only develops at 6 or 7 years of age (age range in which formal studies begin), children would have already completed the acquisition process in full and the difficulties would be the same. We could attribute the difficulties to the fact that linguistic awareness is still in development. But I believe that the difficulties may not be related only to the lowest or highest awareness level, as other cognitive aspects are also involved in this process. And it is also needed to examine if there are really no awareness levels of linguistic awareness. I disagree, in this aspect, with Marshall and Morton's model.

Tunmer and Herriman believe in the second view, the one in which metalinguistic awareness develops during middle childhood and it is related to a more general change in the processing abilities that occur during this period. According to this view, metalinguistic awareness is, in development terms, a different type of linguistic functioning that emerges during middle childhood. In support to this position, as the authors state, a great deal of researches that has accumulated along time says that middle childhood is the period in which children are able to show a great variety of linguistic abilities that have in common the property of requiring the capacity to think about and manipulate the structural features of

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[17] Although the authors say that this process is complete at 4 or 5 years of age, some researchers (as Karmiloff-Smith (1979c) and Lamprecht (1990)), consider that there are some aspects of language acquisition that go beyond 5 years.

language. More than simply using the linguistic system to produce, comprehend, edit or correct utterances — automatic processes —, the linguistic system *per se* is treated as an object of thinking, with control processes being used to perform mental operations over the products of mental mechanisms involved with normal language processing. Metalinguistic operations differ from the normal linguistic processes in the type of cognitive process exhibited. Automatic processes of the type involved in the production and comprehension of sentences require few or no attention and are done very rapidly, while control processes require more attention and involve an element which is chosen if operations are to be performed or not.

Tunmer and Herriman say that, for example, in the comprehension of an utterance, the listener is not aware of anything that may interfere with being aware of the voice of the speaker and being aware of having understood the utterance, as the processing, in general, is automatic. The listener does not notice things like individual phonemes and words comprised in the utterance, the grouping relations between the words constituents, or if the utterance is structurally ambiguous or synonym to another utterance, unless he thinks about it deliberately, that is, unless he is evoking a control process to think on the structural features of the utterance. Treating language as an object of thought is not an automatic consequence of using the system as a mean of communication.

In addition to this type of involved processing, another distinguishing feature of metalinguistic operations is that its use tends to separate language from its context. Children metalinguistically aware are capable of abstracting themselves from the normal use of language and focus their attention on the properties of language used to convey content more specifically than the content itself. They are capable of analyzing and manipulating aspects of the language that were only previously mastered to listen and produce utterances. As Donaldson (1978) asserts, in early stages of linguistic development, children's perception of what they say — the things to which language refers to — appears in general before their perception of what they are using to talk. That is, before children develop a full awareness of language, language is inserted for them in the continuum of events around them.

Tunmer and Herriman (1984) reveal that studies on the development of phonological awareness show that most 5-year old children and many 6 and 7-year old children are incapable of segmenting words into phonemes (LIBERMAN et al., 1974; HAKES et al., 1980; TUNMER and FLETCHER, 1981; TUNMER and NESDALE, 1982,) even if four weeks-old children may notice small phonetic differences in sounds of speech. Many studies, mentioned by Tunmer and Herriman that show that 6-year old children find difficulties in

separating letters from their referents are consistent with these results (PIAGET, 1929; OSHERSON and MARKMAN, 1975; MARKMAN, 1976; VYGOTSKY, 1962.) Instead of evaluating the arbitrary nature of the relations between the meanings of the words and their phonological productions, young children tend to see words as inherent properties of the objects.

A related result, also mentioned by Tunmer and Herriman, was found by Hakes (1980), who asked children between 4 and 8-year old to judge the acceptability of grammatical and agrammatical sentences. While the oldest children tended to judge the acceptability based on syntactic and semantic features of the sentences, the youngest children were, in general, incapable of dissociating the meaning of a sentence from its form. An examination of the reasons given by the children for their judgments revealed that they tended to judge the acceptability based on the situation described in the sentences and not in the form of the sentences themselves. When the nature of the task asks that children focus their attention in the structure of a sentence, younger children tend to have a poorer result.

The authors believe, like Karmiloff-Smith (1979a) pointed out, that a feature of language development after 5 years of age seems to be a gradual passage of extralinguistic reference to an intralinguistic one, both in the spontaneous utterances as in the later metalinguistic awareness. One possibility that may be taken into account is that both the later linguistic development and the development of metalinguistic abilities are the reflex of an underlying change in the cognitive capacities that occur during this period or, like Karmiloff-Smith (1979b) describes, a "stepping-up" in the "metaprocedimental level".

Linking the later development of language in relation to greater changes in the cognitive development during the period of concrete operations to metalinguistic awareness, Tunmer and Herriman (1984) understand that the abilities to *separate* a word from its reference, *dissociate* the meaning of a sentence from its form, and *abstract* from the normal use of language in the sense of focusing the attention in structural features sound much like what Piaget called the ability to decentralize, or mentally stay out of a situation to think about the relations involved. The essential feature of metalinguistic awareness and concrete operational thinking is the ability to control the course of one's own thinking, which suggests that both may be the reflex of a much more general change in the underlying cognitive capacities, the development of metacognition, which, according to Flavell (1977), consists in the "cognition about cognition."

Two empirical predictions may have derived from these considerations. First, from the suggestion that a broad variety of metalinguistic abilities that develop during middle

childhood is the result of the emergence of a new type of linguistic functioning (that is, the ability to think about and manipulate structural features of language) follows that performances of children in tasks that ask for metalinguistic operations may be positively related one with the other. As different metalinguistic performances may involve abilities that are unique to tasks designed to measure them, we cannot expect to see the same development *value* through different measures. But children whose performance is advanced in one may be advanced in all of them. The second prediction is an extension of the first. If metalinguistic performances reflect an underlying change common to cognitive capacities, that is, if each one of them requires an ability that is metacognitive, then such performances must be correlated with performances in other non-linguistic tasks that also require metacognitive operations.

Tunmer and Herriman (1984) find evidence to support these predictions in studies by Hakes et al. (1980) and Tunmer and Fletcher (1981.) Hakes et al. measured the ability of children aged 4-8 years to judge the acceptability of sentences, to judge the synonym of pairs of sentences, to segment words in their constituent phonemes and to solve standard piagetian tasks. They found that the performances of children in three metalinguistic ability tests and in one concrete operations test were highly correlated. The great increase in reported metalinguistic abilities during middle childhood that coincides with the emergence of concrete operations shows that these two changes may not be isolated events that just happen during the same age period, but are possibly manifestations of an underlying change in cognitive capacities, the emergence of metacognitive control over the information processing system.

The third view states that metalinguistic awareness develops after children have started formal studies and it is decisively the result of learning to read. Tunmer and Heriman say that one of the main proponents of this view is Donaldson (1978.) The author asserts that the formal introduction of studying, especially learning to read, results in an increase in metalinguistic abilities which, soon after, make children able to have great control of their own thinking processes, in a way that they can use cognitive abilities in a broader range of situations. Donaldson does also emphasize that the initial acquisition of reading skills is a means to make the difficult transition from "embedded thinking" to "non-embedded thinking" easier. She believes that the initial reading mastery is more important than it is usually considered to be. According to this author, to speed up the development of cognitive capacities, children should be introduced to reading as soon as possible in the beginning of formal education.

However, Tunmer and Herriman (1984) believe that this hypothesis raises conceptual and empirical problems. While this research does indeed show that there are positive correlations between measures of metalinguistic awareness and reading, this does not answer the question of cause and effect. Based on conceptual reasons, it would seem that the development of metalinguistic awareness is a *pre-requisite* to being able to read. The fundamental task of children in learning to read is to find out how to map the printed text in their existent language, a task that requires the ability to deal explicitly with features of spoken language. Without the metalinguistic ability to think about language, children would not be able to find the properties of spoken language that are central to the correspondence between its written and spoken forms. This would suggest that metalinguistic awareness is a necessary condition, but not a sufficient one to learning to read. We could find children that are metalinguistically aware, but that cannot read; but we could not find children that are not metalinguistically aware and that can read. I agree with the arguments of these authors with respect to the third view.

To finish with this question, Tunmer and Herriman (1984) suggest that, based on the available conceptual models and empirical researches, the most acceptable view is the second one, which says that metalinguistic awareness is a distinct type of linguistic functioning as to the developmental question, which emerges during middle childhood and that is related to a much broader change in the information processing capabilities, which occur during this period.

Recalling the three views, Nesdale and Tunmer (1984) consider that these different metalinguistic awareness notions have important methodological implications. One of them is about the age at which children start to show metalinguistic awareness and the age range in which this ability develops. According to the first approach previously mentioned, the researcher could expect to find metalinguistic awareness evidences when children first start to speak, approximately around the age of 18 months; but, according to the third view, researchers would expect to see the emergence of metalinguistic awareness only after the beginning of formal education. The consequence of this is that researchers would need to develop appropriate techniques for the age of the children taking the tests. And besides that, to access the different conceptual points of view it would be necessary to develop techniques that could account for age range, which dimension goes from 18 months up to 8 years old or more.

The three approaches have different implications as to the extension of the tasks that children have to take to show any level of competence in relation to metalinguistic awareness, and to the procedures used to access the children's competence.

Nesdale and Turner, on a methodological point of view, say that, just like in any research, the researcher wishes to use a method that reduces the probability of Type I Errors or false positive errors[18] and that, at the same time, the researcher also wishes to avoid being too conservative and raising the risk of Type II Errors or false positive errors. However, while the controlled experiment may be used with some success in children in middle childhood (that is, the age at which metalinguistic awareness emerges, according to the second and third views), its use is considerably more problematic with younger children of the specified group in the first of the conceptual approaches previously presented. More specifically, as the age of the tested children decreases, the use of controlled experiments with their standard procedures raises the probability that their linguistic abilities or maybe their memory or their cognitive abilities are not enough to be up to what is demanded by the experimental situation. In other words, with younger children, the probability of Type I Errors raises up in controlled experiments. For example, as very young children are still in the process of language acquisition, and are also still developing their cognitive abilities, they may not be able to understand the question that is presented to them or do not understand the kind of answer they are expected to give, even if they do have the relevant metalinguistic ability. Consequently, their answers, under these conditions, undervalue their true skill. Some studies, like those of Gleitman et al. (1972), Fox and Routh (1975), Smith and Tager-Flusberg (1982) and Chaney (1992), that will be presented later, will try to adapt the tests to younger children, in the sense of reverting this situation of children not revealing their capabilities because of the difficulty level of the tests and, not necessarily, because they just do not have them.

### 2.3.2 Studies about the emergence of linguistic awareness in younger children

One of the first studies about children's linguistic awareness, the one in which all others here presented are based on, is that of Gleitman, Gleitman and Shipley (1972), *The emergence of the child as grammarian*. The authors explain that their article is focused on one aspect of linguistic development, which is the ability of the speaker to think about the rules

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[18] In statistical terminology, a Type I Error means rejection of the null hypothesis, believing in the research hypothesis by mistake. The Type II Error, in contrast, implies in not rejecting the null hypothesis when it is in fact false, rejecting then the research hypothesis, which would be right.

that he or she follows. Their main concern is the emergence of this ability in children. They verified if children 5, 6 or 7-years old have this ability in extraordinary levels and if some level of this ability can be seen in a 2-year old child.

Gleitman et al. believe that, at first glance, it may seem a bit of a paradox to researchers of cognitive development in the early years of linguistic development in pre-school children to understand that, if language is simply a tool of thinking, then it is surprising that linguistic abilities seem to emerge so earlier than other cognitive abilities. As they explain, the progress of children as to logic, to conviction in quantity conservation, to the concept of number seem so painfully slow, but any mother can attest the jumps in apparently abstract thinking in the fields of syntax and phonology. No 3-year old child says the syllables so bad that he or she does not feel capable of using child speech with dolls and other socially inferior individuals. The authors understand that these aspects of child competence are rarely studied, in part due to the belief that it is impossible to deal with them experimentally. However, they explain that through anecdotal data it is easy to point out cases where children show a great sensibility to identify subtle language features.

In their study, Gleitman et al. (1972) show that the ability to think about linguistic structures is available to some very young children. First, the authors show the basics of this abstract attitude at the age of 2. Then, they document the evolution of this ability in children in school age. The results of their analysis reveal that every child showed, at minimum, a foggy ability to think about language. Even 2-year old children presented non-random classification of simple sentences: The fact that they stepped up, proposing "silly" sentences to their mothers is an evidence, according to the authors, that there is, at minimum, the basics of metalinguistic ability.

These authors got to the conclusion that the ability to think about language increases a lot with age. Older children were better not only in noticing deviations in the sentences, but also in explaining where the deviations were.

Another pioneer work in the sense of showing that young children have metalinguistic abilities is that of Fox and Routh (1975). In this work, 50 children from 3 to 7 years were asked to repeat spoken sentences and then split them into words, then the words into syllables and finnaly syllables into sounds. The study is focused on the development of the ability of children to split sentences into words, words into syllables and syllables into phonemic unities. The procedure used by the researchers was feasible and showed that, in general, children do have this ability in younger ages than previous studies had verified. This result is due to the techniques used, which had less cognitive requirements. 3-year old children were

able to split most sentences and to split most of the words into sub-unities. At the ages of 5 or 6, children were able to do this task with fewer errors.

Bialystok (1986) did a research on the factors of development of linguistic awareness with 119 children, at the age range from 5 tp 9[19]. Approximately half of these children were bilingual. In her study, among other goals, she was checking the differences between monolingual and bilingual children. In the tasks, children were asked to judge if sentences were grammatical (G) or not (g), and if the sentences were meaningful (M) or not (m) due to their syntactic acceptability, independently of their meaning. This work gives evidences that children do answer systematically to a metalinguistic task, even at the age of 5. This contradicts models in which metalinguistic awareness is described as a conceptual revolution that goes on sometimes around the age of 7. The notion of metalinguistic ability is, then, replaced by a description of a progressive linguistic development in which analyzed concepts may be intentionally applied under varied contextual demands.

Although, according to Bialystock (1986), the idea of metalinguistic ability had evolved from a variety of cognitive and linguistic realizations, the precise nature of this capacity or group of capacities that constitutes metalinguistic ability has never had a consensual definition. Scribner and Cole (1981), mentioned by the author, concluded that metalinguistic ability cannot be considered "a general guidance for language or a unitary group of abilities," but a "highly diversified collection of knowledge and abilities."

In the design proposed by Bialystock, metalinguistic awareness is treated as a reflection of the growth of the two components of abilities involved in language processing — the analysis of linguistic knowledge in structured categories and the control of attention procedures to select and process specific linguistic information (Bialystok and Ryan, 1985.)

The designation of these as the two components of abilities involved in language processing has three implications. First, language development, from the earliest stages to the more complex ones, involves both aspects of processing. Second, different uses of language may be described by its differentiated efficacy in these components of separable abilities. Third, metalinguistic ability refers to that portion of language development to which high levels of both the components are required. So, a metalinguistic task is considered as a problem whose solution requires relatively high demands of these components of abilities. In these terms, the heterogeneity between metalinguistic performances is explained in terms of the differences in specific demands of the task in relation to its dependence of the two

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[19] 5 years old (Kindergarten), 7 years old (1st grade) and 9 years old (3rd grade).

components of separable abilities. Although metalinguistic tasks in general demand high levels of both components, differences in the level of dependence produce systematic differences in the difficulty of the tasks and, so, variability in the performance of children in a battery of metalinguistic tasks.

Linguistic knowledge analyses are the component of the ability responsible for making explicit those representations that were first implicit or intuitive. Some emerging aspects of linguistic structure are the knowledge of speech unities (that is, syllables and phonemes,) the understanding of form and meaning relations (the "sun-moon" problem[20]) studied by Piaget (1929), Vygotsky (1934) and Scribner and Cole (1981) and syntax awareness (grammaticality judgment and error correction.) In opposition to ordinary conversation, in which non-analyzed representations are adequate, metalinguistic tasks are usually designed so that the solution is achieved only if the relevant structure is explicitly known.

The development of the control of linguistic processing, according to Bialystok (1986), reflects the ability of children to intentionally consider the relevant aspects of language for problem solving. Just as the height of a glass is prominent by means of perception in the problem of liquid conservation, so is meaning in most oral languages directed to children. Moreover, most metalinguistic problems require that children focus only in form (repeating structured inventions, counting words in sentences, detecting rhymes and so on) or, less commonly, only in meaning (synonym and paraphrase judgments). Purposefully suspending meaning or form requires control of linguistic processing.

The manipulation of the analysis control requirements in the different versions of the grammaticality judgment task was reflected in the problem of the difficulty of the tasks proposed in the Bialystok's (1986) study. The correction task, which required more analysis of linguistic knowledge, was harder than the judgment task for the two youngest groups, but both tasks were of equivalent difficulty for the older children. They developed previously sufficiently analyzed structures to correct sentences as to judge their grammaticality. The incongruent items (gM, gm) in judgment tasks, which demanded more control of linguistic processing, were harder than the congruent items (GM, gm). The Gm items were especially harder for monolingual children, but consistently easier for bilingual children. Similarly, ignoring the irregular meaning in the correction task, according to the instructions in the sense

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[20] Test where the researcher proposes that the child change the name of the sun and the moon. The sun is then called moon and vice-versa. The goal of this test is to verify the capacity of children to dissociate word and referent. From the moment in which the child accepts the challenge on, the researcher asks questions like: "What shines during the day?" The child has to answer, paying attention to the name change.

of accepting the meaning score, was harder than repairing grammar to accept the grammaticality score.

The congruent items were clearly well-mastered by both groups at 7 years of age. In this case, a "meaning-only" or "grammar-only" strategy is adequate to get to the solution. For the incongruent items, both values for grammar and meaning must be isolated and judgments intentionally applied only to grammar. In these problems, there is no strong improving in any grade, with some items showing a U curve effect[21].

Another important author that supports the emergence of metalinguistic abilities very early on is Eve Clark. Clark (1978) says that children start to think about some properties of language in a very young age. According to her, the study of what children are aware of gives a way to find out what are their conceptions about what language is. But this requires that we first establish which thinking abilities they possess, how and when they are ready to develop, and which role they play in the acquisition process itself.

People, as supported by Clark, may be aware of their language in different levels, from the virtually unaware, automatic monitoring of their own speech to the fast change of languages in professional translation or in a detailed and analytic work by linguists. The first signs of an ability to think about language begin to show up around two years of age. This includes:

(i) Spontaneous correction of their own pronunciation, word form, word order and even change of languages in the case of bilingual individuals;

(ii) Questions about the correct words, the right pronunciation and the appropriate speech style;

(iii) Comments on other people's speeches: Their pronunciation, accent and the language they speak;

(iv) Comments on games with different linguistic unities, word segmentation into syllables and sounds, rhymes and games with words;

(v) Judgment of linguistic structure and functions, decision of what utterances mean, if they are appropriate or polite, if they are grammatical;

(vi) Questions about other languages and language in general.

Clark considers that, although a list like this seems to make it simple and direct the study of children awareness, the criteria to access awareness is not always clear. She adds that

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[21] To get more information about the U curve effect, I suggest Strauss (1982).

sometimes it is difficult, for example, to distinguish implicit judgments of daily use of language.  We can think of a 2-year old child that answers to well-formed commands (like "Throw the ball!"), but not to telegraphic ones ("Throw ball!" or "Ball!"). The differentiation between these two types of command may be the result of awareness to differences of form in some level. But, equally, it may be the result of the understanding of a single element of command. Using language is not the same as thinking about it. It is more likely to see older children using explicit judgments about language and their questions about language are more obviously thoughtful.

Another sign that children are aware of language is their adhesion to rules and to producing them. When introduced to unfamiliar coined words, for instance, they may add the appropriate plural, possessive or past tense endings. Their ability to do so, like many have pointed out, is a measure of their knowledge of general rules of specific flexions appliance. Berko (1958), using coined words that children could not have heard before, was able to show that 5 and 7-year old children applied the appropriate English noun and verb terminations. They had a harder time with comparative (-*er*) and superlative (-*est*) terminations.

In a similar study with Russian children, Bogoyalenskiy (1957/1973), cited by Clark, used the names of various objects and asked 5 and 6-year old children how they would call a baby ostrich, a baby tree, a baby nose, etc., to check if they could provide the appropriate diminutive endings. Every child was successful, although they may not have distinguished between the diminutives that are normally applied only to animal names and those that are not that restrict.

Clark (1978) says that even younger children can sometimes give impressive evidence that they master the ending of a specific word. They overgeneralize and apply the ending to words that would not take them, producing every English past tense, for instance, like the –ed suffix in "breaked," "goed," and "doed," along with "jumped," "walked" and "wanted."

The correct use of the rule, however, requires distinguishing between implicit knowledge for daily use and awareness. The addition of a word ending is simply the content of daily use. Children are always learning new words. However, deciding out of context which terminations can be applied apparently requires some level of awareness. Only when children start to make explicit comments on word ending or about irregular paradigms we can say without fear of mistake that they are thinking about their language.

The different types of awareness discovered by Clark are classified according to the metacognitive abilities involved. These abilities were listed in emergence order, from the most to the least basic one. The first is the ability to *monitor* their own utterances. This

activity is a pre-requisite for spontaneous correction, the practice and adjusts of their speech style to different listeners. Another ability is to *verify* the result of someone's utterances. Even very young children check if their listeners understood them and, if not, they try again. Especially later, they begin to comment in an explicit way about their own utterances and those of others. They also correct other people. Another ability yet is to *test reality*: Children verify if a certain word or sentence "worked," in the sense of making the listener understand what they are saying. A fourth ability is the one that underlies deliberate attempts to learn the language. Children practice not only sounds and sentence structures, but also speech styles characteristic of different roles.

The two last abilities listed in Chart 5 seem to emerge later than the others. When *predict* the consequences of the use of certain forms, children use language or make judgment about it out of context. They provide the appropriate inflections to show plural, past tense or diminutives; they judge utterances as appropriate to certain environments or speakers; and they correct sentences that are wrong. Finally, when *thinking* about the product of an utterance, children may be using what they were never asked to do in other forms of metacognition. With language, it is possible to think about the structure of independent language and its effective use. Children identify specific linguistic unities — anything from a sound to a sentence, they provide the definitions of words, invent games and riddles and explore other forms of verbal humor, besides explaining why some sentences are possible and how they can or cannot be interpreted.

| |
|---|
| 1. Utterance monitoring<br>    a. Spontaneous correction of their own speech;<br>    b. Practicing sounds, words and sentences;<br>    c. Adjusting speech according to the listener's age and status (and spoken language). |
| 2. Utterance results verification<br>    a. Watching if the listener understood it or not (and correct it if necessary);<br>    b. Comment on their own utterances and those of others;<br>    c. Correcting other people's utterances. |
| 3. Reality test<br>    a. Deciding if a word or description works or not (and, if not, then |

| |
|---|
| trying another one). |
| 4. Deliberate attempt to learn<br>    a. Practicing new sounds, words and sentences;<br>    b. Role-playing "voices" for different roles. |
| 5. Inflections, words, phrases or sentences consequence prediction<br>    a. Applying flexions to new words out of context;<br>    b. Judging, out of context, which utterance would be more polite or which one is more appropriate for a certain speaker;<br>    c. Correcting word-order or word-building in sentences previously judged as "silly". |
| 6. Thinking about the results of an utterance<br>    a. Identifing linguistic unities (sentences, words, syllables, sounds);<br>    b. Providing definitions;<br>    c. Creating games and riddles.<br>    d. Explaining the reason why certain sentences are possible and how they could be interpreted. |

Chart 5: Metacognitive abilities and language awareness
Source: Clark, 1978.

In Chart 5 Clark captures the development of different phenomena, from the most basic to the most complex one, under each metacognitive ability. Clark points out that, given the incomplete nature of the available data, this order is temporary.

When mentioning the difficulty to distinguish between the ordinary use of language and implicit knowledge when some level of prediction can play a role, Clark analyses the English tense inflection acquisition. It could be said that, according to the author, in order to apply the right tense inflections, 2-year old children must be aware of this appliance at some level to identify it and select it instead of applying other possible inflection that denote complete actions. However, not before 5 years of age, at least, children seem to be capable of identifying the *–ed* ending explicitly as the linguistic unity that adds a meaning of past tense and to judge the appropriate past tense forms of strong verbs like *bring*. Similarly, they show implicit knowledge of different linguistic unities — words, syllables and phonetic segments — long before they can think explicitly about these units. Implicit knowledge, then, holds some similarities with the first stage in Vygotsky's (1962) knowledge acquisition, which is a virtually automatic, unaware acquisition. This contrasts with later improvement through activity, aware control over acquired knowledge — Vygotsky's second stage.

Slobin (1978), with examples of spontaneous speech from his daughter, Heida, shows that children from 2:9 to 5:7 also reveal metalinguistic abilities in a very early age. The author believes that, along with the development of language itself, the capacity to concern about language and speech emerges as an object of thought. The development of language awareness is part of a general development of awareness and self-awareness. He distinguishes, just like Clark (1978), levels of metalinguistic capacity, from a foggy awareness or speech monitoring of pre-aware speech that underlies self-repair to the focused and analytic work of linguists. A big part of this road is taken during the first school years. The following aspects of language awareness appear between 2 and 6 years of age:

| |
|---|
| 1. self-repairs and rephrasing during speech; |
| 2. comments on other people's speech (pronunciation, dialect, language, meaning, style); |
| 3. explicit questions on speech and language; |
| 4. comments on one's own speech and language; |
| 5. answers to direct questions about language. |

Chart 6: Aspects of language awareness
Source: Slobin, 1978.

To Berthoud-Papandropoulou (1978), from diary studies as well as experiments, she states that it is clear that children think about language well before they have any formal teaching on grammar: Spontaneously and in answers to questioning, they make observations on pronunciation, about morphology, they correct other speakers, observe meaning and form, and they even create games. The author questions: But do children think about the language in a more "philosophical" way? Do they have ideas about essential properties that make natural language unique as a means of communication and representation? The author understands that this metalinguistic activity can be considered as part of a general cognitive activity scheme for two reasons. The first one is that language, due to its nature, is a product of human cognition as well as a representational system that children have to build and learn how to use. The second one is that the fact that language is transformed in an object of human thought is a manifestation of a general structure of knowledge that happens during cognitive development.

According to Smith and Tager-Flusberg (1982), there is a great interest among developmental psychologists in the development of metalinguistic awareness, that is, in the development of the ability of children to think about language as an object. According to

these authors, one of the main focus of this study is the age of the metalinguistic intuition acquisition studied, and the most frequent conclusion is that the ability to make metalinguistic judgments is a rather late development and is related to other aspects of linguistic development. They present two views: The autonomy hypothesis and the interaction one. The first hypothesis emphasizes the distinction between initial acquisition of spoken language and the development of metalinguistic awareness. According to this hypothesis, initial acquisition of basic comprehension and production processes by children develops independently from the metalinguistic awareness development. The real meaning of metalinguistic development, in this perspective, is making it easier to produce later linguistic productions: Writing acquisition, learning a second language and the development of social skills with or through language use. Two things support the autonomy hypothesis of linguistic and metalinguistic awareness: a) the acquisition and basic comprehension of production processes do not require awareness, but learning the alphabetic system does; and b) the abilities to use spoken language and the abilities to judge language do not develop at the same time.

According to Smith and Tager-Flusberg (1982), basic theoretic and empiric arguments can be given to support the autonomy hypothesis. However, they say that there are some potential problems with both arguments. First, they say that it must be noted that the age at which children begin to make explicit judgments on language form is still open, although many authors say that these abilities are observable only in middle childhood. Smith and Tager-Flusberg report that many studies verified the great difficulty that preschool children have with tasks that demand that they make explicit judgment about the form of linguistic utterances. But there also many researchers who succeeded in simplifying these tasks to make them more accessible to preschool children. Second, the authors consider that the idea of concrete operations is under discussion in developmental psychology. Some psychologists have said that decentralization[22] should not be thought as a unique ability that emerges in a specific development period. If these psychologists are right, as Smith and Tager-Flusberg point out, then there are fewer reasons to think that the ability to make metalinguistic judgments emerges at once during middle childhood.

The interaction hypothesis presents an alternative view of the relation between linguistic and metalinguistic development. According to this hypothesis, basic comprehension and production processes acquisition by children is influenced by the development of metalinguistic awareness and, reciprocally, metalinguistic development is influenced by

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[22] Piagetian theory terminology, as explained previously.

linguistic development. Two points support the interaction hypothesis: a) metalinguistic awareness plays an important role in language acquisition during the preschool period and also in later aspects of linguistic development, like learning to read; and b) preschool children, as well as older children, have metalinguistic abilities.

Under this perspective, theoretic and empiric arguments follow. Theoretically speaking, the authors mention Marshall and Morton (1978) and their "complicated" machine, responsible for natural language production and comprehension, in which many different types of processes may not work properly. One of the important functions of metalinguistic awareness, according to these authors, is to help finding problems and correcting the processes through monitoring when communication fails and also through the analysis of which specific part of an utterance requires revision, correction or improving.

In empirical terms, strong arguments in favor of interaction hypothesis are those of Clark (1978) and Slobin (1978), studies which we explored previously. Smith and Tager-Flusberg consider that these works are especially important for reminding us that metalinguistic awareness can be elicited in a variety of ways, not only in formal tasks. However, Smith and Tager-Flusberg (1982) consider that Clark, although giving support for the interaction hypothesis when suggesting that linguistic and metalinguistic development superimposes one over the other in relation to time more usually then it is usually assumed so, did not examine the correlation between basic linguistic development and the monitoring abilities of children. A work focused on this correlation, in their opinion, could provide evidence in favor of the interaction hypothesis, as it is possible that these two simultaneous developments are autonomous. Moreover, they argument that none of the two hypothesis has been given, up to the moment, any decisive support.

To fill this gap, Smith and Tager-Flusberg (1982) developed an important study, whose focus was to evaluate these hypotheses, investigating 3 and 4-year old children's abilities from an ample variety of metalinguistic judgment tasks and from the correlation between their performances in these tasks and in a broader series of basic linguistic development measures. The 36 children were given 6 metalinguistic tasks, which included speech sound judgment tasks, word judgment tasks, word-referent differentiation, syntactic judgment tasks (morphemes and word order) and two measures of linguistic development: the *Peabody Picture Vocabulary Test* and a sentence comprehension task. The results showed that 3 and 4-year old children are able of making metalinguistic judgments and that there is a significant correlation between their performance in these tasks and their scores in linguistic development measures. This result is very interesting because it suggests that preschool

children have metalinguistic capacities much ampler then it was previously assumed, and because it also suggests these capacities relate to basic linguistic development during school years — what seems to reinforce the body of arguments in favor of the interaction hypothesis.

Chaney (1992) also presents a valuable work in defense of the interaction hypothesis and of the idea that young children are capable of revealing metalinguistic capacities. The author explains that, although the performance of children in metalinguistic tasks improves with age, like Hakes (1980) and Liberman et al. (1974) state, the generally poor/unsatisfactory performance of younger children has lead many researchers to conclude that preschool children lack the ability to dissociate form and meaning, and that metalinguistic awareness is some kind of distinct linguistic ability that emerges after the 6 years of age. On the other hand, a considerable number of observation recordings gives support to the hypothesis that the emergence of metalinguistic ability may happen before that. Chaney (1988), Slobin (1978), van Kleek and Bryant (1983) and van Kleek and Schuele (1987) offered a series of examples of spontaneous speech in which 2 and 3-year old children performed metalinguistic feats. These examples of spontaneous speech vary in their metalinguistic complexity. Spontaneous correction and games with sounds are somewhat automatic and may not require that the child think about the utterances awareness; self-repairs and games with sounds may be considered at the border of awareness. Cases in which children show their knowledge of linguistic structures (that is, rhymes, creation of new words or questions about word boundary show, at last, a rudimentary awareness, although children may be incapable of describing what they know. Chaney ponders that, when children begin to comment about structural aspects of utterances they are clearly showing a complex awareness of language forms.

The fact is that, although research on metalinguistic development that uses experimental tasks concludes that metalinguistic abilities do not develop before middle childhood, metalinguistic awareness has been documented in children much younger with evidences in anecdotal and diary studies.

To explain why researches show this apparent discrepancy with relation to the age in which linguistic awareness emerges, Chaney considers that, first, the goals are a bit different in these two types of research. Experimental tasks prove the mastering of an ability with a number of children, usually establishing some criteria, like percentages of correct forms, while spontaneous data show the initial emergence of an ability in one or many children. I consider that, to the perspectives of the present work, the argument that spontaneous data represent the emergence of linguistic awareness is crucial. Second, experimental tasks used to determine metalinguistic abilities may very well be too complex to allow that these abilities

are actually shown. Solving metalinguistic problems, as Chaney reminds us, requires two different abilities: (1) analyzed linguist knowledge, the ability to represent the structures of a language besides their meanings; and (2) cognitive control, the ability to select and keep information in memory and coordinating it in problem solving. These two aspects are explained by Bialystock (1986), as we presented previously. Failure of younger children in some tasks may be due to lack of analyzed linguistic knowledge or, equally plausible, due to the amount of cognitive control demanded by the task.

Chaney (1992) also deems that few researchers were able to succeed in modifying some metalinguistic experimental tasks to make them more accessible to younger children (CHANEY, 1989; de VILLIERS and de VILLIERS, 1972; FOX and ROUTH, 1975; 1984; SMITH and TAGER-FLUTSBERG, 1982; TUNMER, BOWEY and GRIEVE, 1983). These researchers limited or carefully controlled the complexity of the linguistic input, avoiding the use of metalinguistic terminology and providing demonstrations and practical questioning; these procedures resulted in a perfected performance by younger children. According to the results of these authors, most children were able to make metalinguistic judgments and the number of tasks by which they could pass improved with age. These studies show that preschool children can make metalinguistic judgments and productions when demands of cognitive control are not that high, and that metalinguistic knowledge emerges gradually and not abruptly. The fundamental question seems to be, according to Chaney, if, while many studies focused on the mastering of metalinguistic ability stage, some researchers and theorists paid attention to the development stages of linguistic awareness.

The aim of Chaney's (1992) study was to keep on describing metalinguistic abilities of younger children and to explore the stages at which metalinguistic abilities are acquired. The hypothesis is that, if preschool children can show that they think about phonemes, words and sentence structures, this can provide convincing evidence that basic metalinguistic abilities are acquired gradually in the beginning of childhood instead of abruptly in middle childhood. The second aim of the research was to examine the correlations between initial metalinguistic abilities, normal linguistic development and emergent alphabetization knowledge. Positive correlations would support the interaction hypothesis, explained by Smith and Tager-Flusberg (1982), showing the interrelations of these various ability developments. To carry on these goals, 3-year old children were given four linguistic development tests, two alphabetization knowledge tests and a broad quantity of metalinguistic tasks, including judgment and production tasks of each domain: Phonological awareness, word awareness and structure awareness. The tasks varied in the level of metalinguistic complexity; some were designed to

account for the supposedly easier abilities of speech error correction and games with language, while others were meant to make a more complex analysis and for synthesis of linguistic structures. 43 children (22 boys and 21 girls, whose average age was 3:8), took part in the research.

All metalinguistic tasks were simplified to make them accessible to 3-year old children, by difficult level of vocabulary control, using simple linguistic structures, avoiding the use of metalinguistic terms in the instructions whenever possible. The tasks were preceded by demonstration and practice to raise the chance of success of the children and to lower the errors due to variables extern to the task.

The first result was that most 3-year old children were capable of making many metalinguistic judgments and productions, refuting the statement that metalinguistic abilities do not emerge before middle childhood. The second result was that all metalinguistic performance (the combined scores of phonological awareness, of word awareness and of structure awareness) improved with age in months, as well as the performance in the following metalinguistic tasks: Phonemes, rhyme judgment, word segmentation, coined/real words, word/referent differentiation, morphemes and syntax. These data, according to Chaney, come from convincing evidences that metalinguistic abilities do not emerge abruptly, but increase gradually during the language acquisition process. The third result was that many tasks showed to be consistent in their general difficulty order, what may be a developmental sequence indicative.

To Chaney, it is justifiable that, if children could show the ability to think about language in an ample variety of tasks, this could give convincing evidence that basic metalinguistic abilities are acquired in the beginning of childhood. The results showed that approximately every preschool child could make some judgments and productions, showing that they are learning to think about the forms of language as well as about meanings. The children had varied their metalinguistic abilities, with some 3-year old showing sophisticated complexity in their metalinguistic judgments and in language use. These results, taken along with those of Smith and Tager-Flusberg (1982) make it clear that metalinguistic abilities do not emerge abruptly after the 6 or 8 years of age, but develop early in preschool years. The findings — all the metalinguistic performance improved with age, even among 3-year olds, and certain abilities, like phoneme judgment and correction, phoneme synthesis and morphology and syntax judgments, which are already well-developed in younger subjects — are strong indication that the age ranging from 2 to 4 years of age is a very active stage of metalinguistic learning. Furthermore, the results showed that 3-year old children are able of

doing a series of metalinguistic judgments and productions and that there is a significant relation between their performance in metalinguistic tasks and their linguistic development as a whole.

Going back to the Smith and Tager-Flutsberg (1982) hypothesis, Chaney says that the interaction hypothesis is better to account for the data and offers a much richer view of metalinguistic awareness acquisition then that of the autonomy hypothesis.

On what follows, we will turn to studies about morphological awareness.


## 2.4 MORPHOLOGICAL AWARENESS


The search on the literature for studies about morphological awareness leads us to a conclusion: few are the works on the theme, especially in relation to Brazilian Portuguese (BP). This is also the conclusion of Mota (2009), in her recent work about metalinguistic development. The author states that in the specific case of Brazilian Portuguese, few studies have investigated the development of morphological awareness. Mota also mentions that those who did so were focused in the relation between orthography and morphosyntax[23]. This was my conclusion as well.

It is not the aim of the present work to talk about the relation between morphological awareness and the writing and reading processes. However, I will bring some studies on the topic, looking for important concepts that may help us to build an argument around what morphological awareness is.

Carslile, one of the most respected researchers of morphological awareness, developed a study about structure and derived word meaning awareness and the relation of these forms of morphological awareness to word reading and reading comprehension (CARSLILE, 2000).

The author states that, as morphemes are meaning unities, a central question is how awareness of word structure is related to the comprehension of the meaning of words morphologically complex and how these forms of morphological awareness are related to reading comprehension. The expectation is that this morphological analysis and the reasoning (especially of derived forms) contribute to the understanding of written texts if the students

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[23] There are Brazilian researchers who investigate the relationship between othografy and morphology and morphosyntax, like Jane Correa, Taiçara Farias Canêz Duarte and Antônio Roazzi.

were aware of the morphological components of words both as to their meaning and to their grammatical roles.

Carlisle comments that researches (like that of SCHREUDER and BAAYEN, 1995) on mental lexical organization and on lexical access aspects suggest that morphological processing works towards the goal of computing meaning from constituent components. Structural analyses by themselves may be misleading, as words may sound (or seem) similar, but are not morphologically related (like "bear" and "beard"[24]). The importance of meaning similarity is emphasized by the exploratory research with psychological bases for determining relations conducted by Derwing (1976). He found that semantic similarity was more important than phonetic similarity, but that phonetic similarity influenced the relation judgments by children more than that by older students or adults.

As morphological awareness, according to Carlisle (2000), contributes to reading, it must have as its bases the ability to analyze words and constituent morphemes with the goal of building meaning. Thinking about these expectations, some researchers reported developmental improvement in morphological structure awareness and its link with word meaning. Student understanding of changes in structure and derived forms meaning can be affected by structure transparency and suffix productivity (CARSLILE, 1988; CHAMPION, 1997; TYLER and NAGY, 1989). Transparency and productivity have been related to the success in interpretation and in formation of derivations in meaning contexts. Carslile (1988) found that, when there were errors in derived forms production, the younger students several times applied a common, productive suffixes, that do not require changes (that is, when given a word like *produce* and a sentence context, the student said *producement* instead of *production*[25]).

In the sense of gathering more information in relation to structure and morphologically complex word meaning awareness, Carlisle (2000) included in her study structural analysis (form derivation and decomposition) and definition tasks. Snow (1990) and others (like LITOWITZ, 1976) revealed that word definition demand metalinguistic capacities; students must treat words like objects of thought, integrating linguistic properties and contexts that they retrieve from memory.

In her study, Carlisle (2000) applied a series of tests, including a word reading test, a morphological structure test and a vocabulary knowledge test to 34 3rd grade students (18

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[24] Examples provided by Carlisle (2000).

[25] An example of Portuguese would be, given a word like *demorar* and a sentence context like "Demorar demais acabou em…," the student would produce *demoradamento* instead of *demora*.

boys and 16 girls) and to 26 5th grade students (10 boys and 16 girls.) Her results revealed, in addition to the preexistent literature, that the ability to decompose morphologically complex words appears only in children above the 4th grade, and that for both 3rd graders as well as for 5th graders there is a significant link between structure awareness and the ability to define morphologically complex words. Moreover, the study also found that, for both grades, the morphological measures contributed significantly for reading comprehension.

Carslile and Nomanbhoy (1993) investigated younger children, 1st graders, and stated that most of them are still mastering the expression of inflectional aspects, but they may be learning derivational affixes that are productive (that is, useful in making series of different words) and transparent derived words (that is, the sound of the base form is preserved in the derived counterpart.) The authors mention the study of Jones (1991), which suggests that children are learning categorical sound changes in relation to meaning and grammatical roles. Phonemic awareness acquisition apparently makes such learning easier; children who can count or manipulate word syllables, but that cannot isolate phonemes, may have problems in manipulating derivational and flexional suffixes that vary in phonetic representation. So, the authors predict that children who lack phonemic awareness may be left behind in relation to their peers in morphological learning, as well as in their mastering of the alphabetic code. In this work, there is a clear suggestion of the relation between semantics and morphology and between morphology and phonology, as we will see in the tests' responses in the Chapter 4.

The semantic and phonological transparencies, as Carlisle and Nomanbhoy (1993) explain, help the child to be aware of morphological relations (CARLISLE, 1988; DERWING and BAKER, 1979; TYLER, 1987.) If, following the Nagy and Anderson (1984) example mentioned by the authors, morphologically related words are understood in a continuum from semantic transparency (like in *red* and *redness*[26]) to semantic opacity (like in *apply* and *appliance*[27]), it is expected that children notice the relation between the transparently related words. In fact, as far as the semantic link goes, less probably children or adults will judge that two words are morphologically related. The vision of the two authors suggests that phonological sensitivity may give a base to morphological learning, but that linguistic knowledge (semantic and syntactic) may be a significant aspect of morphological awareness in the beginning of the 1st grade.

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[26] In Portuguese, I could mention the *alegre – alegremente* example, in which the base and the derived word are semanticaly related.

[27] In Portuguese, I could exemplify this kind of relation with *casa – casaco*, in which the bases are different and there is no morphological relationship between them.

With relation to the type of tasks, Carlisle and Nomabhoy say that, in general, the performance in production tasks seems to distinguish good and poor readers more clearly than the performance in judgment/comprehension tasks. In their study, the group of 101 children (59 boys and 42 girls) did significantly better with inflected forms than with transparent derived ones, and better with transparent derived forms than with derived ones with phonological changes, as expected. It is interesting that 1$^{st}$ graders were able to produce around 41% of transparent derived forms, which gives evidence that the more productive inflected and derived forms are, in some measure, being mastered. This result reveals that inflected form tasks are easier for children than the derived forms.

Deacon and Kirby (2004) also concluded that morphological awareness of inflections and simple derivations may emerge earlier, while an understanding of more complex derivational relations may appear later. These authors were investigating if morphological awareness could not be "more phonological." The authors say that, given the role played by phonological awareness in reading development, it is critical to establish if morphological awareness is not simply "more phonological" — that is, that the relation between morphological awareness and reading operates independently from phonological awareness. They believe, then, that the studies that control phonological awareness and verbal and non-verbal intelligence are necessary. In their study, they applied phonological and morphological awareness tasks and verbal and non-verbal intelligence measurements, as well as reading measurements to 143 children from 2$^{nd}$ to 5$^{th}$ grade. The results revealed that morphological awareness brought a small but significant contribution to the development of reading and, besides, that morphological awareness is not just "more phonological", it makes a contribution above and beyond phonological awareness.

Nunes, Bindman and Bryant (1997), exploring the relation between morphological awareness and orthography, developed a study in which they found five stages of orthography development. This longitudinal study gathered 363 children of the 2$^{nd}$, 3$^{rd}$ and 4$^{th}$ grades, which were observed for 3 years, 3 times a year. The following tasks were applied: One orthography task in which children had to spell 30 words (10 words were verbs that have regular past tenses, which end in -ed; 10 were verbs with irregular past tenses, with their final consonant being spelt phonetically; and 10 were non-verbs, with their final consonant also being spelt phonetically); and three grammatical awareness tasks (sentence analogy task, word analogy task and productive morphology task.) The data suggests five stages in the development of orthography. In the first one, children do not spell the words' endings systematically; in the second, they spell the words phonetically and ignore non-phonetic

conventional orthography for inflectional morphemes; in the third stage, they begin to realize that the non-phonetic conventional –*ed* orthography is, sometimes, a correct way of representing the final /d/ and /t/sounds, but do not know that they must be restricted to grammatical category. In stage four, they understand the grammatical significance of -*ed* in orthography and attribute it to past verbal forms — regular and irregular. In the final stage, they have learnt the exceptions and apply this orthography only to the past tense of regular verbs.

       The reading about the morphological awareness literature reveals that there is no concern with the concept of morphological awareness, which is usually understood as the ability to think about and intentionally manipulate the minimal unities of meaning of the language. So I recall the concept of morphology of Katamba and Stonham (2006, p. 3,)

(1)     Concept of morphology:
        Study of word-structure

and apply it to the concept of linguistic awareness of Tunmer and Herriman (1984, p. 12),

(2)     Concept of linguistic awareness:
capacity of thinking about and manipulating structural features of spoken language, treating language itself as an object of thought in a way opposed to the simple use of the linguistic system to understand and produce sentences

understanding morphology as a subsystem of language, I could suggest the following concept:

(3)     Concept of morphological awareness

       capacity of thinking about and manipulating structural features of the morphology of language, treating the structures within the word as an object of thought in a way opposed to the simple use of the linguistic system to understand and produce sentences.

       This concept is pre-theoretical, as emphasized by Tunmer and Herriman (1984), and, according to Pratt and Grieve (1984), it is difficult to be more specific in the definition of the expression due to its nature, functions and typical age still being subject to a lot of debate.

However, important aspects as *when* and *how* metalinguistic awareness emerges, brought by Nesdale and Tunmer (1984) are not accounted for in this concept. Obviously, it is only possible to conceive a clear and precise definition about what morphological awareness is from a certain theoretical stance for, as Saussure said, the point of view is what creates the object.

I understand that a theory that tries to explain morphological awareness has to show the steps towards linguistic awareness, approaching this gradual development. And for such, I looked for support in Karmiloff-Smith, in the book *Beyond Modularity*, from 1992, that introduces the Representational Redescription Model. In the following section, I will give an explanation of this model.

## 2.5  KARMILOFF-SMITH'S  (1992)  REPRESENTATIONAL  REDESCRIPTION MODEL

The Representational Redescription model (RR) has as its premise the fact that, to understand how cognitive development occurs, the involved phenomena must be seen from a developmental approach, giving support to a conjunction of innate and built aspects in the explanation of human cognition.

Unlike the nativism approach to modularity, in which there is the encapsulation of modules, Karmiloff-Smith (1992) believes in a process of modularization, which occurs repeatedly as the product of development. To her if the human mind ends up with any modular structure the mind becomes modularized as developmental proceed, even in the case of language. She argues for the plasticity of early brain development. Furthermore, she understands that there is a limited amount of innately specified, domain-specific predispositions which would suffice to constrain the input that the infant mind computes. In this way, with time, brain circuits are progressively selected for different domain-specific computations. She stresses that with "innately specific" she did not mean anything like a genetic blueprint for prespecified modules, present at birth. In her perspective, Nature specifies initial biases that channel attention to relevant inputs, which affect brain development.

In 1992, Karmiloff-Smith (p. 5) said that

> Only future research using on-line brain-activation studies with neonates and young infants can distinguish between the two hypotheses. If Fodor's thesis of prespecified modularity is correct, such studies should show that, from the very outset, specific brain circuits are activated in response to domain-specific inputs. By contrast, if the modularization thesis is correct, activation levels should initially be relatively distributed across the brain, and only with time (and this could be a short or relatively long time during infancy) would specific circuits always be activated in response to domain-specific inputs.

Nowadays it is possible to solve this issue because recent means of investigation already show brain-activation in neonates.

Explaining what a domain is, Karmiloff-Smith states that, from the perspective of the child's mind, a domain is a set of representations that sustain a specific area of knowledge: language, number, physical, and so forth. There are microdomains as well, like pronoun acquisition within language, which can be thought of as a subset within particular domains. In its turn, a module consists in an information-processing unit that encapsulates that knowledge and the computations on it. In this sense, considering development domain-specific does not mean modularity, because storing and processing information may be domain specific without being encapsulated.

Literature registers a great debate between nativist/gerativist and Piaget's constructivist theories. To Piaget neither processing nor storage is domain specific. As Karmiloff-Smith (1992, p. 7) explains, "For Piagetians, development involves the construction of domain-general changes in representational structures operating over all aspects of the cognitive system in a similar way". Besides, Piaget sees the young infant as assailed by undifferentiated and chaotic inputs.

For nativists, in contrast, the neonate is seen as preprogrammed to make sense of specific information sources and the learning is guided by innately specified, domain-specific principles, which determine the entities on which subsequent learning takes place. Karmiloff-Smith considers that fixed constraints provide an initial adaptive vantage, but also a relative inflexibility.

In face of these two theories, she reaches a crucial point (p. 9): "The more complex the picture we ultimately build of the innate capacities of the infant mind, the more important it becomes for us to explain the flexibility of subsequent cognitive development". In this way,

she attempts to determine both the domain-specific and the domain-general contributions to development and, although she recognizes some built-in constraints, she believes that development involve a more dynamic process of interaction between environment and mind than the strict nativist presupposes.

Karmiloff-Smith conceives that Piaget's theory, with a central focus on epigenesist and constructivism seems to be the most appropriate to cover the dynamics of a rich process of interaction between mind and environment. In her opinion the notion of constructivism is equivalent at the cognitive level of the notion of epigenesis at the level of gene expression. Both gene expression and cognitive development are emergent products of a self-organizing system that is directly affected by its interaction with the environment in the Piaget's theory. Karmiloff-Smith points that apart this idea, much of the rest of Piaget's theory deserves criticism. She argues that there is more in the initial functional architecture of the brain than Piaget's theory posits. For Piaget the newborn has no domain-specific knowledge, just sensory reflexes and three domain-general processes of assimilation, accommodation, and equilibration. Conversely, the nativist focus on input systems is not sufficient to explain the way in which children turn out to be active participants in the construction of their own knowledge.

The solution seems to be a marriage between constructivism and nativism. This implies adding domain-specific biases to the initial endowment and that the initial base involve less detailed specifications and a more progressive process of modularization. As Karmiloff-Smith (1992, p. 10) points out, "the brain is not prestructured with ready-made representations, but it is channeled to progressively develop representations via interactions with both the external environment and its own internal environment".

Moreover, Karmiloff-Smith (1992, p. 11) argues that domain-general sensorimotor development alone cannot explain language acquisition. As she states

> Syntax does not simply derive from exploratory problem solving with toys, as some Piagetians claim. Lining up objects does not form the basis for word order. Trying to fit one toy inside another has nothing to do with embedded clauses. General sensorimotor activity alone cannot account for specifically linguistic constraints; if it could, then it would be difficult to see why chimpanzees, which manifest rich sensorimotor and representational abilities, do not acquire anything remotely resembling human language despite extensive training.

Finally, Karmiloff-Smith states that to understand the human mind, the focus must go beyond the innate specifications and it is necessary to recognize that infants and young children are active constructors of their own cognition. This involves both domain-specific constraints and domain-general processes.

In order to understand how the child's mind deals with knowledge, Karmiloff-Smith (1992, p. 15) postulates that a specifically human way to gain knowledge is for the mind to make use of internally information that it has already stored – innate and acquired – by redescribing its representations or, more specifically, "by iteratively re-representing in different representational formats what its internal representations represent".

Karmiloff-Smith argues that what is special about humans is that they spontaneously go beyond successful behavior. In general developing children are not satisfied with using the right words and structures, for example, they go beyond expert usage to exploit the linguistic knowledge that they have already stored. She asserts that this is possible due to the existence of a repeated process of representational redescription. Metalinguistic reflection, in this sense, requires flexible and manipulable linguistic representations.

Development and learning, in their turns, involve, on the one hand, the gradual process of proceduralization (that is, rendering behavior more automatic and less accessible) and, on the other hand, a process of "explicitation" and increasing acessibility ("representing explicitly information that is implicit in the procedural representations sustaining the structure of behavior") (KARMILOFF-SMITH, 1992, p. 17).

The RR model tries to account for ways by which children representations become more manipulative and flexible to the emergence of the aware access of knowledge. All this trajectory covers cyclical processes by which the information that is already present in the independent functioning of the organism, representations with special goals, become progressively more available trough redescriptive processes to other parts of the cognitive system. Karmiloff-Smith (1992) states that representational redescription is a process by which implicit information *in* the mind subsequently becomes explicit *for* the mind, first inside a domain, then, sometimes, between domains.

The model has four levels in which knowledge is represented and re-represented. They are: Implicit (I), Explicit 1 (E1), Explicit 2 (E2) and Explicit 3 (E3). Karmiloff-Smith understands that these different forms of representation do not constitute stages related to age

of developmental change. They are parts of a reiterative cycle that goes on inside different micro-domains the whole time. In brief, achieving behavioral domain at a certain level, knowledge is then redescripted in a way that is accessible to the next level.

The process is domain-general, but it is affected by the form and the level of expliciteness of representations which support particular domain-specific knowledge at a given time. In the acquisition of language, "some initial domain-specific constraint channel the progressive building up of domain-specific linguistic representations but that, once redescribed, these representations become available to domain-general processes" (KARMILOFF-SMITH, 1992, p. 32). Furthermore, the innate specifications allow infant to become attentive to linguistic input and sets the boundaries within which language acquisition can take place; while a more constructivist perspective opens up possibilities for representational flexibility, which ultimately leads to metalinguistic awareness.

At level I, the representations are in a format of procedures for analysis and answering to external stimuli. They are not available for other operations in the cognitive system. The procedure as a whole is available as data for other operations, but not its parts. During this stage, children focus on external data to create representational adjunctions. Level 1 culminates in a consistently well-developed performance in any microdomain that has achieved this level. It is what Karmiloff-Smith (1992, p. 19) calls "behavioral mastery," in which children present correct forms related to each microdomain (pronoun acquisition, block manipulation, etc.). The data available in level I are relatively inflexible.

As Karmiloff-Smith (1992, p. 48) explains

> To become more flexible and manipulable as data (level-E1 representations) and thus ultimately accessible to metalinguistic reflection as well as to cross-domain relationships with other aspects of cognition (level-E2/3 representations), the knowledge embedded implicitly in linguistic procedures (level-I representations) has to be re-represented.

Level I is followed by an internal driven level, in which children do not focus on external data anymore. An internal dynamic is responsible to these internal representations, which transform themselves into change focus. This is the first explicit knowledge level — Explicit 1 (E1). The representations of E1 are reduced to descriptions that loose many of the details of the codified information. The E1 level involves explicitly defined representations that can be manipulated and related to other redescripted representations. The E1

representations go beyond restrictions imposed at level I, where representations are simply used in answer to external stimuli. It is important to stress that, although these representations of level E1 are available as data to the whole system, they are not necessarily available to conscious access and to verbal report. This is what makes them different from representations in levels E2 and E3.

As Karmiloff-Smith states, it is easy to perceive when a child has verbally statable metalinguistic knowledge. But in E1 level, which also involves explicit representations, not available for verbal report, more subtle empirical clues must be sought. As she considers, these clues may be gleaned from late-occurring errors and self-repairs. She mentions a Newport's study about American Sign Language, which identifies that initially children use holistic signs, although in ASL signs have morphological structure. In contrast to deaf parents who are non-native signers, children acquiring ASL as a native language analyze its morphological structure. This analysis is expressed via late-occurring errors in their output after they have been using the sign correctly for some time. The errors involve separate movements that isolate two separate morphological markers, instead of that holistic sign. Karmiloff-Smith considers that this extraction of component parts from initial holistic signs is suggestive of level E1 representational redescription. These representations are more explicit than the procedural ones, but yet do not reveal conscious reflection. Children seem to analyze the level I representations and to extract the implicit information that they contain. E1 level involves a redescription of information into a format that is accessible to certain tasks outside normal input/output relations but not yet to metalinguistic explanation.

In level E2, the representations are available to conscious access, but not to verbal report (what is only possible in level E3.) Although for some authors awareness is reducible to verbal report, the RR Model states that E2 representations are available to awareness, but they are in a representational code similar to E1 representations, from which they are redescriptions.

Karmiloff-Smith and colleagues (1991) developed a study in which there is a partially on-line task. A story was told to the child and in any moment the experimenter stopped the story, asking the child to repeat "the last word", "the last sentence", "the last thing" that the storyteller had said each time she stopped. No explanation was given about what count as a word or a sentence. This task is partially on-line because it engages normal language processing and causes interruption of the construction of a representation of the speech input.

It also has an off-line metalinguistic component, since the child must know what the term "word" means and differentiate this from what a sentence or a thing mean. In this sense, to access and reproduce the last word, for example, the child have to focus on his or her representation of the acoustic input, make a decision as to which sequence of segments of it constitutes the last word, and repeat that sequence.

In another experiment, Karmiloff-Smith and colleagues compared data from on-line word task with their responses to off-line questioning about what count as a word. They asked children to help a teddy bear find out what count as a word and read out a list of word, one by one, asking "What do you think about X? Tell Teddy if X is a word". They hypothesized that off-line tasks would require level E2/E3 representations, while the partially on-line task would require E1 representations. Their predictions were that 3- and 4- years old would fail both types of tasks because they are still in the level I format, with representations procedurally encoded in this level. However children around 5 would succeed on partially on-line tasks but be less successful in the fully off-line metalinguistic tasks, whereas children of age 6 or 7 would succeed on both tasks. The result was confirmed. The developmental progression of the study is important. According to the RR model, at age 3, children's output is more or less devoid of segmentation errors and children represent formal word boundaries for both open-class and closed-class words. However, these representations are in the level I format and, because of this, are inaccessible for purpose outside input-output relations. Between ages 3 and 5 children are able to access the represented knowledge and succeed on partially on-line tasks. This is possible because the level I representations have been redescribed into an accessible E1 format. Around age 5 or 6 children engage in more consciously accessible theory construction about what words are and can succeed in off-line tasks. This is possible because knowledge is been redescribed in the E2/E3 format. Developmental progress is expresses by several re-representation of the same knowledge, allowing for increasing accessibility.

In level E3, knowledge is recodified in an inter-system code. Only in this stage is knowledge available to aware access and oral report.

This model highlights the importance of the notion of representational change over time. Only a developmental perspective can take into account behavioral and representational change over time and, in addition, make the adult mind truly understandable.

I believe that, taking these notions into account, it is possible to think in a concept for morphological awareness that makes it viable to see it as a process that develops gradually and that reveals levels of representations that go from implicit to explicit knowledge during childhood. Furthermore, I will try to illustrate these phenomena both with spontaneous speech data as well as with morphology tests developed especially to reach this goal.

## 2.6 THE FUTURE OF THE REPRESENTATIONAL REDESCRIPTION MODEL

Recent studies about cognition and the brain have shown that ideas like an innate capacity for language or like a specific gene for language may be mistaken or, at least, must be questioned. The RR model, shown in the previous section, argues that domain-specific and domain-general predispositions are required to explain cognition and language. However this model was published in 1986, 1992 and contributions from neuroscience can be made nowadays. Neuroconstructivism – is a very recent framework that conjugates neuroscience and constructivism, arguing that cognition and brain cannot be studied independently. As this theory is recent and it is devoted to cognition in general, much more about language acquisition still need to be developed in future works.

### 2.6.1 The Nature-Nurture debate and Neuroconstructivism

As Bates et al. (1998) asserts the Nature-Nurture debate is with us since it was first outlined by Plato and Aristotle. However, according to Karmiloff-Smith (2006), this controversy is obsolete because nativists and domain-general empiricists agree that development involves contributions from both genes and environment. Karmiloff-Smith's model (1992), presented in the previous section, formalizes this interaction with a marriage between constructivism and Nativism. However, she thinks that because we lack a testable theory about the interaction between genes and environment and because of the entrenched philosophical views about what it means to be human the debate remains to determine whether it is nature or nurture that plays the greater role in constraining the developing brain (KARMILOFF-SMITH, 2006). Karmiloff-Smith (1998, p. 389) maintains that "it is a truism that development involves contributions from genes and environment, but theories differ with respect to the roles they attribute to each". She also states that at some level all theorists

concur in the existence of some degree of innate specification, being the difference in positions concerned to how rich and how domain-specific the innately specified component is, whether development is the result of predetermined epigenesist (mere triggering) or probabilistic epigenesist and what happens when things go wrong. In her opinion Nativism and Empiricism are not in fact the only options (KARMILOFF-SMITH, 1998).

In 1998, in the article "Development itself is the key to understanding developmental disorders", she introduces *Neuroconstructivism*. While supporting Piaget's view that infants are active participants in their own learning and that cognitive structures are emergent, not innately specified, she proposes a different view from domain-general or domain-specific approaches, which is a *domain-relevant* perspective of developmental change. In this view she argues that the Neuroconstructivism approach recognizes innate constraints, but unlike the staunch nativist, considers them to be initially less detailed and less domain-specific as far as higher-level cognitive functions are concerned. Rather development itself plays a crucial role in shaping phenotypical outcomes, with the protracted period of postnatal growth as essential in influencing the resulting domain specificity of developing neurocortex (Karmiloff-Smith, 1998). The neuroconstructivist domain-relevant view entails that "the brain starts out with a number of basic-level biases each of which is somewhat more relevant to the processing of certain kinds of input over others, and which **become** domain-specific over time, through neuronal competition and a process of gradual modularization" (Karmiloff-Smith, 2010, p.2). In this view, genes, brain and environment are not mere triggering, but they play a dynamic, multidirectional role in shaping development outcomes (KARMILOFF-SMITH, 2009).

Real interaction, according to Karmiloff-Smith (1998) is not between genes and environment. Rather, in relation to genes, the interaction lies in the outcome of the indirect, cascading effects of interacting genes and their environments, while related to the environment, the interaction comes from the infant's progressive selection and processing of different kinds of input. The notion of 'environment' for both the strict nativist and the empiricist is a static one, whereas development is dynamic. "The child's way of processing environmental stimuli is likely to change repeatedly as a function of development, leading to the progressive formation of domain-specific representations".

### 2.6.2 Nativism and Neuroconstructivism

To Karmiloff-Smith (2010), the nativist approach points at least four arguments to support their claims. First, they argue, based on neuropsychological adult patients whose

brain had developed normally previously to suffering a brain trauma that there are dissociated impairments (e.g., cases of agrammatism, prospagnosia, or agnosia). This indicates, in the nativist view, that the brain is composed of independent functioning, domain-specific modules (BARON-COHEN, 1998; BUTTERWORTH, 2005; DUCHAINE, 2006; VAN DER LELY, 2005; GOPNIK, 1997; TEMPLE, 1997). The second argument comes from evolutionary psychology, which asserts that the human brain has evolved into the equivalent of a Swiss army knife in which each innately-specified module in the newborn is adapted for a specific, independent function (BARKOW, COSMIDES and TOOBY, 1992; DUCHAINE, COSMIDES and TOOBY, 2001). The third argument claims that young infants possess innately-specified, core knowledge/core principles (BUTTERWORTH, 2005; CAREY, 2009; KINZLER and SPELKE, 2007; PINKER, 1999; SPELKE, 2005; SPELKE and KINZLER, 2009). Karmiloff-Smith considers that learning, in the nativist accounts, was banished from having any explanatory role. At last, children with genetic disorders presenting some scores "in the normal range" in one or more domains alongside serious deficits in other illustrate dissociation of general intelligence from independently functioning domains like grammar, number, face processing and the like. Karmiloff-Smith first criticism to these arguments is that they are all static. Furthermore, they ignore what Piaget deemed to be essential: The developmental history of the organism. The growth of knowledge over ontogenetic time is a crucial component of Piaget's epistemology. The nativist approach takes a snapshot of knowledge at one specific time point like birth. Moreover, Karmiloff-Smith argues that nativists tend to disregard the *progressive* development of the infant brain.

In addition, Karmiloff-Smith (2006) asserts that researchers, in their excitement at using human genome to uncover the functions of specific genes, have often ignored the gradual process of ontogenetic development. The belief that there might be a gene for language, for example, has emanated, according to Karmiloff-Smith, from a focus on the structure of the adult brain in neuropsychological patients whose brain were fully and normally developed until their brain damage. In her opinion, the developing brain is very different, since "it starts out highly interconnected across regions and is neither localized nor specializes at birth, allowing interactions with the environment to play an important role in gene expression and the ultimate phenotype" (KARMILOFF-SMITH, 2006, p. 9).

In young infants, as Karmiloff-Smith (2010) points out, neural processing tend initially to be diffuse across several regions in both hemispheres, but with the continuous processing of inputs over developmental time, brain activity becomes increasingly restricted to more specific networks in the left or right hemispheres. The infant brain is not a collection

of static modules, but an emergent property of dynamic multi-directional interactions between biological, physical and social constraints. Neuroconstructivism considers the brain as a self-structuring, dynamically changing organ over developmental time as function of multiple interactions at multiple levels, including gene expression (CASEY, 2002; JOHNSON, 2001; KARMILOFF-SMITH, 2009). Karmiloff-Smith (1992) believes in a gradual process of modularization as opposed to the notion of built-in modules, and this view improves processing efficiency. Karmiloff-Smith (2009, p. 59) asserts that rather than invoking innately specified modules in the start state, "the Neuroconstructivism approach argue for increased plasticity for learning (FINLAY, 2007), that is, for a limited number of domain-relevant biases, which become domain specific over developmental time via their competitive interaction with each other when attempting to process environmental input". This means that for Neuroconstructivism, if the adult brain contains modules, they emerge developmentally during a process of gradual modularization. In other words, Neuroconstructivism does not rule out domain specificity; but consider that it cannot be taken for granted and must be questioned.

Unlike the nativist approach, Neuroconstructivism offers a truly developmental perspective, to assess how progressive change occurs from infancy onwards, and how parts of the developing system may interact with other parts differently at different times across ontogenesis. This perspective focuses on change and emergent outcomes, and every aspect of development turns out to be dynamic and interactive, since genes do not act in isolation in a predetermined way.

A good example that genes do not act in isolation and that there is not a specific gene for each function is the FOXP2 gene, about which there was much excitement regarding its role in human language. According to Westermann, Thomas and Karmiloff-Smith et al. (2010), the FOXP2 illustrates the importance of tracing gene expression over time. It was found that several generations of a British family (KE) presented speech and language impairments. Researchers discovered a mutation in the FOXP2 gene on chromosome 7 (LAI et al., 2003) in the affected family members. Since then some hailed this as the gene contributing to human language evolution (PINKER, 2001; WHITEN, 2007). However, as Westermann et al. explain, in-depth molecular analysis in humans (GROSZER et al., 2008), chimpanzees (ENARD et al., 2002) and birds showed that the function of this gene was widespread and contributed to the rapid coordination of sequential processing and its timing. Furthermore, FOXP2 is expressed during learning, confined to motor regions. The reason why this gene mutation affects speech and language is that rapid coordination of sequential

processing and its timing is critical to speech. FOXP2 is not specific to that domain, but affects other domains as well. The KE family also had problems with imitating non-linguistic oral articulation, with fine motor control and with the perception/production of rhythm, suggesting a domain-general effect of differing impact.

### 2.6.3 Plasticity for learning and domain-relevant predispositions of the brain

The role of the FOXP2 gene reveals the importance of plasticity for learning. As Karmiloff-Smith (2010) maintains, development – typical or atypical, human or non-human – is fundamentally characterized by plasticity for learning. According to Karmiloff-Smith (2009), for many decades the notion of plasticity was related to the human system's response to damage, but this notion is changing and it is becoming clear that development is due to plasticity for learning. The ideas of plasticity and domain-relevant biases related to development lead to the belief that the adult brain does not contain modules from the start state, but they emerge developmentally during the process of gradual localization/specialization of function, i.e., progressive modularization (KARMILOFF-SMITH, 1992; 1998). The question is how does Neuroconstructivism explain this?

A very important point is that Neuroconstructivism does not imply that the neonate brain is a blank state with no structure, as empiricists would claim, nor does it entails that any part of the brain can process any and all inputs. On the contrary, as Karmiloff-Smith (2010) explains, "Neuroconstructivism maintains that the neonate cortex has some regional differentiations in terms of types of neuron, density of neurons, firing thresholds, etc." This differences are not domain-specific nor domain-general constraints, rather they are domain-relevant, i.e., different parts of the brain have small structural differences, which turn out to be more appropriate/relevant to certain kinds of processing over others. Thus the brain activity is initially widespread for processing all types of input and competition between regions gradually settles which domain-relevant circuits become domain-specific over time. Karmiloff-Smith reports a study by Minagawa-Kawai et al. (2007) which inspected language-specific phonemic contrasts in infants from 3 months to 28 months and found that the onset of activation in different areas of cortex was age-specific. Moreover, another study by Mills, Coffey-Corins and Neville (1997) indicates that the comprehension of single words moves from bilateral processing between 13-17 months to left lateralized processing at 20 months.

### 2.6.4 Neuroconstructivism and the RR model

Karmiloff-Smith (2010, p. 8) recalls her cognitive-level developmental hyphothesis – the Representational Redescription Model – which postulates that "what is specifically human to human intelligence is a process by which task-specific representations stored as procedures *in* the brain become, via internally-generated process of RR, domain-general knowledge *to* the brain". This internal self-organizing process is generated by behavioral mastery and not by negative feedback, and "allow knowledge relevant to one domain to become transportable to other domains without the need to process new external input". RR is a model of internally generated process occurring outside the processing of external stimuli. Karmiloff-Smith adds that "with the current advances in developmental brain imaging, it should be possible to assess the hypothesis by detecting specific networks in cerebral resting state underlying RR".

Karmiloff-Smith (2010) argues that Constructivism and Neuroconstructivism perspectives involve a developmental way of thinking, in any age of the population. In her opinion it is crucial to identify full developmental trajectories, to assess how progressive change occurs from infancy onwards, and how parts of the developing system interact with other parts at different times in order to understand developmental outcomes. She (2010, p. 12) believes that "developmental timing is amongst the most important of factors that need to be taken into account when endeavoring to understand human development".

In the following chapter, I will present the methodology applied to the data.

## 3 METHODOLOGY

There are two types of data in this thesis, both related to sensitivity to morphological resources of language and to morphological awareness. In this chapter I will describe how these data were obtained.

## 3.1 MORPHOLOGICAL VARIANT FORMS

With respect to the first type of data I will present some children's production of morphological variant forms, which were obtained in different moments. The data are from children's spontaneous speech collected by me during my final graduation work from children between 2 and 8 years of age, data from a database called Inifono, which also consist of spontaneous speech from one child with age between 1 and 4 years and other spontaneous data collected from children between 2 and 5 years of age during my PhD research. I also found data in other researches about languae acquisition.

The data from my final graduation work were collected in different moments from children of a preschool in Farroupilha, in the state of Rio Grande do Sul, Brazil, where I live. In these collections, I merely observed the children playing and talking to each other. During these observations, I took note of the kind of production that I expected to hear.

The data from the database were collected in different moments with the participant (one girls, from 1 to 4:1 years of age), in which the researcher played and talked to the child. This subject lived in Porto Alegre, Rio Grande do Sul. The other researches in which I found data of overregularization were Simões (1997) and Silva (2007).

The data on my PhD research were obtained by several researchers, students and teachers from PUC University, who heard them from children during spontaneous conversations and registered the data for me. Every child lived in the Porto Alegre region.

All these children were from a middle class socioeconomic status.

There is not a great amount of data, but the intention is to illustrate the phenomenon and not to do a quantitative analysis of it in the children's speech.

## 3.2 MORPHOLOGICAL TESTS

Inspired by Berko (1958) and her tests, I developed three morphological tests with coined words and applied them in several situations of pre-tests with both adults and children.

Another reason for the creation of the tests is that at that moment I did not find morphological tests in Portuguese applied to children. Two pre-tests were applied to ten adults in order to check if the tests were adequate and understandable. They were applied to ten children as well with the same objective. The adults were graduated and from a middle class socioenonomic status. The children also belong to a middle class environment.

In the real appliance of the tests, children were presented to three morphological tests with coined words. I will present each of them.

Afterwards, the morphological tests on coined words were applied to the subjects of the present study.

### 3.2.1 Subjects

The subjects were eighty-four children aged between 3:4[28] and 10:11 that took part of three morphological tests. All of them study in a regular school of Farroupilha.[29] The tests were applied in November 2009. The chart bellow shows the number of children who took part of the tests and their respective ages.

| Grade | Children's ages | Number of children |
|---|---|---|
| 4th grade | 9:10 to 10:11 | 10 |
| 3rd grade | 8:3 to 9:9 | 14 |
| 2nd grade | 7:7 to 8:4 | 10 |
| 1st grade | 6:5 to 7:2 | 21 |
| Kindergarten III | 5:3 to 6:3 | 12 |
| Kindergarten II | 4:4 to 5:3 | 11 |
| Kindergarten I | 3:4 to 4:4 | 6 |

Chart 7: Children's ages per grade
Source: The author.

The first test was with 1st graders. I selected the subjects by raffling ten children of each group (there were two groups). This proceeding was used with Kindergarten III, Kindergarten II and Kindergarten I (there was one group of each grade). After the test, I realized that ten children of each group would take too long, and that the school would not

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[28] 3 years: 4 months.
[29] I talked to the principal of the school, in which I worked from 2002 to 2005. This school was chosen because it is easier to get the acceptance of the children's parents for the tests when the experimenter is known.

approve it. So, I decided to select (again by raffling) just five children of each group, counting ten or fifty of each grade, depending on how many groups of each grade there was. Each child who was able to take part in the tests brought a document[30] signed by his or her parents. In one of the three groups of the 3rd grade, only four children brought the document signed. Being able to take part in the tests means not presenting any mental disturbances or learning deficits. The reason why I chose not to include children with mental disturbances or learning deficits is that any sort of handicap could influence the results. Teachers informed me if any child was directed to the psychologist with some kind of disturbance or learning deficits. In Kindergarten III and Kindergarten II I decided to include children who wanted to be part of the study and brought the document signed. Because of this, I had 12 and 11 children, respectively. In Kindergarten I, four children did not want to take part of the tests, although they did bring the document signed anyway. No one else in this grade brought the document signed to take part in the study. Because of this I had only 6 children able to take part in the tests.

### 3.2.2 Test 1: Derivation of words

Test 1, the word derivation test, consists of three parts of six questions. The children were asked to derive words from a given coined base. These forms were coined from Portuguese templates and Portuguese stress patterns. There were three possibilities of responses to each question, related to three bases.

#### 3.2.2.1 Coined bases to Test 1

The first coined base, *flopo* [ˈflo.pu], has two syllables, the first of them presents a CCV structure and the second a CV structure, as words like "bloco" [ˈblo.ku] (block) or "prato" [ˈpra.tu] (dish.) This is a familiar word structure for a Portuguese speaker. The coined word "flopo" has the same stress pattern of "bloco" and "prato". This base was created with a simple and common structure in order to check if with a simple structure children would find less difficulties on applying adequate suffixes and prefixes.

The second coined base, *segor* [seˈgor], has two syllables as well, the first of them with a CV structure and the second one with a CVC structure, as words like "calor" [kaˈlor]

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[30] See Annex 3.

(heat) or "bolor" [boʹ.lor] (mold.) The coined word "segor" has the same stress pattern of "calor" and "bolor". The main differences between the first and the second coined bases are that the first one presents a CCV structure syllable, which is a little difficult for children in the beginning of the language acquisition process, and the second word presents a CVC structure syllable. Furthermore, the second word, "segor," ends in a consonant. This base was created with this structure in order to check if the fact that it ends with a consonant and the fact that the last syllable presents a CVC structure would interfere in the capability of applying adequate suffixes and prefixes to the base and in the choice of suffixes and prefixes.

The third coined base of Test 1 is *mafata* [maʹ.fa.ta). This word has the simplest structure because it presents three simple syllables with CV structure. However, it is the longest one, with three syllables. The stress is on the second syllable, which is the most common stress pattern in Brazilian Portuguese. The same structure and stress patterns are found in real words like "barata" [baʹ.ra.ta] (cockroach) and "batata" [baʹ.ta.ta] (potato.) I decided to coin words with different patterns of stress, but all they are very common in Brazilian Portuguese. Moreover, *mafata* is a female noun because it ends with a thematic vowel –a–. This base was created like this in order to examine if the fact that it presents the simplest structure and if the fact of having a female format would interfere in the results for the appliance of morphological resources to the base and in the choice of suffixes and prefixes.

### 3.2.2.2 Test 1 questions and expected responses

The six questions with the coined bases require that children derive words, using adequate suffixes or prefixes for each question. Chart 8 presents the questions related with the bases (with a translation below each question).

| |
|---|
| 1a) Uma pessoa que lida, que trabalha com flopo, segor ou mafata é um ...<br>(A person who handles, who works with flopo, segor or mafata is a ...) |
| 1b) Um/a flopo, segor ou mafata pequeno/a é um/a …<br>(A little flopo, segor or mafata is a ...) |
| 1c) Um/a flopo, segor ou mafata grande é um/a …<br>(A big flopo, segor or mafata is a ...) |
| 1d) Um/a flopo,segor ou mafata muito grande é um/a ... |

| |
|---|
| (A very big flopo is a ...) |
| 1e) Um lugar cheio de flopo, segor ou mafata é um ... <br><br> (A place full of flopo, segor or mafata is a ...) |
| 1f) Uma pessoa cheia de flopo, segor ou mafata está ... <br><br> (A person who is full of flopo, segor or mafata is ...) |

Chart 8 — Test 1 questions
Source: The author.

It is important to highlight that there are many possibilities of derived words with adequate suffixes for each question. Some examples of adequate responses are provided in Chart 9, bellow.

| Questions with the coined base *flopo* |
|---|
| 1a) Uma pessoa que lida, que trabalha com flopos é um *flopeiro, flopista, flopador*. <br><br> (A person who handles, who works with flopos is a ...) |
| 1b) Um flopo pequeno é um *flopinho*, *flopito*, *flopeco*, *mini-flopo*. <br><br> (A little flopo is a ...) |
| 1c) Um flopo grande é um *flopão*, *flopãozão*. <br><br> (A big flopo is a ...) |
| 1d) Um flopo muito grande é um *flopaço*, *mega-flopo*, *super-flopo*. <br><br> (A very big flopo is a ...) |
| 1e) Um lugar cheio de flopos é um *flopozal*, *floparia*, *flopário*. <br><br> (A place full of flopos is a ...) |
| 1f) Uma pessoa cheia de flopo está *flopada*, *flopenta*, *floposa*. <br><br> (A person who is full of flopo is ...) |
| Questions with the coined base *segor* |
| 1a) Uma pessoa que lida, que trabalha com segor é um *segoreiro*, *segorista*, *segorador*. <br><br> (A person who handles, who works with segor is a ...) |
| 1b) Um segor pequeno é um *segorzinho*, *segoreco*, *segorzito*, *mini-segor*. <br><br> (A little segor is a ...) |
| 1c) Um segor grande é um *segorzão*, *segorãozão*. <br><br> (A big segor is a ...) |

| |
|---|
| 1d) Um segor muito grande é um *segorzaço*, *super-segor*, *mega-enorme*.<br><br>(A very big segor is a ...) |
| 1e) Um lugar cheio de segor é um *segorzal*, *segoraria*, *segorário*.<br><br>(A place full of segor is a ...) |
| 1f) Uma pessoa cheia de segor está *segorzada*, *segorenta*, *segorosa*.<br><br>(A person who is full of segor is ...) |
| Questions with the coined base *mafata* |
| 1a) Uma pessoa que lida, que trabalha com mafata é um *mafateiro*, *mafatista*, *mafatador*.<br><br>(A person who handles, who works with mafata is a ...) |
| 1b) Uma mafata pequeno é um *mafatinha*, *mafateca*, *mini-mafata*.<br><br>(A little mafata is a ...) |
| 1c) Uma mafata grande é uma *mafatona*.<br><br>(A big mafata is a ...) |
| 1d) Uma mafata muito grande é um *mafataça*, *mega-mafata*, *hiper-mafata*.<br><br>(A very big mafata is a ...) |
| 1e) Um lugar cheio de mafata é um *mafatal*, *mafataria*, *mafateiro*.<br><br>(A place full of mafata is a ...) |
| 1f) Uma pessoa cheia de mafata está *mafatada, mafatenta, mafatosa.*<br><br>(A person who is full of mafata is ...) |

Chart 9 — Expected responses to Test 1
Source: The author.

### 3.2.2.3 Experimental context and procedures

The experimenter took each child from his or her classroom to another pleasant room, with a table and two chairs. Once there, the experimenter instructed the child that he or she would play a game of coining words. The child could invent any kind of word he or she saw fit. This way, the child could feel safe to answer the way he or she thought it was good.

Afterwards, the experimenter read the questions to the child. After reading each coined base – *flopo*, *segor* and *mafata* –, the experimenter asked the child to repeat the word just read. This proceeding was adopted to make sure that the child could understand and pronounce the word in a satisfactory way. Only after the child repeated the base would the experimenter read the question. If the child answered "I don't know," the experimenter

repeated the question. If this behavior persevered, the experimenter recorded the answer "I don't know." Each response was recorded at the moment of the test by the experimenter. In the end of the session, after the three tests, the child was taken back to his or her classroom.

### 3.2.3 Test 2: Extracting the base of the derived form and inflect the basic form

The second test, related to the extraction of the base of the derived form and to the inflection of verbal forms, consists of a little story in which there are some questions that need answering. The responses should be coined bases that are either extracted forms of a given base (in the first part of the test) or past tense and present continuous inflected forms (in the second part of the test.)

The derived forms used in the test were based on the responses of the pre-test 1 with adults and children. The children were asked to extract the base of the coined derived words or inflect verbal forms from other verbal forms in the past tense or in the present continuous form. The test has the format bellow. The coined words are highlighted.

3.2.3.1 <u>Test 2 questions and expected responses</u>

Esse é nosso amigo Winki. Ele gosta de visitar muitos lugares estranhos e diferentes e aprende muitas coisas em suas viagens.

(This is our friend Winki. He likes to travel to several weird and different places and he learns lots of things in his trips.)

Imagine que esses dias ele contou que conheceu um *zoque* ['z□.ke]. Viu *zoquinhos* [z□.'ki.□us] e *zocões* [zo.'kõjs]. O que significa *zoquinho*?

(Imagine that just the other day he told me that he met a *zoque*. He saw *zoquinhos* e *zocões*. What does *zoquinho* mean?)

E *zocão* [zo.'kãw]?

(And what does *zocão* mean?)

Ele andou muitos quilômetros e entrou em uma *zocaria* [zo.ka.'□i.a]. O que significa *zocaria*?

(He walked several kilometers and came in a *zocaria*. What does *zocaria* mean?)

Assim que ele saiu de lá, percebeu que estava todo *enzocado* [i$^n$.zo.'ka.du]. Como será uma pessoa *enzocada*?

(As he left the place, he realized that he was all *enzocado*. How is a person who is *enzocada*?)

Winki também me disse que gosta muito de *plomos* ['plo.mus]. Você sabe dizer o que é *plominho* [plo.'mi u]? E *plomão* [plo.'mãw]?

(Winki also told me that he likes *plomos* a lot. Do you know what *plominho* means? And what does *plomão* mean?)

Sempre que ele viaja encontra muitos *plomistas* [plo.'mis.tas]. O que será que significa *plomista*?

(Frequently in his travels he comes about several *plomistas*. What does *plomista* mean?)

Winki diz que nas viagens ele *mila* ['mi.la] muito. Se ele *mila* muito, ontem ele também _____. Todo dia ele também *chugue* ['u.gi] na hora do almoço. Ontem mesmo ele _____. Sua mãe *ferte* ['fɛ.ti] todos os dias. Agora mesmo ela está _____.

(Winki says that in his trips he *milas* a lot. If he *milas* a lot, yesterday he _____ too. Every day he also *chugues* in the lunch time. Yesterday he _____. His mother *fertes* every day. Now she is _____.)

Os *plomistas* são muito *milantes* [mi.'ln.tis]. O que será que significa *milante*?

(Plomistas are very *milantes*. What does *milante* mean?)

Agora Winki cansou. Ele vai dormir um pouquinho. Diga "tchau" para o Winki. Até a próxima!

(Now Winki is tired. He is going to take a nap. Say "bye" to Winki. See you!).

Adequate responses are those in which the children extracted the base and interpreted the mean of the suffix. They are provided in the chart bellow.

| Test 2 questions | Expected responses for test 2 questions |
|---|---|
| O que significa *zoquinho*? (What does *zoquinho* mean?) | *Zoque* pequeno (Little zoque) |
| E *zocão*? (And what does *zocão* mean?) | *Zoque* grande (Big *zoque*) |
| O que significa *zocaria*? (What does *zocaria* mean?) | Lugar onde vendem-se/moram/encontram-se *zoques* (A place where *zoques* are sold/live/are found.) |
| Como será uma pessoa *enzocada*? | Cheia de *zoques* |

| | |
|---|---|
| (How is a person who is *enzocada*?) | (Full of *zoques*) |
| Você sabe dizer o que é *plominho*? <br><br> (Do you know what *plominho* means?) | *Plomo* pequeno <br><br> (Little *plomo*) |
| E *plomão*? <br> (And what does *plomão* mean?) | *Plomo* grande <br><br> (Big *plomo*) |
| O que será que significa *plomista*? <br><br> (What does *plomista* mean?) | Pessoa que lida, trabalha com *plomos* <br><br> (A person who works with *plomos*) |
| Se ele *mila* muito, ontem ele também <br><br> (If he *milas* a lot, yesterday he) | *Milou* <br><br> *Miled* |
| Todo dia ele também *chugue* na hora do almoço. Ontem mesmo ele <br> (Every day he also *chugues* in the lunch time. Yesterday he) | *Chugiu* (também será aceito "chugou") <br><br> *Chugued* (we will accept the form "chugou" too) |
| Sua mãe <u>*ferte*</u> todos os dias. Agora mesmo ela está <br> (His mother *fertes* every day. Now she is) | *Fertendo* (também será aceito "fertando" ou "fertindo") <br><br> *Ferting* (in Portuguese we will also accept the form "fertando") |
| O que será que significa *milante*? <br> (What does *milante* mean?) | Que *mila* muito <br><br> (who *milas* a lot) |

Chart 10 — Adequate responses for test 2
Source: The author.

### 3.2.3.2 Experimental context and procedures

After the appliance of the first test, the experimenter introduced the second test. He told the child that he or she would listen to a little story about a friend of hers — Winki. During the story, there would appear some questions that the child needed to answer in order to complete the story. This proceeding was adopted to make the child believe he or she was participating in the making of the story. Then the experimenter introduced Winki, a paper doll, and asked if the child would like to hold Winki in his or her hands. After each question, the experimenter recorded the child's response.

### 3.2.4 Test 3: Word judgments

In the third test, the child was asked to judge some words. He or she had to say whether the word in the sentence was correct or incorrect and then explain why. The word was emphasized by the experimenter. All the words available to judgment are morphological variants forms (see section 2.2.3), which are normally produced by young children during the language acquisition process. The test was in the format bellow.

3.2.4.1 <u>Test 3 questions and expected responses</u>

Vamos brincar de professor(a). Se tu ouvisses uma criança dizer: "agora eu vou "borrachar", dirias que está certo ou não? Por quê?

(Let's play of being a teacher. If you heard a child saying: "now I will *borrachar*," what would you say? Is it correct or incorrect? Why?)

E se ela dissesse: "eu usia uma blusa"? Está certo ou errado? Por quê?

(And if the child says: "I *usia* a blouse?" Is it correct or incorrect? Why?)

E "eu fazi um bolo"? Está certo ou errado? Por quê?

(And what about "I *fazi* a cake"? Is it correct or incorrect? Why?)

E se a criança dissesse "o chinelo serveu", o que tu dirias para ela?

(And if the child says "the slipper *serveu*," what would you say to her? Is it correct or incorrect? Why?)

Adequate responses are those in which the child answers that the word is wrong and explains the reasons why. They are provided in the chart bellow.

| Test 3 questions | Expected responses for test 3 questions |
|---|---|
| borrachar | Está errado porque a forma correta é "apagar". (It is wrong because the correct form is "apagar"/ "to erase"). |
| usia | Está errado porque a forma correta é "usava". (It is wrong because the correct form is "usava"/ "I wore it". |

| fazi | Está errado porque a forma correta é "fiz". (It is wrong because the correct form is "fiz"/ "I did it"). |
|---|---|
| serveu | Está errado porque a forma correta é "serviu". (It is wrong because the correct form is "serviu"/ "it fits"). |

Chart 11: Expected responses for test 3
Source: The author.

### 3.2.4.2 Experimental context and procedures

After the appliance of the second test, the experimenter presented the third test, inviting the child to play of being a teacher. The experimenter introduced a nameless doll and asked the child to name the doll. This proceeding was adopted to make the child believe he or she was actually being a important part of that game. The experimenter said that the doll was very young and could not talk the correct way. So the child, who is now a teacher, should help the doll, saying if what the doll said was correct or incorrect, and explaining the reasons why. The responses were recorded by the experimenter.

These three tests present an increasing level of difficulty from the first — easier — to the third — the most difficult. In the second test, the questions about derivation were more difficult than the questions about inflection. Carlisle and Nomanbhoy (1993) state that children present a better performance on inflection than on derivation. All children understood the tests and answered something in an adequate or inadequate way.

These three tests were designed to test morphological awareness through the ability of applying morphological resources to coined bases, extracting the base from derived words, inflecting verbal forms and judging words, and explaining why they were considered incorrect. In other words, if a child was able to do these tasks, he or she already shows morphological awareness. This means that I consider, at the moment of the formulation of these tests, that the tests are efficient on measuring morphological awareness. At the end of the analysis, I will evaluate if this is true or not. As we saw, according to Karmiloff-Smith (1992), there are four levels of representation in the mind that reflect formats of knowledge. Three of them are explicit, but just two of them only express morphological awareness: E2 and E3. I expect that my tests reveal these two levels of representation.

# 4 DATA DESCRIPTION AND ANALYSIS

## 4.1 IMPLICIT AND E1 REPRESENTATIONS

While most theorists, when talking about the development of child's grammar and linguistic awareness postulate just two levels – implicit and explicit knowledge –, the Representational Redescription (RR) model, by Karmiloff-Smith (1992), presents four levels – Implicit, Explicit 1 (E1), Explicit 2 (E2) and Explicit 3 (E3). Each of these phases has its importance and characteristics. Although this model may be applied to any domain of cognitive development, this thesis intends to show how one can apply the RR model to linguistic data, specifically Portuguese morphology. It is important to remember that the aim of this thesis is to show the levels of representation redescription that children go through, from morphological sensitivity to morphological awareness. The children productions that will be shown below are clues to what is happening inside the mind. In other words, data are possible behavioral evidence of mental representations.

Although the model has been presented in chapter 2.5, I will present some concepts again in order to proceed with the data analysis.

The RR model accounts for the emergence of conscious access to knowledge and for children's theory building. It is a model that shows the way in which children's representations become progressively more manipulable and flexible. Through this model, it is possible to see the phases in which implicit knowledge becomes explicit and the way in which morphological sensitivity becomes morphological knowledge and morphological awareness. As Karmiloff-Smith (1992, p. 18) says, "Representational redescription is a process by which implicit information *in* the mind subsequently becomes explicit knowledge *to* the mind".

As seen in section 2.5 the actual process of representational redescription is domain general, but affected by domain-specific knowledge, particularly the level of explicitness of the representations. In other words, in order to explain the RR model, Karmiloff-Smith (1992) proposes a marriage between nativism and constructionism, in which she believes there are domain-specific predispositions to language development and general domain cognitive processes involved in language development.

Development and learning, according to the RR model, involve the gradual process of proceduralization, in which behavior is more automatic and less accessible, and a parallel process of explicitation and increasing accessibility. The process of representational

redescription occurs spontaneously as part of an internal drive toward the creation of intra- and inter-domain relationships, but at times it also can be triggered by external influences.

The RR model states that there are four levels at which knowledge is represented and re-represented. It is important to remember that these four levels are not age-related stages of developmental change. In the first level – Implicit level – representations are in the form of procedures of analysis and the child focuses predominantly on information from external environment. In this level, new representations are independently stored and are bracketed, thus no intra-domain or inter-domain representational links can be formed. Information in level-I representations is not available to other operators in the cognitive system.

Karmiloff-Smith (1992) maintains that the linguistic representations built up during infancy and early childhood serve young children for comprehending and producing their native language, but these representations are not initially available as data for metalinguistic reflection. They are stored and run as procedure for effective comprehension and production.

Around the second year of life, children start to produce verbal forms (TITONE, 1983; KARMILOFF-SMITH, 2001). According to Andersen (2008), at the age of 1:4, Brazilian children already produce imperative verbal forms. These early verbal forms seem to be the same as the adult's, but they actually are what Bowerman (1982) calls nonanalyzed forms. Bowerman says that this initial child correct usage is due to him/her having learnt forms as independent individual cases (see also KARMILOFF-SMITH, 1979). It is a phase in which children produce irregular forms correctly, like "eu sei" (I know), "eu faço" (I do) and "eu trouxe" (I brought). According to my analysis under the light of the RR model, these early correct verbal forms are representations that are in an implicit format, bracketed, unavailable to analysis, independently stored. They seem correct because they are stored like a block which keeps them unanalyzable. They are actually forms that children can repeat from the linguistic input but do not produce as part of their developing linguistic system. During this implicit level, children are totally focused on the linguistic input. When children produce these correct forms, it is because they have reached mastery behavior, which subsequently triggers the representational redescription of this information to a new format: E1 representations.

This second level – Explicit 1 – is a very important one because it makes a transition between implicit knowledge and the knowledge which will become available to awareness later. In my opinion, it is the huge contribution that the RR model brings in comparison to other models and theories. E1 representations are the result of redescription of the level-I format to a new one. Unlike level-I representations, they are not bracketed. The E1

representations are the beginning of a flexible cognitive system upon which the child's nascent theories can be built. Level E1 involves explicitly defined representations. E1 representations are available as data to the system, but they are not necessarily available to conscious access and verbal report. As Karmiloff-Smith (1992) states, in this first level of redescription, more subtle empirical clues must be sought. She also says (1992, p. 48) that "the fact that such redescription does take place can be gleaned from late-occurring errors and self-repairs".

Based on this description of E1 representations and taking a look at morphological acquisition data, we can see that after the early correct production of verbal forms, children start to produce some different forms: Regularized, with changes of inflectional suffixes and even lexical novelty based on known verbal forms. To recall some examples, let's take a brief look at Chart 12.

| Morphological variant form | Child's name, age |
|---|---|
| (eu) fazo (I do it) (instead of "faço") | I., 3:6 |
| (eu) fazi (I did it) (instead of "fiz") | Fra., 2:6, 2:9, 3:0; M. 4:1; M. (2:6) |
| (eu) trazo (I bring it) (instead of "trago") | G., 3:4 |
| (eu) trazi (I brought it) (instead of "trouxe") | B., 3:1 |
| (eu) sabo (I know) (instead of "sei") | R., 2:10; G., 2:7; A. 2:4;14, 2:4;21, 2:5, 2:6, 2:9, 3:0 |
| (eu) ponhei (I put) (instead of "pus") | G., 2:5, 2:8 |
| (ele) cabeu (it fits) (instead of "coube") | Isd., 4:4; 5:0 |
| (eu) boti (I put) (instead of "botei") | A.L., 2:1 |
| (eu) pensi (I thought) (instead of "pensei") | H., 3:4 |
| (eu) mexei (I touched) (instead of "mexi") | M., 3:0;15 |
| (eu) descei (I climbed down) (instead of "desci") | O., 2:7 |
| (eu) usia (I used) (instead of "usava") | H., 3:4 |
| (eu) conheciva (I knew) (instead of "conhecia") | Isd., 4:6 |
| massageira (masseuse) (instead of "massagista") | Ra., 5:4 |

| borrachar (to erase) (instead of "apagar") | A., 3:8 |
| surfador (surfer) (instead of "surfista") | Isd., 5:3 |

Chart 12 – Examples of Morphological Variant Forms
Source: The author.

These forms are not accepted in adult grammar. They are considered incorrect. But, as we could see in section 2.2.2, their structure could be grammatically acceptable because they do present Portuguese morphemes. Moreover, these productions show sensitivity to morphological linguistic resources.

Karmiloff-Smith (1992) argues that in E1 representations, the child analyzes the level-I representations and extracts the implicit information they contain. In the case of regularizations, children extracted implicit information about the stems of the paradigms which are more regular or more frequent in the linguistic input and added adequate suffixes to them. Any verbal form is constructed the same way – one stem plus affixes. This procedure used by children to create regularized forms shows an important fact about the Portuguese irregular paradigm: One of the stems is the basic form – and this form, according to Lorandi (2007), is the infinitive form. The others are allomorphs. The base of the paradigm is shown by the choice that all children in my study took: a same root inside each verb was chosen to create forms with the verbs "fazer" (to do), "trazer" (to bring), "saber" (to know) and "pôr" ("ponhar", in the child's version of this verb) (to put). For the verb "fazer", the chosen root was "faz-" (and not "fiz-", which also take part on the paradigm); for the verb "trazer" all forms found in my data presented the root "traz-" (and not "troux-", which also take part of the paradigm); for the verb "saber" the chosen root seems to be "sab-" (and not "saib-", "soub-" or "sei", all entries of the paradigm); and for the verb "pôr" (which is "ponhar" in child's production), all regularized forms presented the root "ponh-" (and not "por-" or "pus-", which also take part on the paradigm). Looking at these data, we can see that with E1 representations, which are exemplified by regularized forms, children do not seem to be looking for data from the environment anymore but looking at the system per se, since they do not hear these forms from their parents. Looking for regularities that they do not find in the environment, children create new forms, with a stem from the paradigm and suffixes which express the right idea about what they intend to convey. Although this kind of data is not available to conscious access and verbal report, it seems to show the beginning of a flexible cognitive system and the children's nascent theory about basic forms in irregular paradigm and regularity then seems to be built.

The process of Portuguese verbal forms regularization shows another important point. Unlike verbal regularized forms in English, which are formed by a stem like "go" plus the regular past tense suffix "-ed" – and all regularized forms are like that – Portuguese regularized forms involve a more complicated process like in Spanish, for example (Aguirre, 2006). Children first extract a stem from the paradigm and then apply regular suffixes to this stem. This process shows that irregular forms are analyzable and not a single block stored in the lexicon, as postulated by Marcus et al. (1992), Pinker (1999) and other nativist analysis. Children in the Explicit 1 level of representation are capable of analyzing irregular paradigms in order to look for some regularity, which is an early cognitive skill, according to Slobin (1980). If they can analyze irregular forms and extract information from them, irregular and regular forms can be analyzed in the same way. This may be a point to Connectionism, but that is a point to future research.

In the case of the changes of inflectional suffixes, children replaced a $1^{st}$ conjugation suffix by a $2^{nd}$ or a $3^{rd}$ conjugation one or vice-versa. This proceeding shows that children can deal with the internal structure of the word and recognize[31] suffixes of the language. The changes are between the same grammatical instances: Conjugation classes. The grammatical idea of tense, for example, is mantained – just the conjugation class is changed. There are three conjugation classes in Portuguese and each class presents in the paradigm different suffixes related to different persons, moods and tenses. The form "bebi" (I drunk it), for example, belongs to the $2^{nd}$ conjugation and presents the root "beb-" plus the $1^{st}$ person and past tense suffix "i" (with no thematic vowel expressed). The form "botei" (I put it), on the other hand, belongs to the $1^{st}$ conjugation and presents the root "bot-" plus the thematic vowel "a" (which in the $1^{st}$ person and past tense form becomes "e"), plus the $1^{st}$ person and past tense suffix "i". In the child production "boti" (A.L., 2:1), for example, instead of the form "botei", which is the adult one, with the $1^{st}$ conjugation structure (stem + e + i), the child applies the structure of $2^{nd}$ conjugation (root + i), as in the case of "bebi". The same happened with the forms presented in data: "di" (R., 4:10) instead of "dei", "pensi" (H., 3:4) instead of "pensei", "suji" (A.C., 2:11; 23) instead of "sujei", "dobri" (A.C., 3:2;15) instead of "dobrei" and "tomi" (A.C., 3:7;6) (J., 3:0) instead of "tomei". For the child to come up with "mexei" (M., 3:0;15), the opposite is true: The child applies a $1^{st}$ conjugation structure to a $2^{nd}$ conjugation form. The same happened with the following forms: Comei (M., 3:0) instead of "comi", "enchei" (J., 3:11) instead of "enchi" and "descei" (O., 2:7) instead of "desci".

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[31] Children "recognize" linguistic resources it the way that E1 representations do it: There is no access to knowledge or verbal report yet.

In a child form like "usia" (H., 3:4), the aspect suffix "ia"[32] belongs to the 2nd an 3rd conjugation, but the child used it in a 1st conjugation verbal form, which should be "usava". The opposite happens with the child form "conheciva" (Isd., 4:6), in which the 1st conjugation aspect suffix "va" was applied to a 2nd conjugation verbal form, which should be "conhecia", as well as with "duava" (M., 4:4) instead of "doía". We can see that changes are made in both directions: From 1st conjugation to 2nd and 3rd[33] and vice-versa. It seems that children experiment the language resources available in their system. At this level, children are no longer focused on the environmental data, but they are focused on the system, discovering how they can put together the linguistic puzzle, with its several little pieces.

In the case of lexical novelty, as we could see in section 2.2.3.2, children coined new words based on those words that they already know. Again, they show that they are able to use morphological resources in an adequate way – albeit not grammatically acceptable, but fully understandable. According to Katamba and Stonham (2006), productivity constraints restrict the way one can coin words. If there is already a word for "demora" ("delay"), for example, one cannot coin "demoramento". But people do these things sometimes when they lack the right word or when they cannot access the word at that time. And so do children. Let's recall all lexical novelty present in the data and then analyze them.

| Child's coined form | Child's name and age |
|---|---|
| surfador (surfer) | Isd., 5:3 |
| massageira (masseuse) | Ra., 5:4 |
| remedieiro (one who sells medicines) | Isb., 5:10 |
| balanceira (bola) (ball) | A.C., 2:10 |
| demoreiro (one who delays) | I. 4:4 |
| oscarzês (language spoken by Oscar) | Isd., 6:2 |
| amigosa (friendly) | A., 8:1 |
| gala (galinha) (chicken) | A.C., 2:10 |
| borrachar (to erase) | A., 3:8 |
| xizar (to mark an "X" in an option) | A., 6:11 |
| vassourar (to sweep) | A.C., 3:11 |
| brinca (to put an earring) | C., 4:0 |

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[32] If the suffix is "ia" or just "a" will not be discussed here.
[33] 2nd and 3rd conjugations present basically the same suffixes for most of their verbal forms.

| filhou (it made kids) | P., 3:9 |
|---|---|

Chart 13 – Lexical novelty
Source: The author.

"Surfador" is a coined word which adjoins a base from the verb "surfar" (to surf) to an agentive suffix "-or" [34]. When the child coined "surfador", he/she was probably lacking the word "surfista". The suffixes "-or" and "-ista" can cover the same meanings in Portuguese. They both carry the meaning of agent. To coin the word "surfador", this child used the right morphological resources, although there is already a word with this meaning in Portuguese, which prevents the need of coining of another one. Some examples of real words that present this suffix is "trabalhador" (workman), "colaborador" (collaborator), "vendedor" (seller). All these words are formed from verbs: trabalhar – trabalhador, colaborar – colaborador and vender – vendedor. The word coined by the child follows the same structure: surfar – surfador.

"Massageira" is a coined word formed from the noun "massagem" (massage) and means "one who performs a massage" (a masseusse). The suffix "–eira" is a usual suffix in Portuguese to indicate an agent. This suffix is used in real words like "faxineira" (maid), "cabeleireira" (hairdresser) and "cozinheira" (cook). The child used the right Portuguese morphemes, but there is already a word for this function – "massagista". The suffixes "-eira" and "-ista" cover the same meaning, which is agent. It is possible that the child probably forgot the right word at the production moment or simply did not know the right word, but she knew the word "massagem", the suffix "-eira" and their meaning, and coined a word to convey the meaning that she was intending to convey.

The coined word "remedieiro" follows the same structure of "massageira", except for the fact that in Portuguese there is no word to convey the meaning of "aquele que vende remédios" (one who sells medicines) using the base "remédio" (medicine), which was the meaning intended by the child. In Portuguese we have the word "farmacêutico" to cover this meaning. The word "remedieiro" is formed from the noun "remédio" (medicine) plus the agentive suffix "-eiro". Examples from real words are "padeiro" (baker), "carteiro" (mailman), "mensageiro" (messenger). All of them mean "one who does something".

"Balanceira" was coined to mean "ball". It was possible to find this meaning by the environment in which the word was produced. The child probably forgot the name for "ball"at

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[34] There are different points of view about this suffix. It may be "dor" (in words like "trabalhador"), which become "tor" in erudite forms (like in "ator"), or it may be "or" linked to the stem by a linking consonant "d" or "t". I will not discuss these aspects here.

the moment of speaking, and created a word from "something that bounces", based on the function of the word, joining the base "balançar" with the agentive suffix "-eira".

"Demoreiro" is a person that is usually late. In this case it is the child's father. The structure of this coined word is the same of other agentive words which end with the same suffix: Base plus suffix "-eiro".

"Oscarzês" is a coined word that means "the language spoken by Oscar". One possibility of naming languages in Portuguese is a base plus the suffix "-ês", like in "Português" (Portuguese), "Inglês" (English), "Polonês" (Polish). As the child could not understand what her little cousin Oscar was saying, she drawn the conclusion that he was speaking his own language – oscarzês ("oscarish" or "oscarese"). As we can see, the structure is adequate to convey this meaning.

"Amigosa" is an adjective which means "friendly". It is formed by the noun "amiga" (friend) plus the adjectival suffix "-osa". Examples of real adjectives with this suffix are "bondosa" (kind), "cuidadosa" (careful) and "generosa" (generous). However, the word "amigosa" does not exist because the word "amigável" already exists to convey the same meaning. At the moment of production, the child was talking about her family which is "bondosa" and "amigosa". In fact, the child did an analogy with the adjective "bondosa", using the same suffix to form another adjective. This means that she already demonstrates sensivity to the meaning and the function of the suffix.

The word for "chicken" in Portuguese is "galinha". There is a suffix in Portuguese that indicates the diminutive – "-inha". However, in the case of "galinha", there is no diminutive suffix, but the child who produced "gala" probably interpreted the end of the word "galinha" as a diminutive suffix, producing "gala" instead of "galinha". When a word like "casinha" (little house), which is a diminutive form, is formed, for example, the thematic vowel "-a" is deleted and the suffix "-inha" is added. In the case of "gala", the child extracted what she thought that was a suffix and added a thematic vowel, showing sensibility to the way in which diminutive words are formed in Portuguese. Another possibility is that "gala" is the female form to "galo" (rooster).

The child who coined "borrachar" intended to say "apagar" (erase) or "usar a borracha" (to use the eraser). This verb is derived from the noun "borracha" and presents a usual structure for verbs in Portuguese: stem plus thematic vowel "-a" plus suffix that indicates tense and mood "-r". This verb belongs to the 1st conjugation, which is the most productive one in Portuguese. In other words, the child coined a verb in the same way that other verbs are coined by adults. However, there is already a verb to convey this meaning in

Portuguese – "apagar". In the cases of the coined verbs "xizar" and "vassourar" the same happened: A verbal 1st conjugation structure was applied to a base. In the first case, "xizar", the base was "xis" (the letter X) and in the second case, "vassourar", the base was "vassoura" (broom).

"Brinca" is an inflected verbal form from the verb "brincar". In Portuguese, this verb has the meaning "to play". However, the child used this form with another meaning – "colocar um brinco" (to put an earring). Thus, the child joined the base "brinco" (without the thematic vowel "-o") with the verbal thematic vowel "-a", which is the right way to conjugate a 1st conjugation verbal form in Portuguese. It is important to highlight that there is no verb to convey the meaning of "colocar um brinco" (to put an earring) in Portuguese, so the child coined one.

"Filhou" is an inflected verbal form as well. But in Portuguese there is no such verb "filhar"[35]. This verb was supposed to mean "to have kids". The interesting fact about this verbal form is that the child coined an inflected form, which means that in his mind there should already be a verbal paradigm of this verb. This verb also belongs to the 1st conjugation, which is the most productive in Portuguese.

The morphological variant forms – regularization, changes of inflectional suffixes and lexical novelty – demonstrate children's sensivity to morphological resources. Although they may be interpreted as errors, they actually consist of E1 representations, which mean the beginning of a flexible cognitive system. This level is a step toward morphological awareness (E2 and E3 phases).

## 4.2 MORPHOLOGY TESTS – E2 AND E3 REPRESENTATIONS

In this part of the analysis, I will compare some results with those found by Berko (1958), since there are points in common. Subsequently, I will present results for questions on which Berko did not work, like the augmentative. Then, I will show why we can consider these data evidence of E2 and E3 representations. For Karmiloff-Smith (personal communication, 2010), linguistic awareness is possible just when the child reaches E2 and E3 levels of representations.

The three morphological tests developed in this thesis involved questions about derivation, verbal inflection and extraction of the base. Different kinds of suffixes were

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[35] A verb which use the root "filh" is "afilhar-se", but it is possible that Portuguese speakers do not recognize the same root in this verbal form and in the word "filho".

expected in responses (see chapter 3), according to the possibilities in Portuguese. Moreover, we can see different morphological processes occurring in word derivation, inflection and extraction of the base like adequate dropping of thematic vowels to the addition of suffixes, adequate addition of suffixes (nominal and verbal ones) and prefixes, addition of thematic vowel in the extraction of the base and the productivity of Portuguese affixes. In other words, we can see how language works during the process of morphological acquisition.

Many of the responses may represent sensitivity to morphological resources. However I had to define a criterion according to which they were considered adequate, taking into account that in this kind of off line tasks, I wanted to look at children skills on adding affixes to a base. Like Berko (1958), I based my work on the tests with adults and considered their responses as a parameter for adequacy. The children responses which match with the adult responses were considered adequate. Furthermore, I also checked the children's capability of dealing with nonce words and their skills in applying of morphological resources to these words. Because of this, responses that do not use the base in Test 1 or that do not extract the right base on Test 2 were not considered adequate. These other responses will be further analyzed as well.

### 4.2.1 Test 1

Berko (1958) analyzed the formation of plural, past tense, diminutive and compounded or derived words, derived adjective, third person singular, singular and plural possessive, the comparative and superlative of the adjective, progressive and derived agentive or compound and the judgment of compound words in a set of alternate questions. In my tests, I analyzed the formation of agentives, diminutive and augmentative, locatives, adjectives, the past tense of 1ª and 2ª conjugations, progressive and judgment of words. I do not include the formation of plural and gender forms because these kinds of inflections are acquired quite early in child language, and I am looking for more difficult morphological processes which could demonstrate more refined knowledge. Future research will look at the more basic processes.

In terms of derivation, in Berko's tests children were asked what they would call a man who *zibbed* for a living, what they would call a very tiny *wug*, what they would call a house a *wug* lives in and what kind of dog a dog covered with *quirks* is. In my tests children were asked to answer these questions as well as others, as we saw in chapter 3. I will first present the questions in comparison to Berko's tests and then analyze the other questions.

In order to compare the results between English- and Portuguese-speakers, let's take a look at part of the table presented in the previews chapter. The data are grouped in 3: 1 (3rd and 4th grades, with 24 subjects), 2 (1st and 2nd grades, with 31 subjects) and 3 (Kindergarten I, II and III, with 29 subjects). Each subject represents one answer to a question.

Table 1 – Percentage of adequate responses to questions 1a, 2a and 3a for children

| Percentage of adequate responses to questions 1a, 2a and 3a | | | |
| --- | --- | --- | --- |
| | Group 1 | Group 2 | Group 3 |
| 1a | 10 (42%) | 5 (16%) | 3 (11%) |
| 2a | 13 (54%) | 3 (11%) | 4 (14%) |
| 3a | 15 (63%) | 6 (22%) | 5 (17%) |

This table shows the results for the questions about agentives from Test 1. In Berko's results, adults unanimously said that a man who *zibs* is a *zibber* and 27% of the 1st grade children were able to give an adequate response to agentives (11% said *zibber*, 11% said *zibbingman* and 5% said *zibman*). In my tests, as we can see in table 1, more than 10% of the children in all groups were able to provide adequate responses, based on the adequacy criterion[36]. The group 1, 3rd and 4th grades, children were able to provide 42% of adequate responses to question 1a and more than 50% to the question 2a and 3a. In the second group, 1st and 2nd grades, to compare with Berko's results, more than 10% of the children gave adequate responses to the questions[37]. We can see that the children's performance in 2a was worse for all groups. This may be due to phonological reasons, since the nonce word *segor* has the least common structure of the three nonce words of Test 1 and ends with a heavy syllable (CVC – consonant, vowel and consonant) which can be more difficult to children. Additionally, *segor* ends in a consonant, while the others end in a vowel. Recall that all words were made up to verify if the phonological structure of the word would affect the results. The structure of the nonce word *mafata*, which has the simpler syllable structure, seems to help all groups to derive agentives.

The responses given by adults and children are illustrated in the following graphs. The responses were classified in categories. The adequate responses were considered the base plus adequate suffixes and compounds. However, other responses may be considered more or less

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[36] Kindergarten I and II could not provide adequate responses. So the results presented referes to Kindergarten III.

[37] 1a = a person who works with a flopo is a _____. 2a = a person who works with segor is a _____. 3a = a person who works with mafata is a _____.

appropriated for each question. For example, a response like "other base plus adequate suffix" is more appropriate than a response like "other base plus other suffix" because in the former the child was able to provide an adequate suffix. However I salient that only the base (*flopo*, *segor* or *mafata*) plus adequate suffixes and compounds were considered adequate to evaluate morphological awareness in this thesis. A future study can look at these other responses more carefully. In the data that I will show, the "base" is always one of these three possibilities: *flopo*, *segor* or *mafata*. When the children used other base, I registered this occurrence as "other base" or "noun (N)". The categories that I established to classify the responses are:

- Base + adequate suffixes: It consists in the base *flopo*, *segor* or *mafata* with adequate agentive (question A), diminutive (question B), augmentative (question C), "very big" (question D), locative (question E) and adjectival (question F) suffixes applied;

- Base + other suffix: It is related to the base *flopo*, *segor* or *mafata* with other suffixes applied, which are not related to the question;

- Compounds: Words in which there is a base (*flopo*, *segor* or *mafata*) and other attached words which function like suffixes or prefixes or a attached word that provide the semantic function of the question to the base (like in "sofá-cama" which means a "sofa" (sofa) that function like a "cama" (bed);

- Sentences with the base: Sometimes children use a full sentence instead of a word to define a *flopo*, a *segor* or a *mafata*, using these bases;

- Sentences without the base: Other times, children use a full sentence instead a word to define a *flopo*, a *segor* or a *mafata* and they did not use these bases;

- Other base + adequate suffixes: This category consists in using other base (not *flopo*, nor *segor*, nor *mafata*) and apply to them an adequate agentive (question A), diminutive (question B), augmentative (question C), "very big" (question D), locative (question E) and adjectival (question F) suffixes;

- Other base + other suffixes (including verbs): This may be considered, as much as a sentence without the base and other base with no suffix, the most inadequate response, since it consists in other base (not *flopo*, nor *segor*, nor

*mafata*) and inadequate suffixes or suffixes which are not related to the question. This category include verbs as responses;

- Other base with no suffix: This is just any free base with no suffix, like "flor" (flower). This category include numerals;

- Base +N (with suffixes A to F): This category is related to the base (*flopo*, *segor* or *mafata*) and another name with adequate suffix, like in "trabalhador de *flopo*, *segor* or *mafata*", in which an adequate suffix like –or (plus the linking consonant –d-) was attached to the base "trabalha" that is the verb presented in the question "a person who works (trabalha) with *flopos*, *segor* or *mafata* is a";

- Repetition of the base/question (ROTB/Q): This is when the child just repeats "*flopo*", "*segor*" or "*mafata*" or repeats the question "*flopo* pequeno" (small flopo), "*segor* grande" (big segor), "*mafata* muito grande" (very big *mafata*) as a response;

- Other responses: In this category it was included all the responses which presented low frequency and/or did not fit in other categories (including proper names, preposition + N, adverbial + prononom, adjective, adverbial + noun, responses like "cheio de alguma coisa" (full of something) and "lugar de + base or other noun" (place full of + base), preposition + base (or another noun), base + adverbial);

- Base + adjective: It consists in the use of the base (*flopo*, *segor* or *mafata*) with an adjective (this kind of response was frequently used in response to the question B (a small *flopo*, *segor* or *mafata* is a), C (a big *flopo*, *segor* or *mafata* is a) and D (a very big *flopo*, *segor* or *mafata* is a);

- Other base + adjective: An adjective is used with another base or noun (not *flopo*, nor *segor*, nor *mafata*);

- Base + adequate prefix: This category include cases in which an adequate agentive (question A), diminutive (question B), augmentative (question C), "very big" (question D), locative (question E) and adjectival (question F) prefix was applied to the bases *flopo*, *segor* and *mafata*;

- Base + other prefix: A prefix which is not related to the question is applied to the bases *flopo*, *segor* or *mafata*;

- Base + repetition of the suffix (ROTS): This category was designed to include a specific kind of responses frequent to the question D, in which the suffix –ão was twice or three times applied to the same base (*flopo*, *segor* or *mafata*), in order to get the effect for "a very big *flopo*, *segor* or *mafata*", like in *flopãozão*;

- Other base + repetition of the suffix (ROTS): When the repetition of the suffix was applied to other bases (not *flopo*, nor *segor*, nor *mafata*);

- N place + base: This kind of responses ir related to the composition of a structure in which a noun that express the idea of place is used with the base (*flopo*, *segor* or *mafata*), like in "casa de *mafatas*" (house of *mafatas*). This category was designed to this kind of responses given to the question E (a place full of *flopo*, *segor* or *mafata* is a);

- N place + other base: When the same kind of responses was structured without the bases *flopo*, *segor* or *mafata*, but with other bases or nouns;

- Base + adjectival suffix and prefix: It consists in the process of parasynthesis, in which a suffix and a prefix are attached to a base at the same time. In this case, the base is *flopo*, *segor* or *mafata*. This kind of responses was found to the question F, in which the child was ask to form adjectives (a person full of *flopo*, *segor* or *mafata* is);

- Present continuous sentence: This category includes responses which consists in verbs with end with –ndo (in Portuguese), like "andando" (walking), "comendo" (eating) or "partindo" (leaving). This kind of response was found to the question F, which ends with a auxiliary verb "is", opening the opportunity to insert a present continuous verb;

- "I don't know": When the child answers "Não sei" (I don't know) and, even with the insistence of the experimenter, s/he continues to answer that s/he does not know.

Taking into account question A (a person who works with *flopo*, *segor* or *mafata* is a) I considered adequate suffixes those which add agentive meaning to the base: -Eiro, like in "jardin**eiro** (gardener), -or, like in "profess**or**" (teacher), -ista, like in "motor**ista**" (driver) and –grafo, like in "fotó**grafo**" (photographer), presented in the adult's responses. I will first show the responses given by adult and then those given by children to the questions 1a, 2a and 3a.
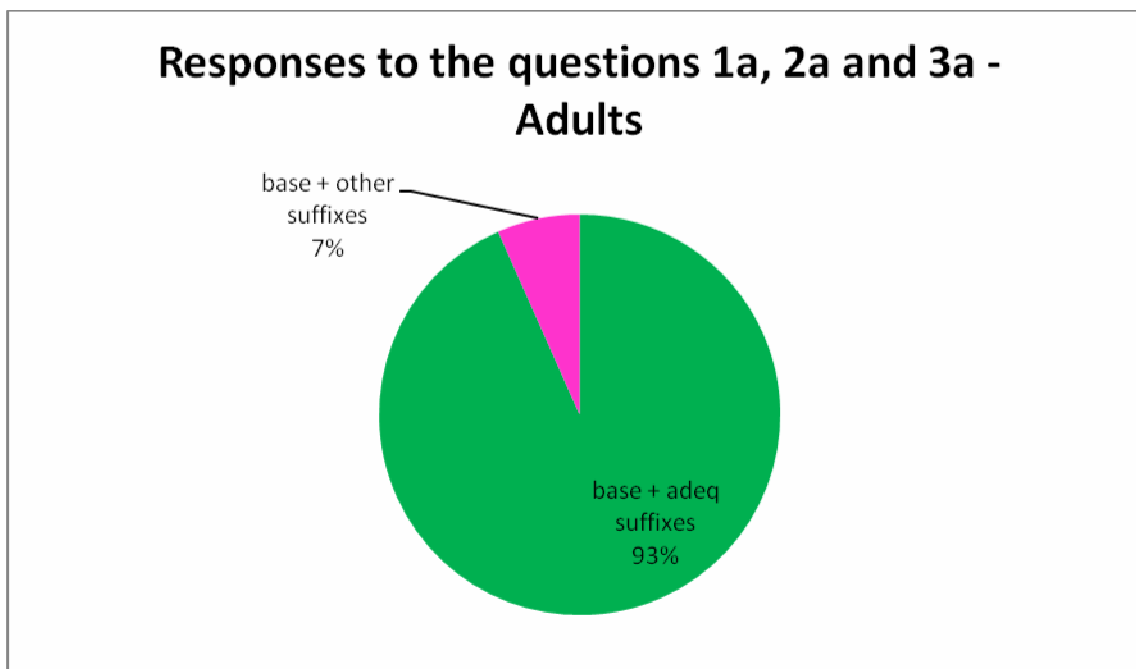


Figure 1: Responses to the questions 1a, 2a and 3a – Adults

This graph joins the results for the three questions: 1a, 2a and 3a. Accordingly, the mayority of adult were able to provide a response with an adequate suffix applied to the three bases: *Flopo*, *segor* and *mafata*. The most frequent suffix is –eiro (11 out of 30), like in "flopeiro". But several others were used as well, including two that are adjectival: –osa (*floposa*) and –ento (*flopento*) (other suffixes). They are not agentive, but represent a possible response to the question "a person who works with is a".

Below one the results for children.
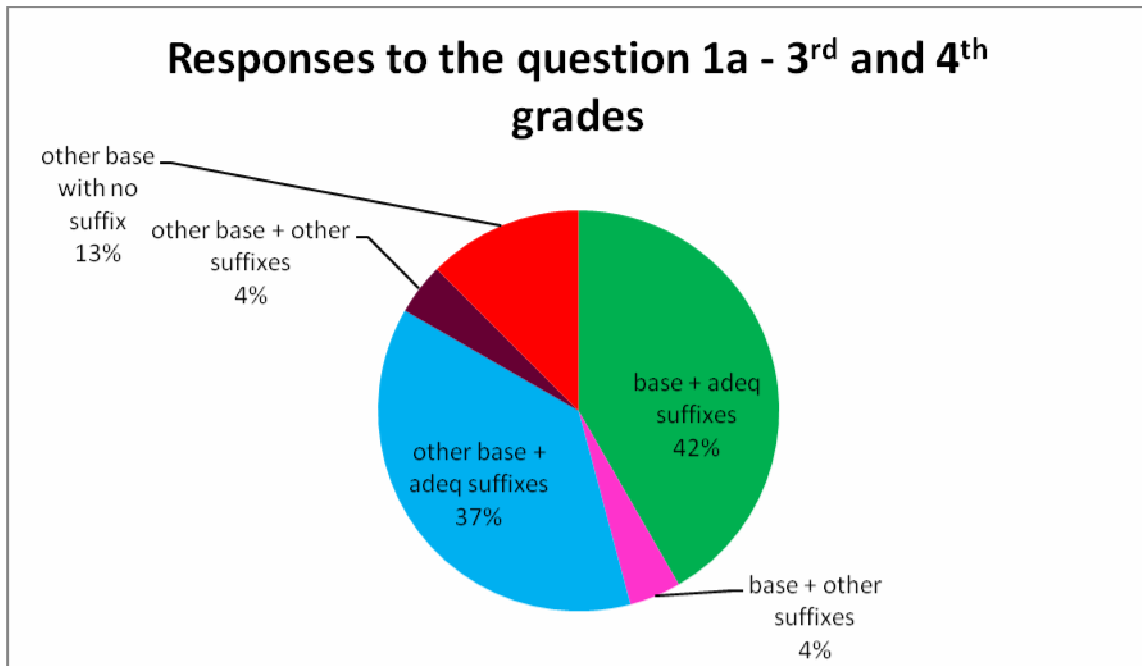
Figure 2: Responses to the question 1a – 3<sup>rd</sup> and 4<sup>th</sup> grades

This is the result of the 3<sup>rd</sup> and 4<sup>th</sup> grades. The children produced 42% of adequate responses, using the suffixes –or (*flopador*) and –eiro (*flopeiro*). The other responses were: "flopões" (big flopo), "agricultor" (agriculturist), "jardineiro" (gardener), "trabalhador" (workman), "floco" (flake), "tratador de cavalos" (attendant horses) and full sentences instead of a word. The most frequent suffix for 4<sup>th</sup> grade was –or (all de adequate responses used –or) and for 3<sup>rd</sup> grade was –eiro (4 out of 6). The choice for the suffix -eiro matches with the results for adults.
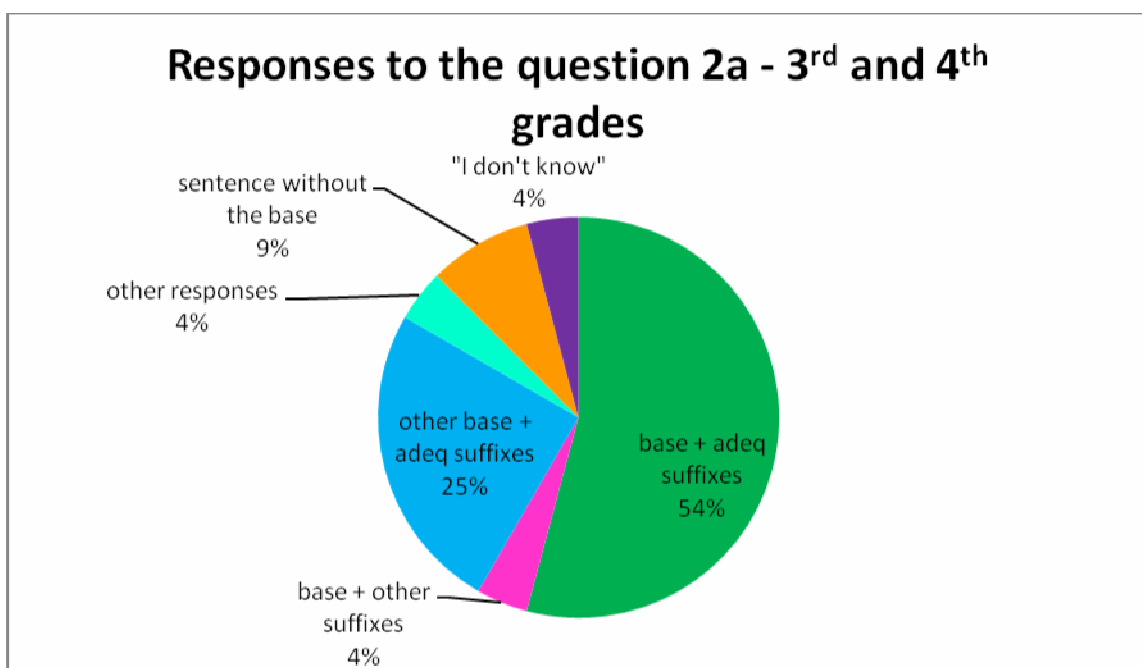


Figure 3: Responses to the question 2a – 3<sup>rd</sup> and 4<sup>th</sup> grades

Related to the second base, *segor*, for the 3<sup>rd</sup> and the 4<sup>th</sup> grades, 54% of the children were able to provide an adequate response. The most frequent suffix for 4<sup>th</sup> grade was –or, like in *segorador* and the suffixes –eiro and –or were preferred by 3<sup>rd</sup> grade, which match with adult's choices. In the 4<sup>th</sup> grade, two children used the suffix –ista, which is the second most frequent in adult's responses along with the suffix –or. The other three kinds of response included the agentive –or in the word "agricultor" (farmer), a sentence which defines who is the person who works with *segores*, and a preposition and a name, "com fogo" (with fire), which had no relation to the question. For 3<sup>rd</sup> grade, there was another response which used the base, that ends with a thematic vowel –o, *sergo*, which involves a metathesis based on the base *segor*. The other responses were the agentive suffix –or in words like "trabalhador" (workman) and "doutor" (doctor) and a sentence to define who is the person that works with *segores*. One child said that s/he does not know the answer.
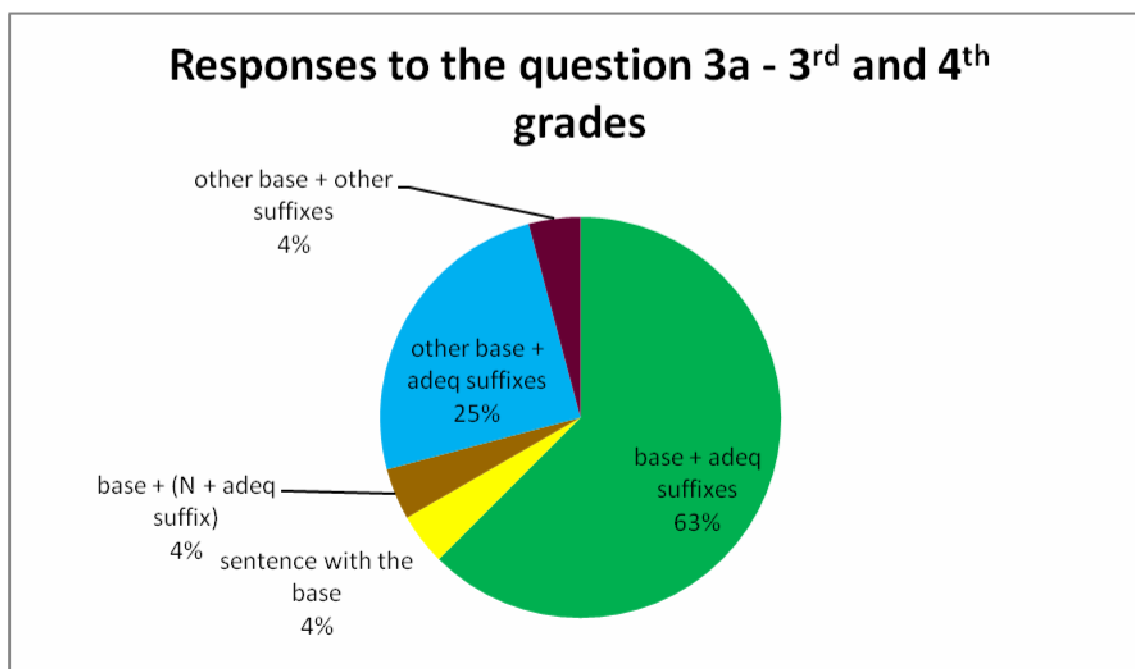


Figure 4: Responses to the question 3a – 3<sup>rd</sup> and 4<sup>th</sup> grades

Figure 4 shows us that 63% of the children in the 3<sup>rd</sup> and the 4<sup>th</sup> grades gave an adequate response to question 3a. The suffix –or (*mafatador*) was chosen in 50% of the responses and the suffix –eiro (*mafateiro*) (the most frequent adult's choice) was the second most frequent response for 4<sup>th</sup> grade. 20% of the responses did not use the base *mafata*, although they did use the adequate suffix –eira and a possible suffix –ano (like in the real word "cavalariano", a person who is part of the cavalry). The suffix –or was also used with another word, like in "*mafapa* trabalhador" (*mafapa* workman), which uses the base with a little alteration in the last consonant. For 3<sup>rd</sup> grade, the suffix –or/ora (showing the male and

female forms) were most frequent and the suffix –eiro was the second most frequent. The suffix –or was used with other agentives as well, like in the word "agricultor" (farmer), which did not use the base. Children also gave a full sentence as response and a word with thematic vowel –a followed by –s (plural) – "pessoas" (people).

Let's check the results for the second group of children: 1st and 2nd grades.
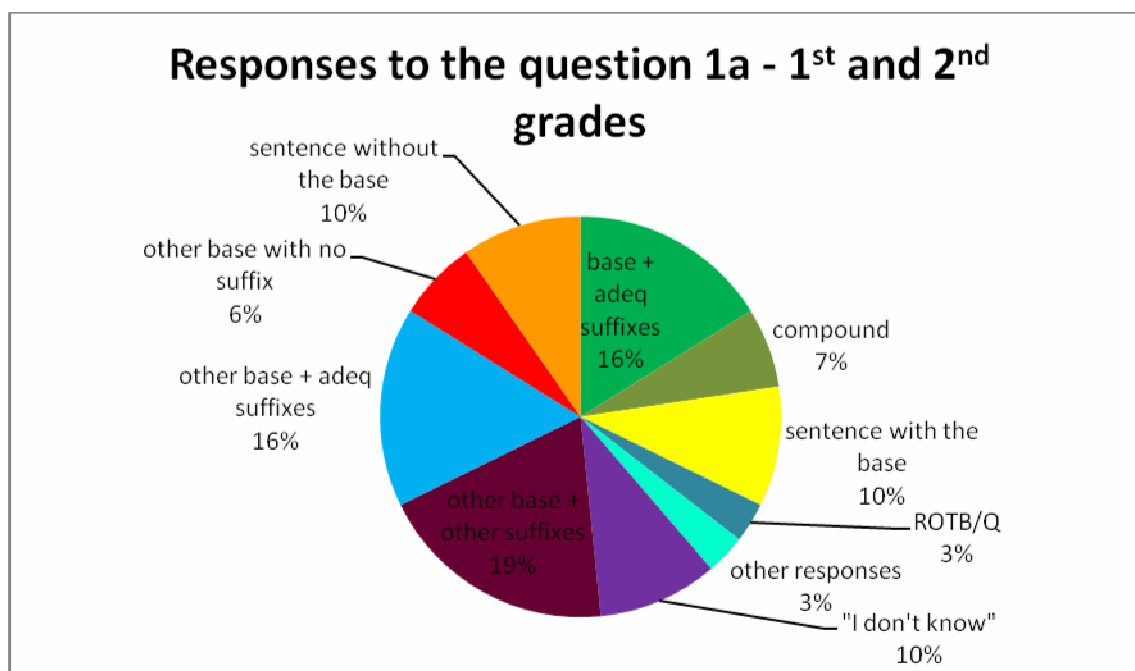


Figure 5: Responses to the question 1a – 1st and 2nd grades

For the 1st and the 2nd grades, a greater variability of suffixes was presented. For the 2nd grade, the most frequent structure was compounds, like "adora-flopos" or "trabalha-flopos" (like-flopos or work-flopos). Two other adequate suffixes were used: -Or (*mafatador*) and –eiro (*mafateiro*). Among the responses which used the base there is one full sentence which is not an adequate response. The other responses were: A word which ends with a thematic vowel –a, "doutora" (doctor), a proper name and a root with no suffix, which is the pronoun "vários" (several). Two children answered that they did not know the answer. For the 1st grade, just one child used an adequate suffix with the base. Inside this variability, we found agentive suffixes, like –or, -eiro and –ista and other responses like  words with thematic vowel -a, like "pessoa" (person) and "criança" (child), a word with thematic vowel –o, "médico" (doctor), a sentence and a word which ends with –ura, floricultura (floriculture). One child said that s/he did not know.
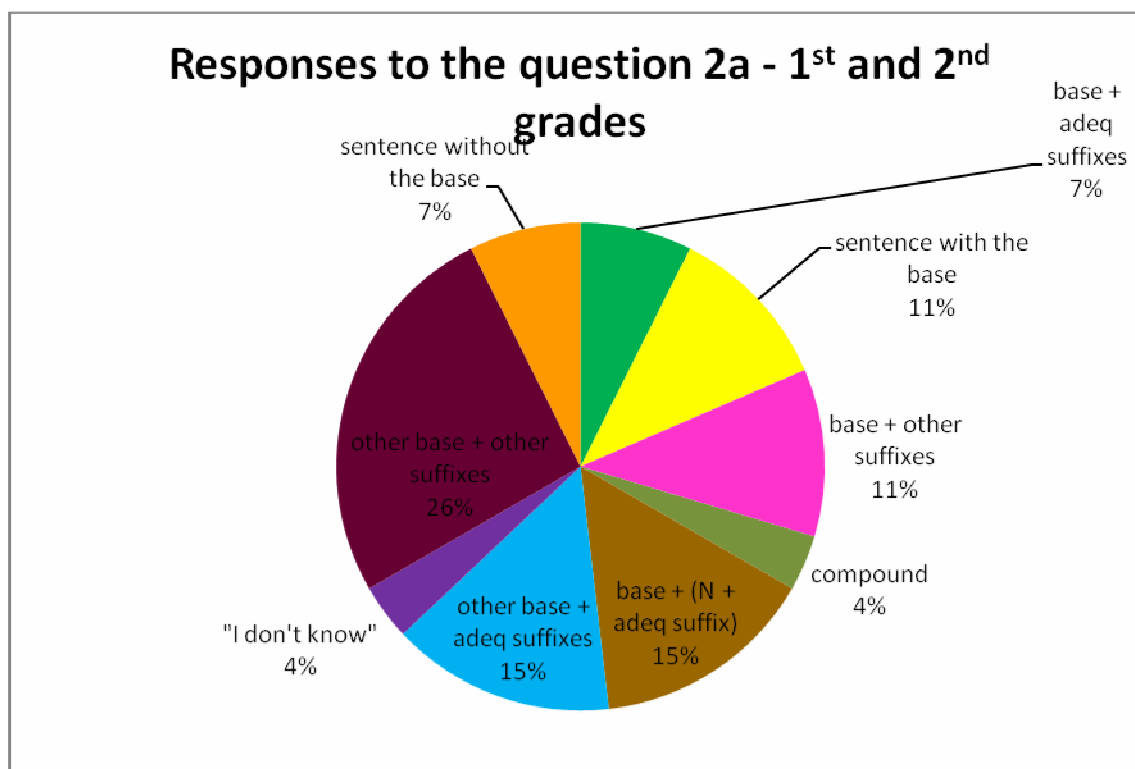
Figure 6: Responses to the question 2a – 1st and 2nd grades

Just 11% of the children (3 out of 31) were able to provide adequate responses. For 2nd grade, one of the responses was with the suffix –eiro and the other was the compound "trabalha-*segor*" (work-*segor*). All the other did not use the base, like –or in "trabalhador" (workman) and "pessegueiro" (peach tree), or did not provide adequate suffixes, like the pronoun "vários" (several), which ends with the thematic vowel –o, followed by –s (plural), and one adjective ending in the suffix –nte, amante, which may be considered an adequate response, since in Portuguese it may be an agentive as well, like in the word "comerciante" (marketer). For 1st grade, just one child gave an adequate response, with the suffix -ista, to this question. All the other either did not use the base, like "rato" (mouse), "artista" (artist), "trabalhador" (workman), "pessoa", "criança" and the proper name "Lisa", or did not provide an adequate suffix, like "*segorzinho*" (little *segor*), "trabalho *segores*" (work *segores*) and "segorzão" (big *segor*).
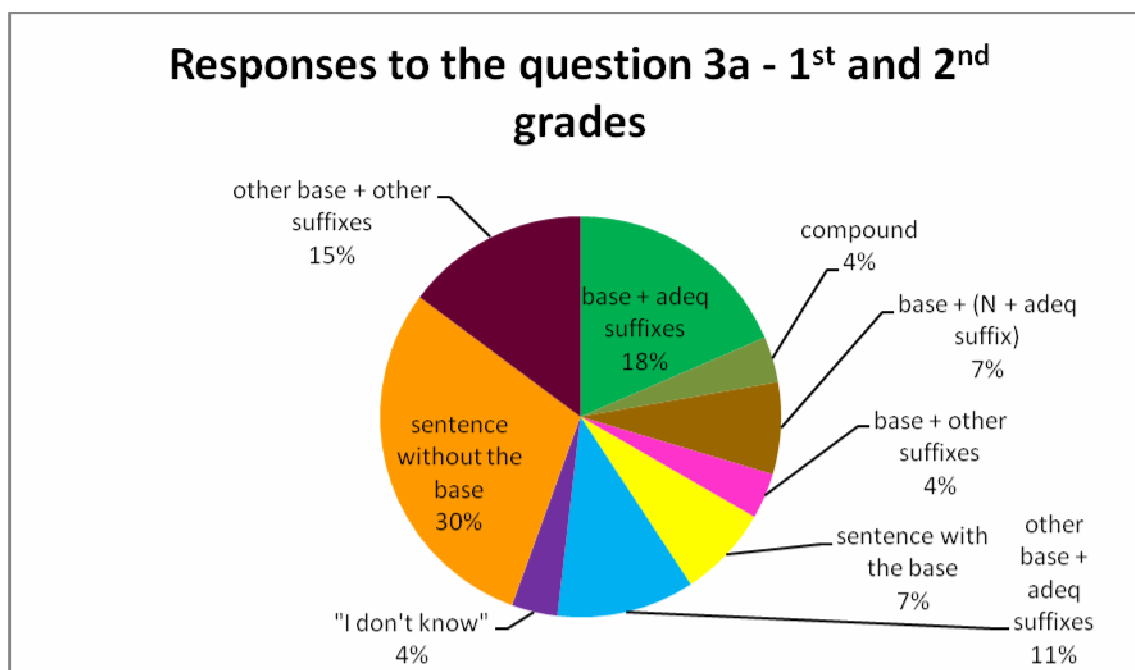
Figure 7: Responses to the question 3a – 1st and 2nd grades

In the second group, 1st and 2nd grades, 22% of the responses were considered adequate to the question "a person who works with *mafatas* is a". For 2nd grade half of the children chose the suffix –eiro and the other used a compound and or+es (mafatores). The suffixes –eiro and –or were used in other words as well, which did not use the base, like "faqueiro" (probably cutlery setting) and "trabalhador" (workman). As we can see, the word "trabalhador" is frequently used. Children also gave as responses a full sentence to define how the person who works with *mafatas* is called and a word with thematic vowel –o followed by –s (plural), which is actually the pronoun "vários" (several). In the 1st grade, just two used an adequate agentive suffix with the base *mafata*. The other responses included an inadequate suffix, like –inha, an adequate suffix in another word, like "pesquisador de *mafatas*" (mafatas researcher), a full sentence to define how a person who works with mafatas is called, with or without the base, and a simple thematic vowel in another word, like "fada" (faerie).

Now the results for Kindergarten I, II and III related to the questions 1a, 2a and 3a.
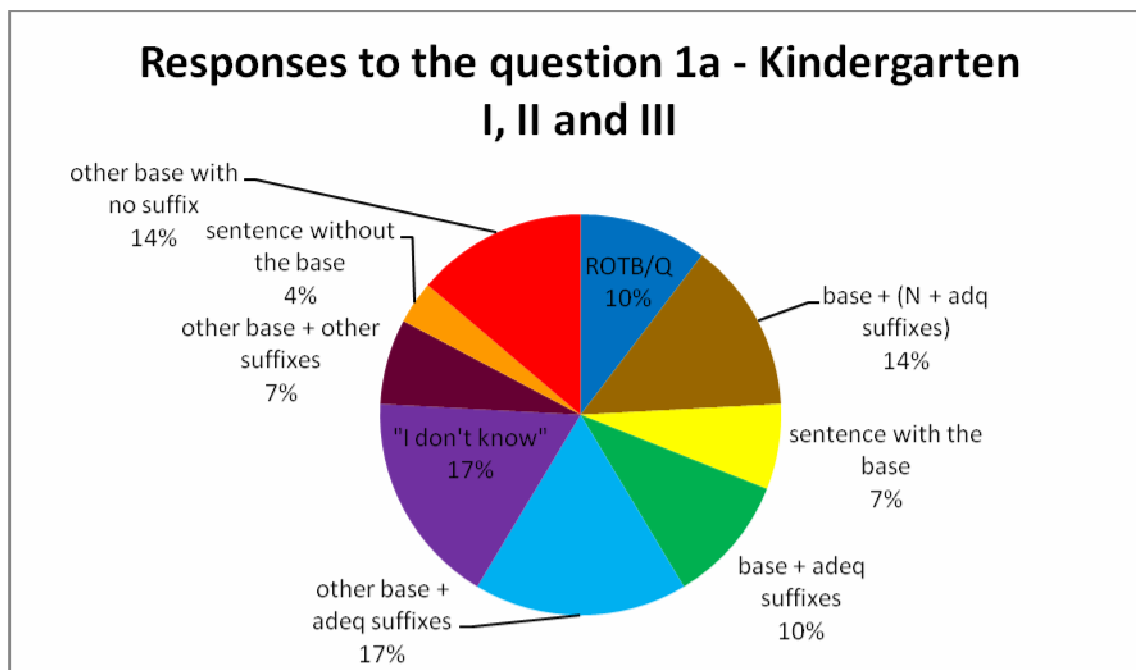
Figure 8: Responses to the question 1a – Kindergarten I, II and III

The third group, Kindergarten I, II and III presented few adequate responses. Kindergarten III presented the suffix –eiro (*flopeiro*) as the preferred one. 3 out of 12 children used this suffix. The other responses either did not use the base or did not use an adequate suffix. One response was a full sentence. Kindergarten II shows no adequate response to this question, although two kinds of responses used the base. They were not considered adequate because they were just a repetition of the base *flopo* or presented an adequate suffix in other word, like in "trabalhador de flopos" (workman of *flopos*), which used the base, but did not apply a suffix to the base. The other responses were a noun with an adjective "pessoa cheirosa" (pleasant smelling person), a verb, "trabalha" (it works), a full sentence with no sense, "a pessoa tem dois" (the person has two) and two words with the thematic vowel –a, "tia" (aunt) and "pessoa" (person). Moreover, no child provided an adequate suffix to this question in Kindergarten I. Half of them said that they do not know the answer and two of them gave words with no suffix as responses, TV and *givape*, a coined word (perhaps this word has a thematic vowel –e, but, as it is a nonce word, I cannot be sure).
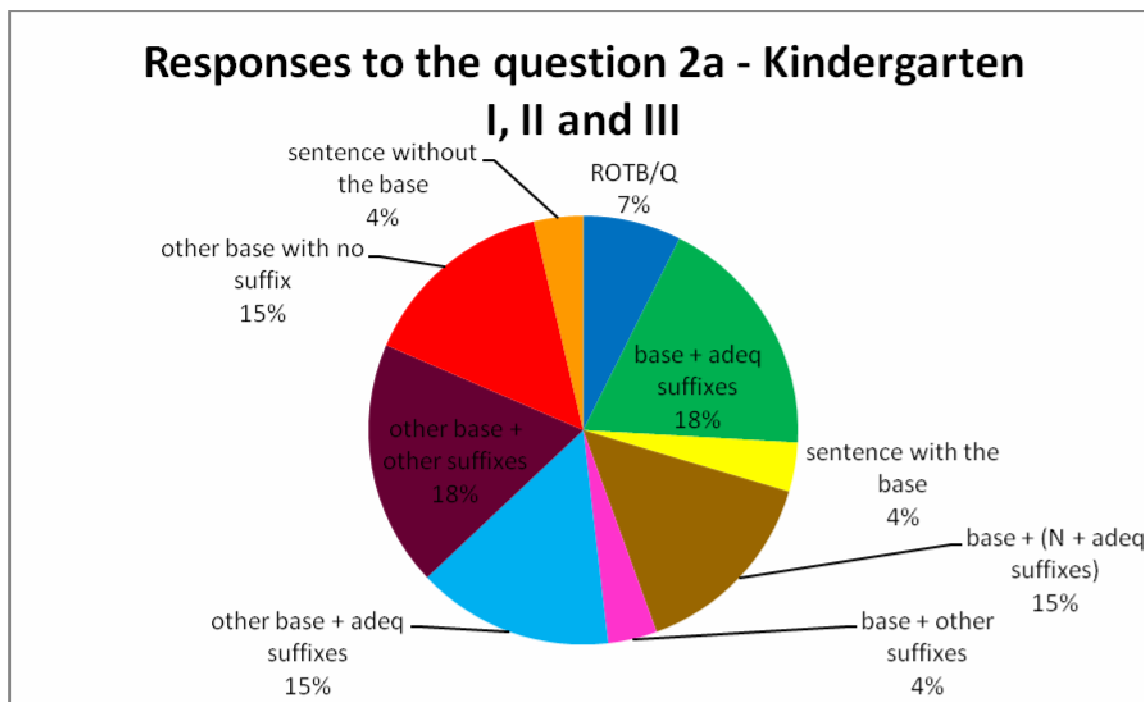
Figure 9: Responses to the question 3a – Kindergarten I, II and III

Kindergarten children provided 18% of adequate responses. Kindergarten III used the adequate suffixes were –or (*flopador*), -eiro/eira (*flopeiro* – male and *flopeira* – female) and –ista (*flopista*). There were other adequate suffixes, but they were used in other bases, like in "construtor" (constructor) and "artista" (artist). In Kindergarten II they either added an adequate suffix to another base, like in "trabalhador de *segores* or did not use the base. In the responses which did not use the base *segor*, a word appeared with the thematic vowel –o, "*profo* médio", which is a coined word, probably based on the first word of the test, *flopo*, a stem with no suffix, "homem" (man), a verb, "trabalha" (it works), a numeral, "um" (one) and a word with the thematic vowel –a, "cadeira" (chair). In Kindergarten I just one child gave an adequate response in this question. The chosen suffix was –eira, which match with the adult's most frequent choice. Most of the responses did not use the base and included a word with thematic vowel, "cama" (bed), a stem with no suffix, "flor" (flower), a word with the suffix –or, "trabalhador" (workman) and a full sentence. One word was derived from the base *segor*, "segora", with the addition of the thematic vowel –a, but it was not considered adequate because the thematic vowel –a has not agentive meaning.
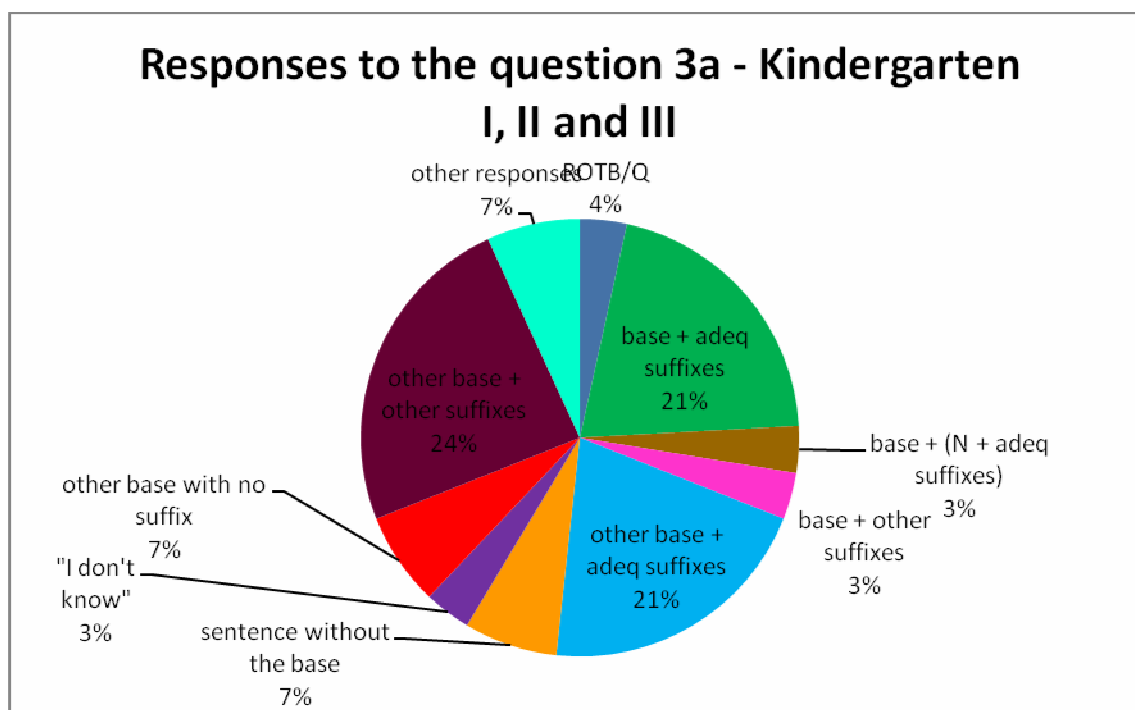
Figure 10: Responses to the question 3a – Kindergarten I, II and III

To the question 3a, the third group produced 21% of adequate responses. The Kindergarten III used the suffix –eira, like adults, with the suffix –or being the second most frequent among the adequate responses. The suffix –or was attached to other bases as well, like in "construtor" (constructor) or "trabalhador" (workman). The suffix –ista was also used by one child in the word "artista" (artist). The other responses were full sentences instead of a single word to define how a person who works with *mafatas* is called. For the Kindergarten II the responses were: The suffix –or with another word, like in "trabalhador de *mafatas*" (workman of *mafatas*), which uses the base, the suffix –or with another word without the base, like in "trabalhador" (workman) or "computador" (computer), the root with no suffix, like "flor" (flower) or "homem" (man), a word with a thematic vowel, like "*profo* médio", which is a nonce word and a nonce response, like "muito isso aqui 2 e 3 (very much this 2 and 3). For the Kindergarten I, just one response was considered adequate: "Mafateira", with the suffix –eira. The other word was "maflata", which I considered a repetition of the base, although there is an addition of the consonant "l". All the others did not use the base, although two of them used the agentive suffix –eira.

For diminutive questions, in Berko's results, no child used a diminutive suffix. They used *baby wug*, *teeny wug* and *little wug*. This is probably because English speakers use diminutive far less than Portuguese speakers, for example. We can see my results for diminutive in the following table.

Table 2 – Percentage of adequate responses to questions 1b, 2b and 3b for children

| Percentage of adequate responses for questions 1b, 2b and 3b | | |
|---|---|---|
| | **Group 1** | **Group 2** | **Group 3** |
| **1b** | 10 (42%) | 9 (29%) | 1 (3%) |
| **2b** | 12 (50%) | 11 (35%) | 3 (10%) |
| **3b** | 12 (50%) | 11 (35%) | 2 (7%) |

The table 2 shows that all groups were able to provide some adequate responses. From Kindergarten I, II and III to 3$^{rd}$ and 4$^{th}$ grade the percentage increases. The group 3's adequate responses were given by Kindergarten III children because none Kindergarten II or III were able to provide adequate responses, using adequate suffixes applied to the base (*flopo*, *segor* or *mafata*).

Let's inspect the responses in detail with some graphs, beginning with adults' results, followed by children's results.

All adults in the pilot study provided adequate responses, using the suffix –inho and its allomorph (-zinho) or female form (-inha), producing *flopinho*, *segorzinho* and *mafatinha*. As the responses were the same for all adults, a graph it is not necessary.

For the group 1, 3$^{rd}$ and 4$^{th}$ grades, the results for question B are below.
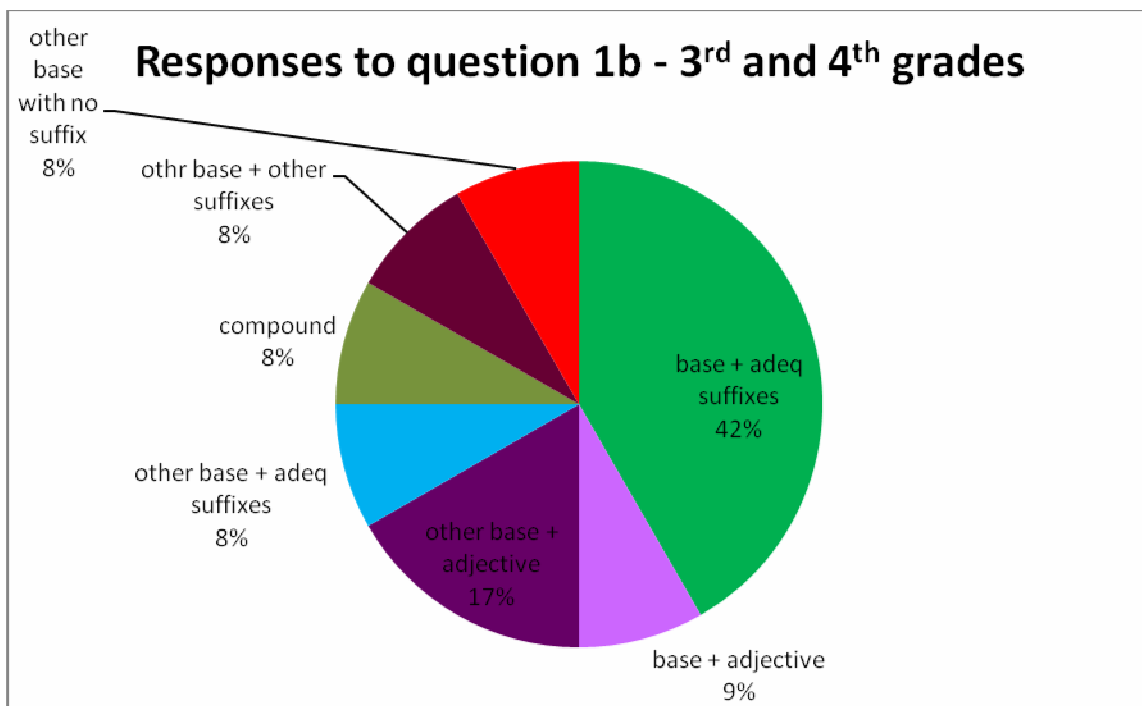


Figure 11: Responses to the question 1b – 3$^{rd}$ and 4$^{th}$ grades

This figure shows the results for question 1b, which is "a small *flopo* is a". 42% of the children in this group were able to provide an adequate response, using the base *flopo* and a diminutive suffix. All 3$^{rd}$ and 4$^{th}$ grades children used the suffixes –inho and –z+inho producing *flopinho* or *flopozinho*. For 4$^{th}$ grade, the suffix –inho was also used with another base, "passarinho" (little bird). There was a nonce compound "*florcopo*" and the other responses seem to take into account the supposed content of the word, looking for a definition of the nonce word: "Lobo pequeno" (small wolf), "flor pequena" (small flower) and "bola de neve" (snow ball). For 3$^{rd}$ grade, two children gave as response "*flopo* grande" (big flopo). Among the responses which did not use the base *flopo*, there are "pequeninho" (tiny), and responses which took into account the supposed content of the nonce word: "formiga" (ant), "gelo pequeno" (small ice), "flor" (flower), "flor pequena" (small flower), "sapo" (frog) and "pó" (dust). The use of "flor" (flower) in this question is probably due to the phonological similarity with *flopo*, since these two words begin with the same syllable.
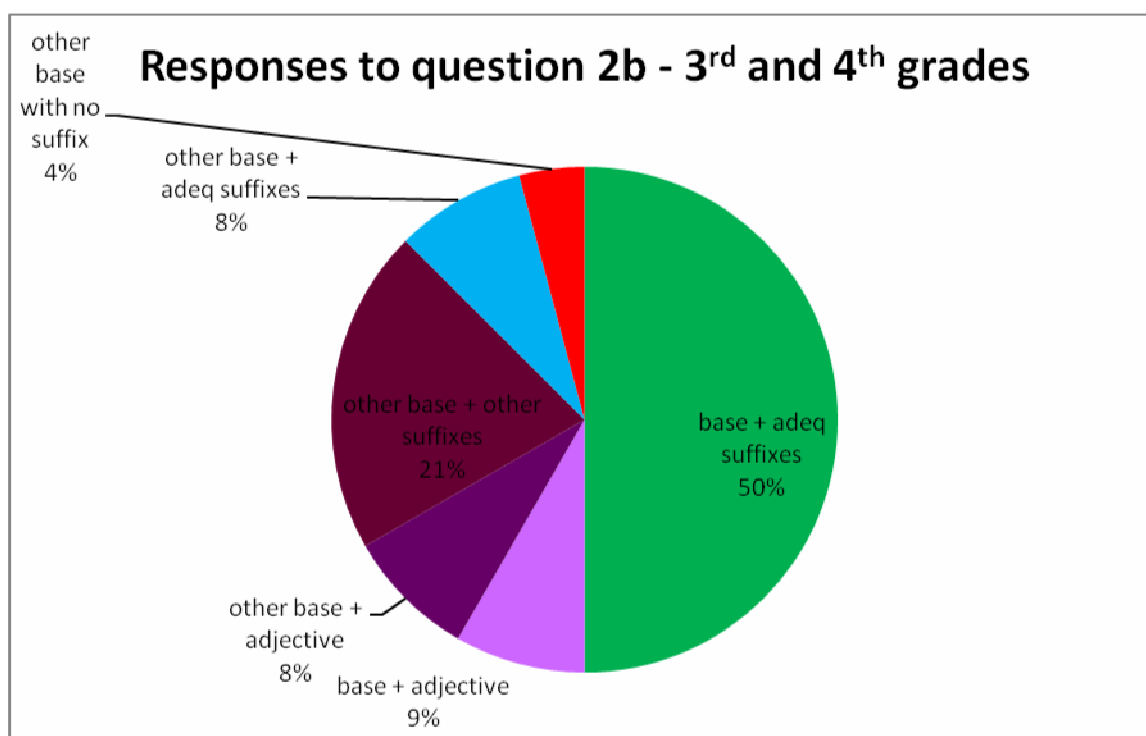


Figure 12: Responses to the question 2b – 3$^{rd}$ and 4$^{th}$ grades

In question 2b, which is "a small *segor* is a", the 3$^{rd}$ and 4$^{th}$ grades presented 50% of responses which used the base plus the diminutive suffix –inho (or its allomorph –zinho). The other responses did not used the base, but they seem to take into account the supposed content of the nonce word *segor*: "cegonha pequena" (small stork) and "olho pequeno" (small eye) used the structure noun plus adjective "pequeno" (small); "formigão" (big ant), which is the

augmentative form; and "flor" (flower), which does not have phonological similarity with the nonce word *segor* and it must have been used taking into account the content of the word. For 3rd grade, the responses were: "*Segor* esticável" (spreadable *segor*) and "*segor* maior" (bigger *segor*), the adjective "pequeninho" (tiny); "joaninha" (ladybug), which is a little animal; "formiga" (ant), which is a little animal as well, and "criança cega" (blind child) (the word "cega" shows phonological similarity with the nonce word *segor*), which used the thematic vowel –a; "porco" (pig) and "prego" (nail), which used the thematic vowel –o.
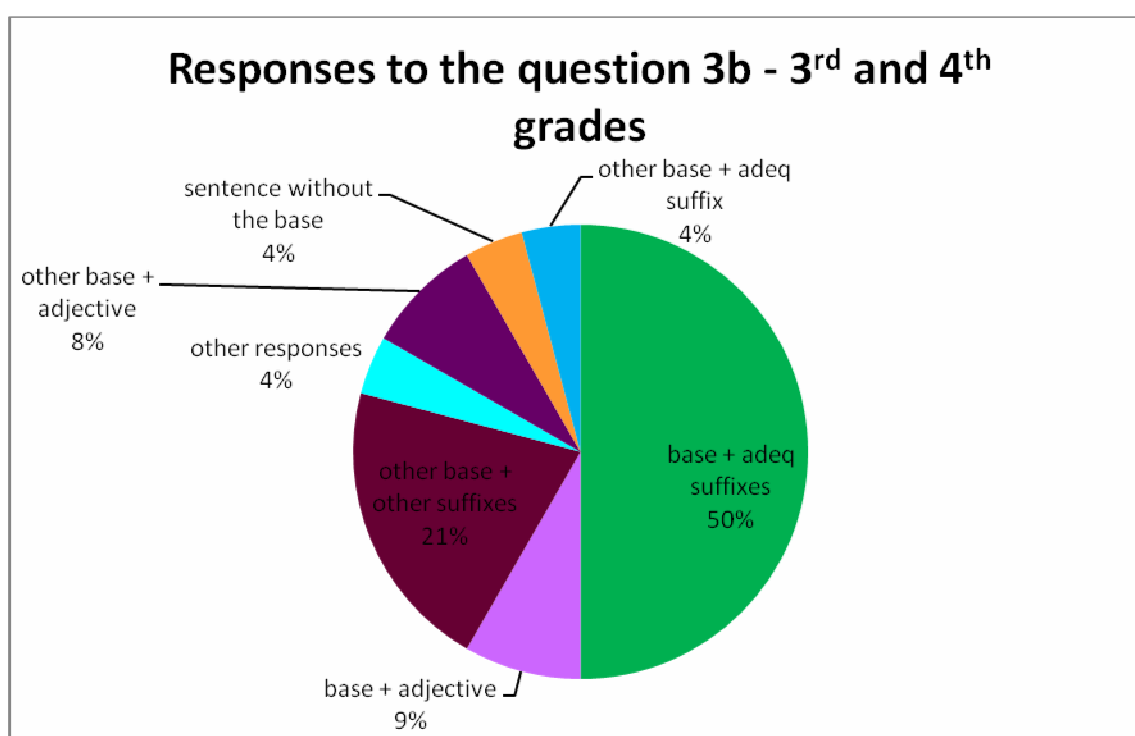


Figure 13: Responses to the question 3b – 3rd and 4th grades

50% of the 3rd and the 4th grades children used the diminutive –inha suffix in question 3b, which is "a small *mafata* is a", producing *mafatinha*. This was the adequate response and matches with the adult's responses to this question. I highlight that, as *mafata* is a female noun, the suffix used is in the female form as well, which reveals a morphosyntatic sensitivity. The other responses for 4th grade were: "*Mafateiro* pequena", in which the child applied the suffix –eiro to the nonce word *mafata* and added the adjective "pequena", mixing male and female suffixes; "formiga" (ant), "tatu-bola" (pillbug) and "bala" (candy), with thematic vowel –a. The other responses for 3rd grade were: "*Mafata* grande", the adjective "pequerrucha" (tiny); "flor pequena" (small flower) and "mato pequeno" (small forest);

"borracha" (eraser), "cabrita"[38] (little goat) and "folha" (leaf) with the thematic vowel –a; and a full sentence to define what a little *mafata* is.

The following figures will show the responses given by the Group 2, with 1st and 2nd grades, to the questions 1b, 2b and 3b.
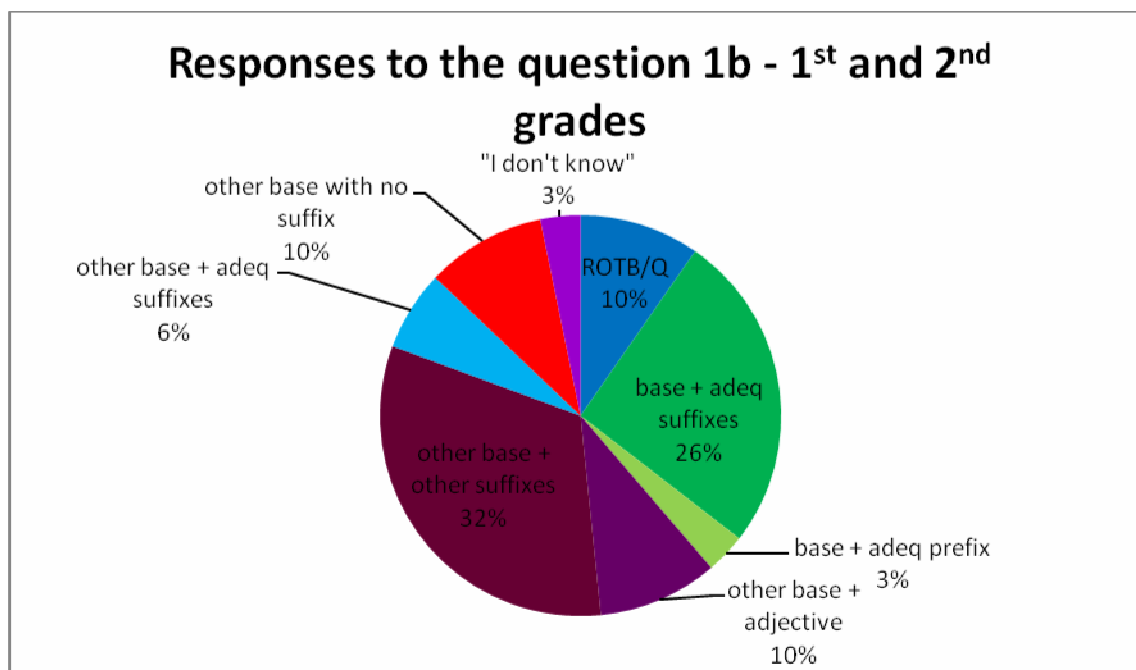


Figure 14: Responses to the question 1b – 1st and 2nd grades

In question 1b, 29% of the 1st and the 2nd graders used the base. However, in this question, there was a greater difference between the two groups, since in the 2nd grade 5 out of 10 children gave adequate responses to the question, while in the 1st grade just 4 out of 21 did it. Almost all the responses used the diminutive suffix –inho with the base *flopo* and one child used "mini *flopo*", which is adequate as well. In the 2nd grade, two children repeated the base and, among the responses which did not use the base *flopo*, one child said "floquinho" (small flake), which is very similar to *flopinho*, the target, and two children answered based on the supposed content of the nonce word: One child used a word with an adjective, "flor pequena" (small flower) (phonological similarity between "flor" and *flopo*) and the other said "semente" (seed). The 1st grade showed again a greater variability of responses. One child just repeated the question[39], saying "*flopo* pequeno" (little *flopo*). Except for the response "floquinho" (little flake), which is phonologically similar to "*flopinho*", all the other responses took into account the supposed content of the nonce word: "Criança" (child), "foca"

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[38] The suffix –ita in Portuguese denotes diminutive.
[39] I considered "repetition of the question" when children answered "flopo pequeno", since the question is about what a "flopo pequeno" is. The same proceeding was adopted with the other questions.

(seal), "pedra" (stone), "caneta" (pen), "bola" (ball) and "formiga" (ant) with the thematic vowel –a; "vulcão" (volcano) and "flocão" (big flake) (phonological similarity), with the suffix –ão; "coisa pequena" (small thing); "vapor" (steam), with no suffix; "médio" (average), "rato" (mouse) and "*flipo*" (nonce word) (phonological similarity) with the thematic vowel – o; "floquinho" (little flake) (phonological similarity) and "bolinha" (little ball) with the diminutive suffix –inho/inha.
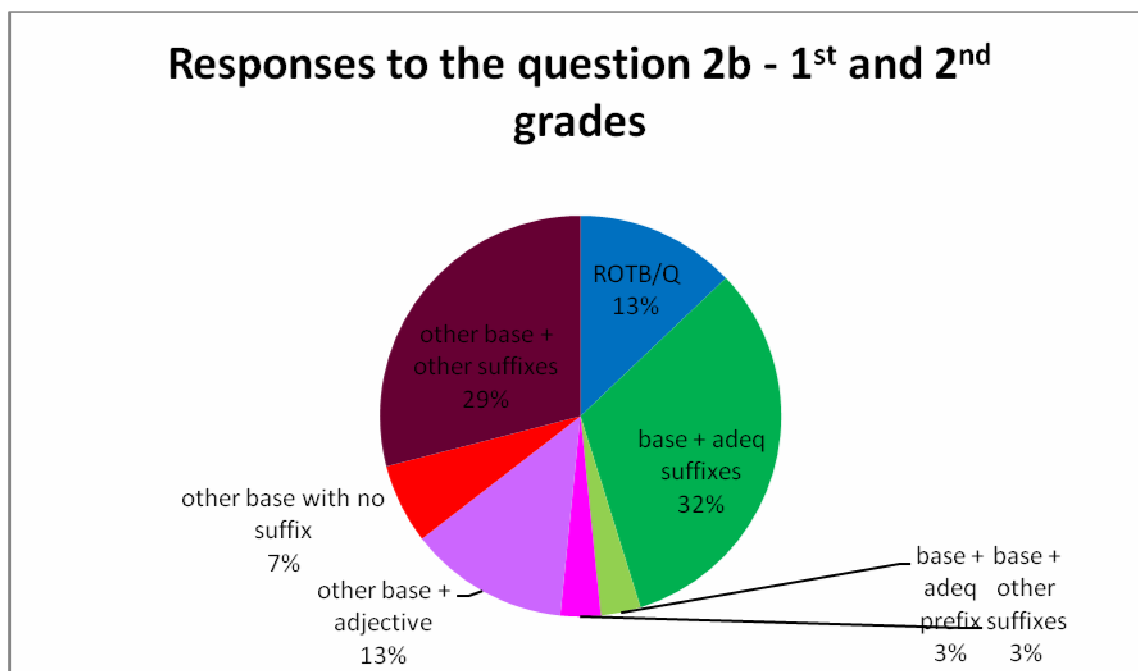


Figure 15: Response to the question 2b – 1st and 2nd grades

In the question 2b, 32% of the 1st and the 2nd grade children constructed adequate responses, using the adequate suffix –inho, alone or with the linking consonant –z-, and the base *segor*. One child used the adequate prefix "mini" with the base *segor*. We can see that with the word *segor*, which ends in a consonant, the suffix –inho appears with the linking consonant –z- more times, which is common in Portuguese. The other responses for 2nd grade were: "Pêssego pequeno" (small peach), which used the adjective "pequeno" and "grão" (grain), which is a small thing. These two last responses probably took into account the supposed content of the word *segor*. In addition, the child who said "grão" (grain) in this question said "semente" (seed) in question 1b, which are semantically similar. For the 1st grade, two children just repeated the question and the other responses were: "Rato" (mouse), "olho" (eye), "médio" (average) and "ovo" (egg), which end in a thematic vowel –o; "girafa" (giraffe), "pulga" (flea), "doença" (disease) and "formiga" (ant), which end in a thematic vowel –a; "caracol" (snail), which has no suffix; "pessoa minúscula" (minuscule person); "madeira pequena" (small wood) and "cigarro pequeno" (small cigarette), which presented

the strucuture noun plus adjective "pequeno" (small). It is interesting to highlight that, except for "girafa" (giraffe), all animals presented as responses are small ones.
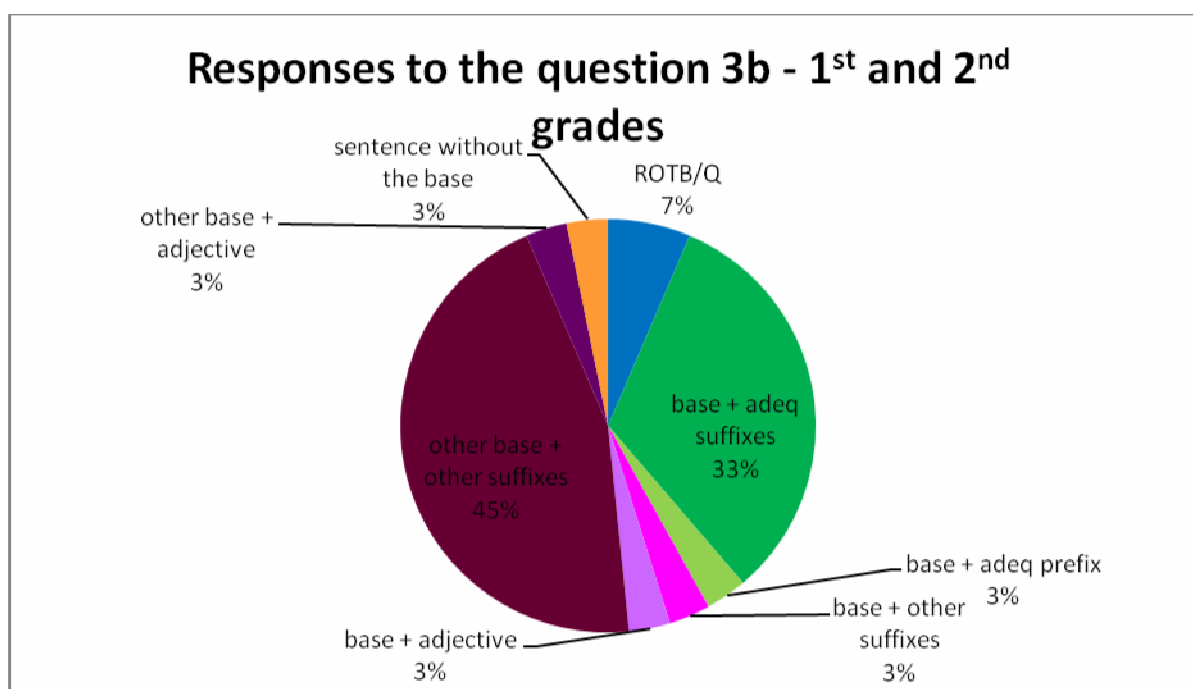


Figure 16: Responses to the question 3b – 1st and 2nd grades

In the Group 2 to the question 3b 33% of the children were able to provide an adequate response, using the adequate suffix –inha (and its allomorph –zinha) or the adequate prefix "mini" with the base *mafata*. The inadequate responses for 2nd grade were: "faca[40]" (knife), "faca pequena" (small knife) and a full sentence. One child just repeated the base *mafata*. For the 1st grade, one child just repeated the question; another child used "*mafatona*", in the augmentative form; and another one used "*mafata* bem pequenininha" (very small *mafata*). The other responses were inadequate and seem to take into account the content of the nonce word *mafata*: "pulga" (flea), "pedra" (stone), "criança" (child), "média" (mean), "*flomiga*[41]" (no translation), "aranha" (spider), formiga (ant) and "fada" (faerie), which used the thematic vowel –a; "coelho" (rabbit), "banco" (stool) and "caranguejo" (crab), which used the thematic vowel –o; and "filhote de formiga", which used the suffix –ote that means diminutive in a structure noun plus preposition plus noun. Again all animal names produced where those of small animals. It is interesting to notice that almost half of the responses was

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[40] The word "faca" presents phonological similarity with the nonce word *mafata*.

[41] "Flomiga" is probably "formiga" (ant) with a metathesis and a change between the phonemes –r- and –l-. Although the 1st grade children do not talk like this anymore ("flomiga" would seem normal in the process of language acquisition), the child probably wanted to modify the word "formiga", since that was a game of coining words. This is just a hypothesis.

other bases with other suffixes, which is the kind of response more inadequate because did not use nor the base nor adequate suffixes.

Let's check the responses provided by the Kindergarten children to the questions 1b, 2b and 3b.
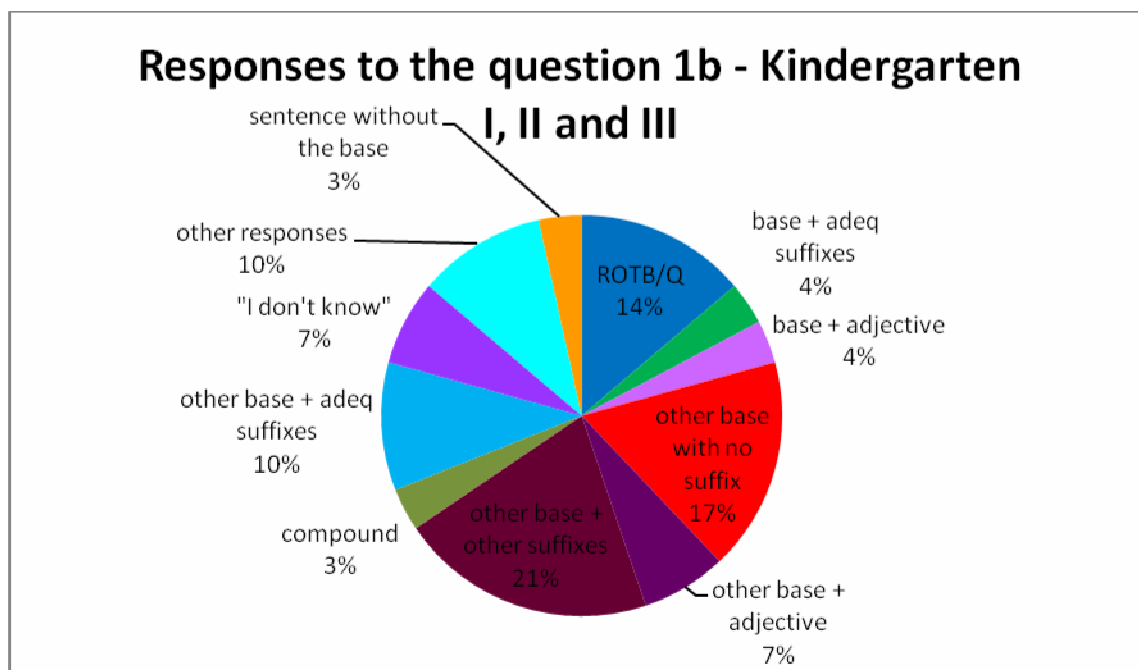


Figure 17: Responses to the question 1b – Kindergarten I, II and III

Just one child (1 out of 29) was able to provide an adequate response to this question. In the Kindergarten III, one child just repeated the base and the other did not use the base *flopo*, giving responses that seem to take into account the supposed content of the nonce word. The responses were: "Nariz" (nose), with no suffix; "*flipi*" (nonce word), which shows phonological similarity with *flopo*; "floco de gelo" (ice flake); bola pequenininha (tiny ball) and "floco muito pequeno" (very small flake) (phonological similarity), which used a word with an adjective; "sementinha" (little seed) and "pequeninho" (tiny), which used the suffix –inha/inho; "borboleta" (butterfly), which ends with the thematic vowel –a; "baixo" (short) and "floco" (flake), which end with a thematic vowel –o ("baixo" was probably used as a synonym of "pequeno" (small) and "floco" was probably used taking into account phonological similarity). For Kindergarten II the responses using the base were: Repetition of the base and the base plus the adjective "grande" (big), and the responses which did not use the base were: The adjective "grande" (big); "cachorro" (dog) and "bloco" (block) (phonological similarity with *flopo*), which end with a thematic vowel –o; the adjective "pequeno" (small), repeating the end of the question; a sentence and the word "grão" (grain),

which have no suffix. Two children said that they did not know the answer. For Kindergarten I two children repeated the base, three gave responses with no suffix ("só isso" (that's it), "dois" (two) and "flor" (flower) (phonological similarity)), and one child answered "bichinho" (little animal), in which he used the diminutive suffix –inho. This last response probably took into account the supposed content of the nonce word *flopo*.
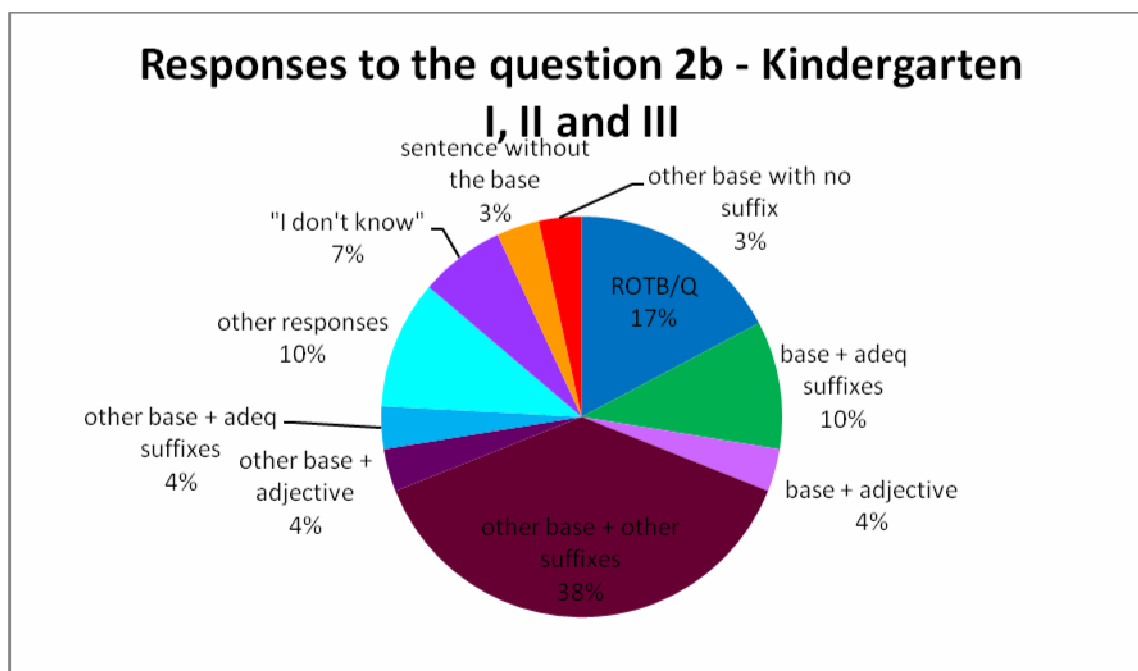


Figure 18: Responses to the question 2b – Kindergarten I, II and III

10% of the Kindergarten children constructed adequate responses, with the suffix –zinho and the base *segor* to answer the question "a small *segor* is a". For Kindergarten III the inadequate responses were: "Olho" (eye) and "baixo" (short), which presented the thematic vowel –o; "sementinha" (little seed), with the suffix –inha; "xícara pequenininha" (tiny cup), which presented the structure noun plus adjective "pequenininha" (tiny); the adjective "pequeninho" (tiny); and "abelha" (bee), with thematic vowel –a. For Kindergarten II responses using the base were repetition of the question and "*segor* grande" (big *segor*). The inadequate responses were: The adjective "grande" (big); "mato" (forest), "bloco" (block) and "gato", which end with thematic vowel –o; the adjective "pequeno" (small); "feijão" (bean), with suffix -ão; and a sentence to define what a little *segor* is. One child said that s/he did not know what a little *segor* is. For Kindergarten I one of the children just repeated the question and the other responses were: "Água da praia" (beach/sea water), which has the structure noun plus preposition plus noun; "espinho" (thorn) and "olho" (eye), which used thematic vowel –o; the adjective "pequeno"; and one child said that s/he did not know what a little

*segor* is. The majority of the responses given by the Group 3 was other bases with other suffixes.
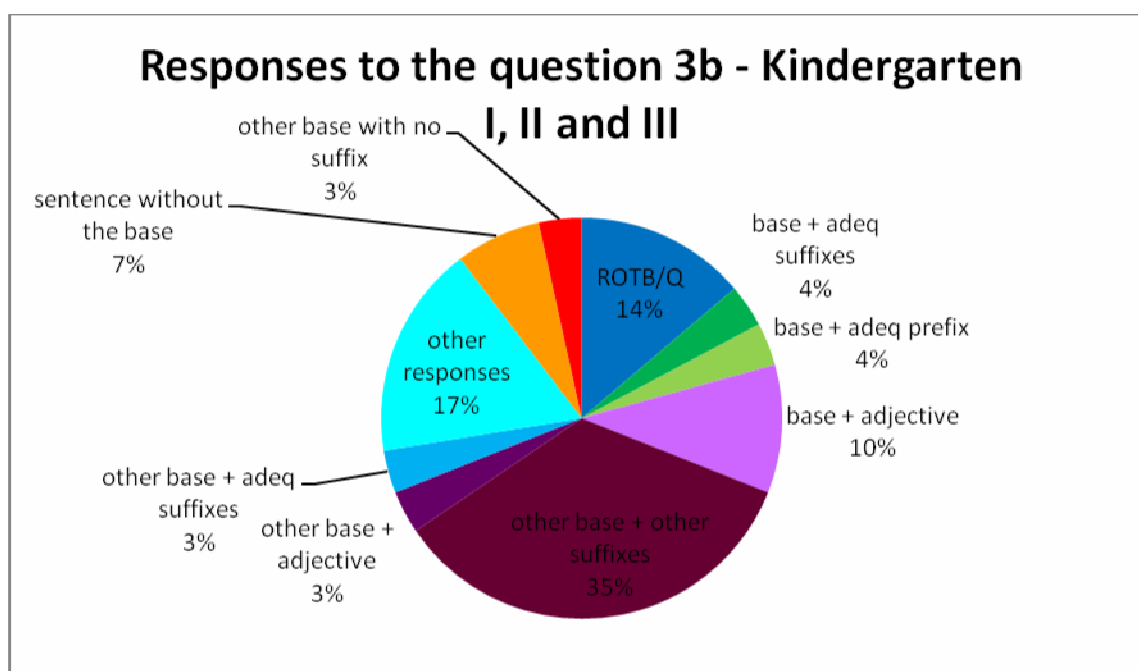


Figure 19: Responses to the question 3b – Kindergarten I, II and III

Just 8% of the Kindergarten children provided adequate responses to this question, using the structures "mini-*mafata*" and "*mafatinha*". For Kindergarten II one child repeated the question and the other responses were inadequate and probably took into account the supposed content of the nonce word *mafata*: "Fada" (faerie) (phonological similarity), "abelha" (bee) and "baixa" (short) with thematic vowel –a; "sementinha" (little seed) with the diminutive suffix –inha; "brinco pequeno" (small earring); and the adjective "pequeninha" (tiny), used by two children. For Kindergarten II, apart from the repetition of the question and the use of the base plus the adjective "grande", which used the base in an inadequate way, the other responses were: Two full sentences; the adjective "grande" (twice); "árvore" (tree) with the thematic vowel –e; "bloco" (block) and "gato" (cat) with the thematic vowel –o; and "maçã" with the thematic vowel –a. For Kindergarten I one child added the adverb "muito" (very) twice to the adjective "pequena" (small) to emphasize the meaning of the adjective; another child just repeated the question; one child said "TV", with no suffix; one child said "rádio" (radio), with thematic vowel –o; one child said "boca" (mouth) and another said "feia" (ugly), both with thematic vowel –a. Again, the majority of the responses given by the Group 3 was other bases with other suffixes.

Following Berko's results, for "the house a *wug* lives in", 58% of the adults formed the compound *wughouse.* Others said *wuggery,wugshouse,* and *wughut.* Again, no child used a suffix. According to Berko, the younger children did not understand this question, and when the older children did, they formed compounds, like *wughouse*. The conclusion is that adults may derive new words, while children at this age use almost exclusively a compounding pattern.

For "a place full of *flopos*, *segores* and *mafatas*", the results are those presented in the Table 3.

Table 3 – Percentage of adequate responses for questions 1e, 2e and 3e for children

| Percentage of adequate responses for questions 1e, 2e and 3e | | | |
|---|---|---|---|
| | **Group 1** | **Group 2** | **Group 3** |
| **1e** | 10 (42%) | 2 (6%) | 2 (7%) |
| **2e** | 7 (29%) | 4 (13%) | 1 (3%) |
| **3e** | 10 (42%) | 4 (13%) | 2 (7%) |

Table 3 shows an increasing percentage of adequate responses from Kindergarten to 3rd and 4th grades. However less than 50% in all groups were able to provide an adequate response, using an adequate suffix with the base *flopo*, *segor* or *mafata*. Nevertheless, this result seems to point out that Portuguese speakers use suffixes far more than English speakers to indicate "a place full of *flopo*, *segor* or *mafata* is a" or "the house a *wug* lives in", which require the same kind of structure.

Figures below illustrate the responses to the questions 1e, 2e and 3e for adults and for children.

**Responses to the questions 1e, 2e and 3e - Adults**

N (place) + base
7%

base + other suffix
3%

base + adeq
suffixes
90%
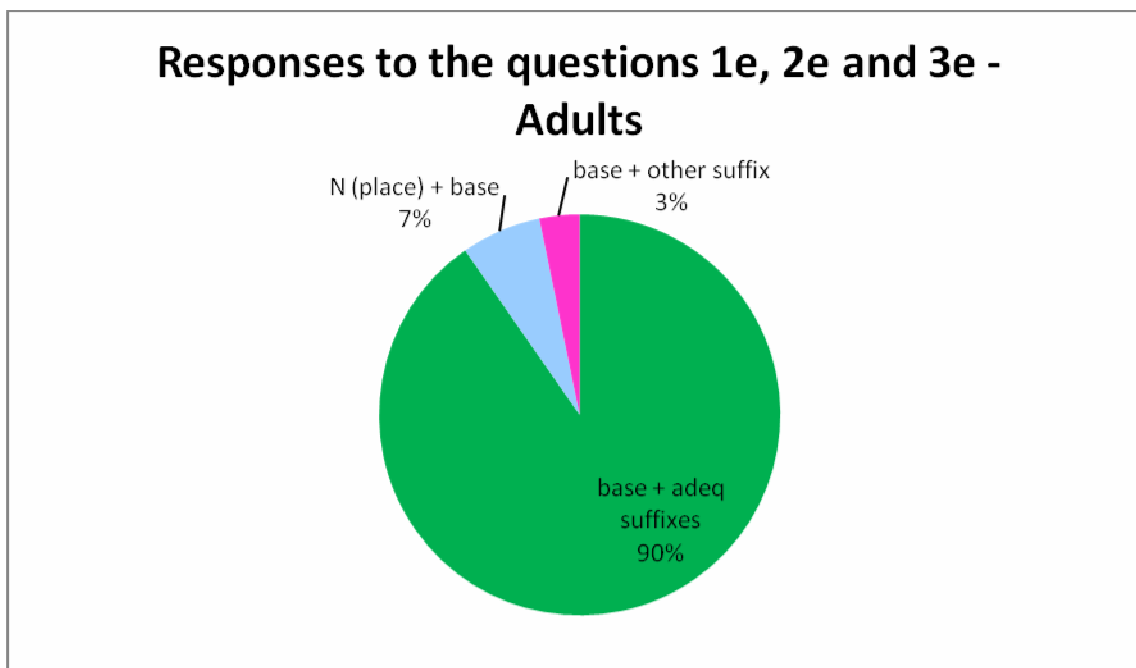
Figure 20: Responses to the question 1e, 2e and 3e - Adults

The Figure 20 shows that almost all adults used the structure base plus adequate suffixes to answer the question "a place full of *flopo*, *segor* or *mafata* is a". The adequate suffixes used were: -polis (*flopolis*), -al (*flopal/segoral/mafatazal*), -dromo (*flopódromo/segódromo*), -ário (*flopário/segorário*), -aria (*floparia/mafataria*), -eiro (*flopeiro/mafateiro*) and –ado (*segorado*). The suffix –zém (*mafatarzém*) was used in analogy to the word "armazém" (storehouse), which is a base. This response was considered adequate, although the subject had coined this suffix because it convey the meaning to the coined word of "place full of". The other responses were *flop**io***, with a suffix that did not mean "a place full of", and "local de armazenamento de *flopo*, *segor* or *mafata*" (*flopo*, *segor* or *mafata* storage compartment). The most frequent suffixes were –al and –ário. In comparison to the responses to the question B, the responses to the question E indicate that there is not just one productive suffix.

Let's now take a look at the children's responses to this question.
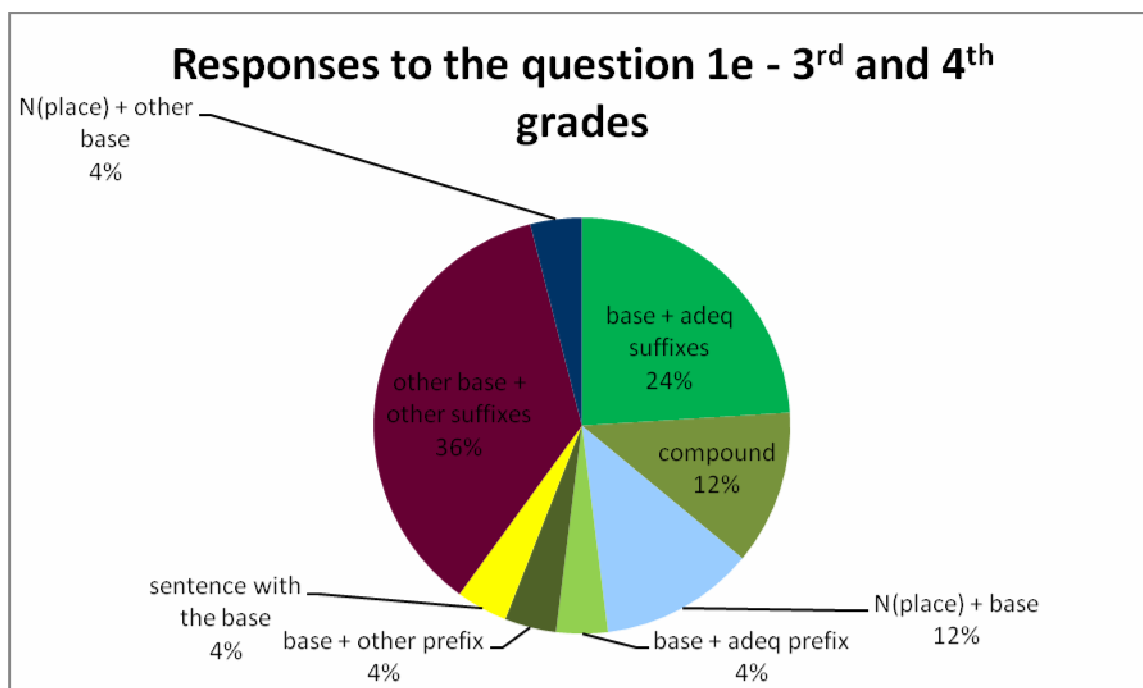
Figure 21: Responses to the question 1e – 3$^{rd}$ and 4$^{th}$ grades

It was more difficult in this question to apply the criterion of adequacy. As we can see, all adults added suffixes to the base and no one created compounds or made constructions like "cidade de" (city of) or "planeta de" (planet of). By contrast, this is what children did. In this case, I considered adequate just the compounds with the base in which the added part functions like an affix. Recall that I considered adequate responses similar to the adult's responses, the same criterion used by Berko (1958). However, we may think that a response like "cidade de *flopos*" (city of *flopos*) or "reino de *flopos*" (*flopos* kingdom) are more adequate than one response that used another base with an inadequate suffix. Taking into account the adequacy criterion, only 4 responses were considered adequate for the 4$^{th}$ grade: "*flopopraça*", "*floponato*", "*floparquinho*" and "*flopoplaneta*" and 4 responses for 3$^{th}$ grade: "Flopolândia$^{42}$", used by 3 children, "*jarflopo*"$^{43}$, "*floponópolis*$^{44}$" and "*flopeiro*$^{45}$". None of these responses are similar to the adults' responses; however, they are adequate because they answered the question with an adequate structure and because some of them (*flopopraça*, *flopoparquinho*, *jarflopo* and *flopoplaneta*) presented words that function as affixes. The other responses for 4$^{th}$ grade were: "jardim de *flopos*" (garden of *flopos*), "cidade de *flopos*" (city of *flopos*), which used the base; and "*florões*" (nonce word), "fazenda" (farm), "floresta"

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$^{42}$ "Lândia" means "terra" (land).
$^{43}$ "Jar" is part of the word "jardim" (garden), and it is not a prefix. It was considered adequate because, for the child who created this form, "jar" is a prefix which add the meaning of "jardim" to the base.
$^{44}$ "Polis" is a Greek root, which means "city".
$^{45}$ The suffix –erio add the meaning of place to a base as well.

(forest), "campo" (field), which did not use the base *flopo*. It is important to highlight that all these responses are places, although they either did not use an adequate suffix or did not use the required base. This indicates that the children did understand the task. The other responses for 3<sup>rd</sup> grade were: "*Loflopos*" (nonce word), "cidade de *flopos*" (city of *flopos*) and a full sentence, using the base; and "cidade" (city), "floresta" (forest), "praça" (square), "fresta" (hole) and "canteiro de flores" (garden bed). Except for "*loflopos*" and "fresta", all these responses are spatial locations. The majority of the responses (9 out of 24) were other bases with other suffixes, which may indicate that it is difficult to children find an adequate suffix to convey the meaning of "place full of something".
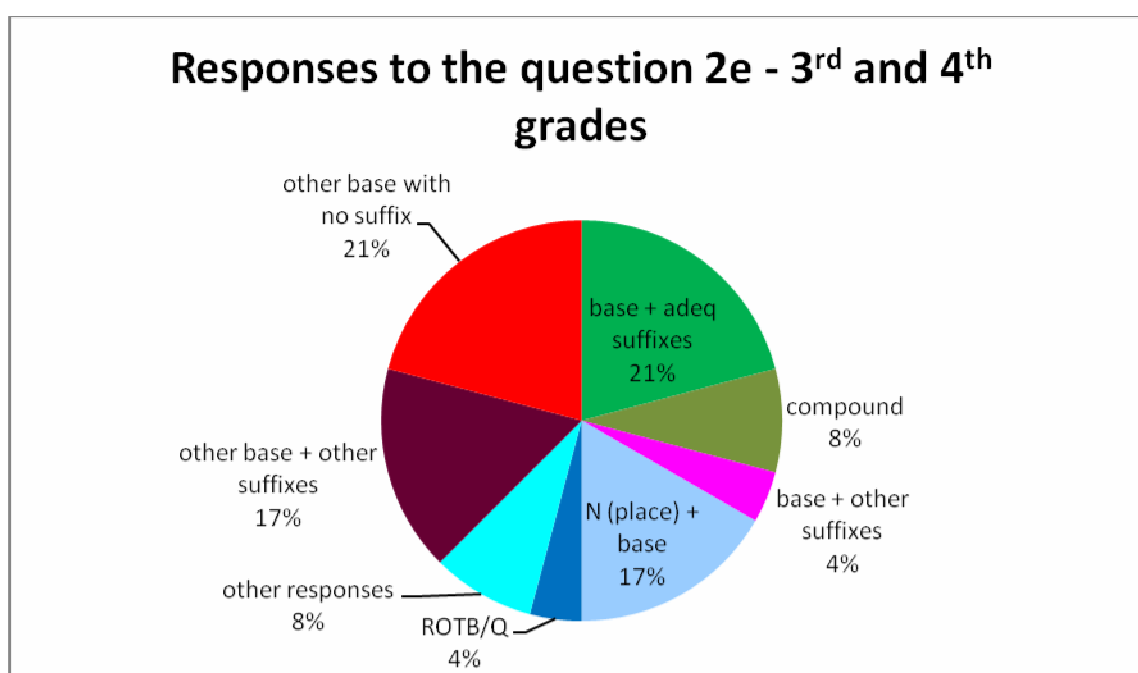


Figure 22: Responses to the question 2e – 3<sup>rd</sup> and 4<sup>th</sup> grades

29% of the responses were considered adequate for 3<sup>rd</sup> and the 4<sup>th</sup> grades in question 2e: "*Segor-parque*", was used twice, and "*segornato*" for 4<sup>th</sup> grade and "*segorlândia*" (used twice), *segrópolis* (with metathesis) and "*segorado*" for 3<sup>rd</sup> grade. Other responses used the base, but they did not added any affix or root to the base or added an inadequate suffix. The 4<sup>th</sup> graders' responses which did not use the base were: "Fazenda" (farm), "pântano" (swamp) and "lugar grande" (big place). Again, all the responses of the 4<sup>th</sup> grade were spatial locations. The other responses, for 3<sup>rd</sup> grade, which used the base *segor* were: "*Sergo*" (with metathesis), "cidade de *segores*" (city of *segores*) and "lugar menos *segor*" (place less *segor*). The responses which did not use the base *segor* were: "Jardim" (garden), "cheio de árvores" (full of trees), "país" (country), "campo de futebol com vários cegos[46]" (football field with several

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[46] The Word "cego" (blind) presents phonological similarity with the nonce word *segor*.

blind people), "lugar grande" (big place), "lugar cheio de porcos" (place full of pigs) and "livro" (book). Except for the last response, all the others were related to spatial locations.
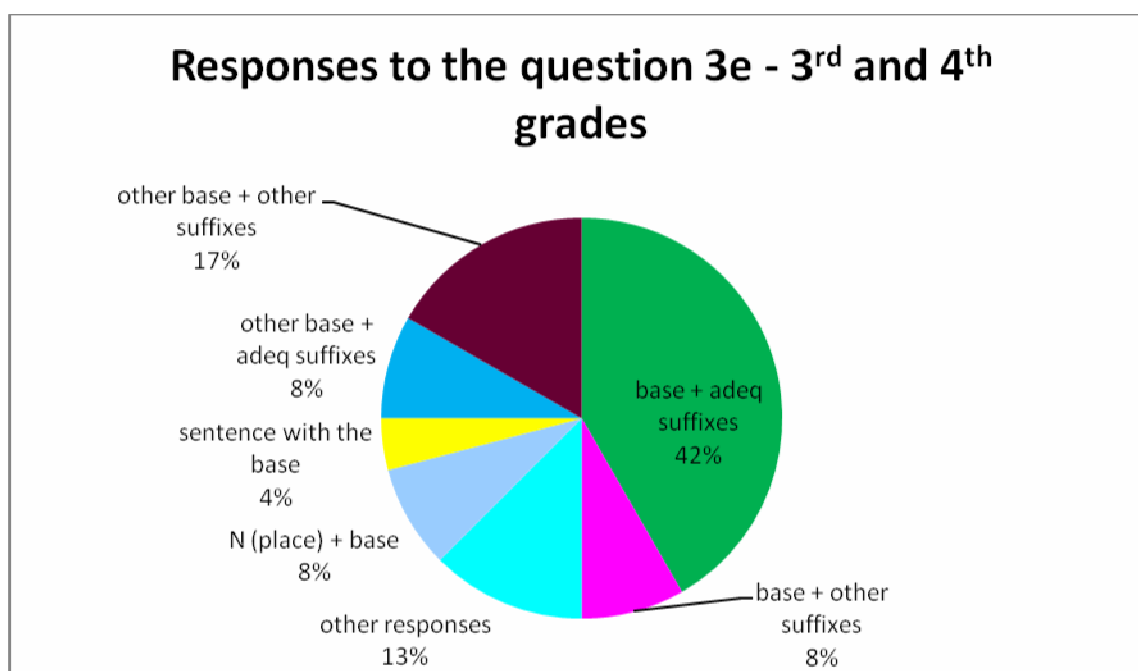


Figure 23: Responses to the question 3e – 3rd and 4th grades

The 3rd and the 4th graders provided 42% of adequate responses to this question. The suffixes used were –ório[47] (*mafatório*), -nato (*mafanato*) and –eiro (*mafateiro*), -lândia (*mafatolândia*) and –pólis (*mafatópolis*). The suffixes –pólis and –eiro were used by adults as well. For 4th grade, other three responses used the base *mafata*: ""*Mafatores*", "lugar da *mafata*" (the place of *mafata*), and "*mafapa*[48] cupinzeiro" (*mafapa* termit nest). The responses that did not use the base were: "Lugarejo[49]" (little place), "quadro" (picture) and "campo" (field). Except for "mafatores" and maybe "quadro" (we can think that a picture is a place where some things are), all responses are related to spatial location in some way. For 3rd grade, the other responses which used the base were: "*Mafatação*[50]", "cidade da *mafata*" (city of *mafata*), and a full sentence. The responses which did not use the base were: "Paraíso" (paradise), "lugar cheio de janelas" (place full of windows), "escola" (school), "matagal" (jungle), and "lugar cheio de flores" (place full of flowers). All the responses, except for "*mafatação*", are related to the idea of spatial location. The suffix most frequent in adult's responses, -al, was used, but not with the base *mafata*.

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[47] The suffix -ório is used in real words like "refeitório" (dining hall) and "laboratório" (laboratory) and convey the idea of "place where one do some action".

[48] Although there is a consonant "p" instead of a consonant "t" in the word "mafapa", I considered it the same use of the base because this changing did not created a real word of the language.

[49] The suffix –ejo convey the meaning of diminutive.

[50] The suffix –ção conveys the meaning of "action".

The following figures are related to the responses given by 1ˢᵗ and 2ⁿᵈ grades to the question "a place full of *flopo*, *segor* or *mafata* is a".
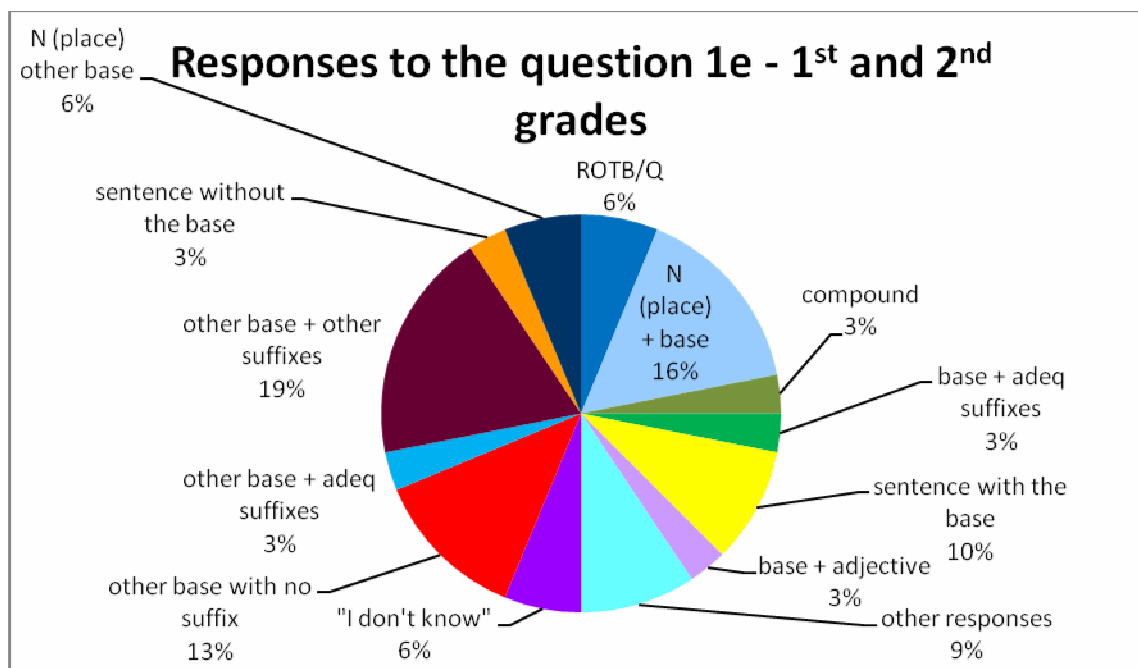


Figure 24: Responses to the question 1e – 1ˢᵗ and 2ⁿᵈ grades

Few children in this group were able to provide an adequate response: Just 6% were considered adequate: "*Flopocampo*" and "*flopolândia*". For 2ⁿᵈ grade the other responses which used the base *flopo* were: Repetition of the base, "baile de *flopos*" (*flopos* party) and "reino de *flopos*" (*flopos* kingdom). The inadequate responses were: "*Floqueiro*"[51] (no translation); "lugar cheio de flores" (place full of flowers), remarking that "flores" and "*flopos*" present phonological similarity); and "jardim" (garden). One child answered that s/he did not know what a place full of *flopos* is. For 1ˢᵗ grade the responses which used the base *flopo* were: Three full sentences, "casa de *flopos*" (*flopos* house), "*flopo* grande" (big *flopo*), "infinito *flopos*" (infinite *flopos*), "muitos *flopos*" (many *flopos*), and "parque de *flopos*" (*flopos* park). The responses which did not use the base *flopo* were: "I have no idea", "milhão" (million), a full sentence, "jardim" (garden), "circo" (circus), "era dos dinossauros" (dinosaur age), "floquinhos" (little flakes) (phonological similarity), "lugar bonito" (beautiful place), "país" (country), "caverna" (cave), "canteiro" (flower bed), "flores" (flowers) (phonological similarity) and "terra dos gigantes" (giant land). Some responses are actually spatial locations, but some others are not.

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[51] This nonce word is very similar to "flopeiro", but it has a "qu" instead of a "p". "Floqueiro" is probably derived from "floco" (flake), but it does not exist.
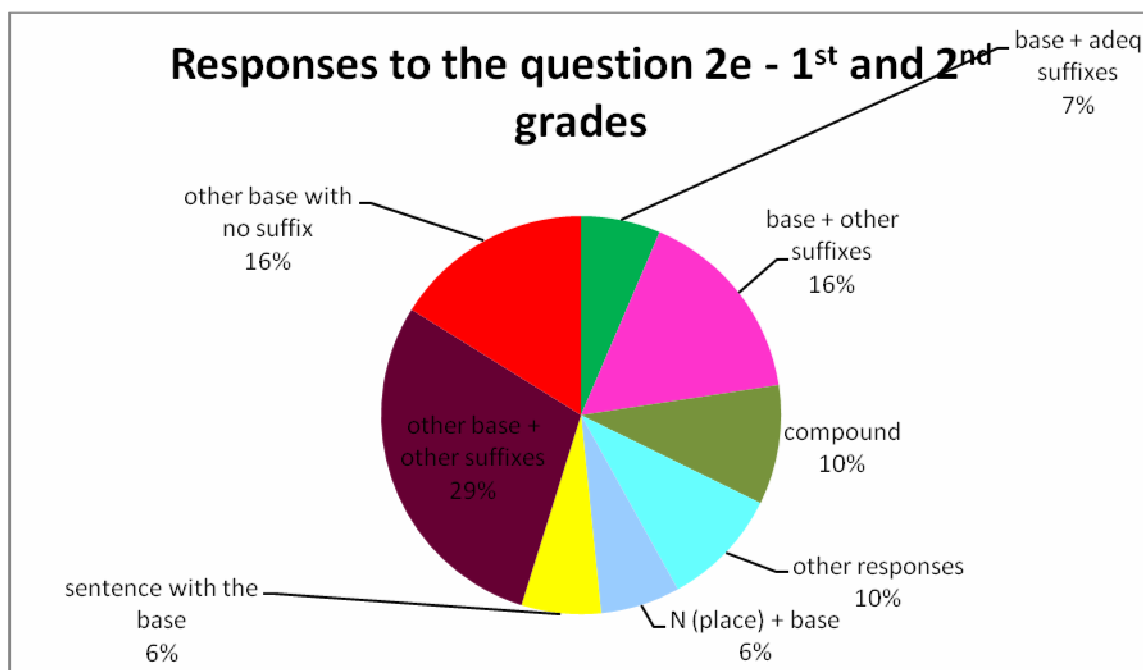
Figure 25: Responses to the question 2e – 1st and 2nd grades

This group provided 16% of adequate responses to the question "a place full of segor is a". The suffixes used were –eiro (*segoreiro*), used by adults as well, and –ândia (*segorândia*) (lândia without the –l-). Compounds were also used: "Restaurante-*segor*" (restaurant-*segor*), "*segor*campo" (*segor*field) and "país-*segor*" (*segor*-country). The other responses for 2nd grade were: "*Segorço*" and "*segores*", which used the base *segor*; and "planeta" (planet), "lugar cheio de pêssego" (place full of peaches), "vários" (several) and "casa" (house), which did not use the base *segor*. The 1st grade showed great variability of responses for this question. The other responses that used the base *segor* were: "*Segores*", "lugar de *segores*" (place of *segores*), "família de *segores*" (family of *segores*), "infinito *segores*" (infinite *segores*), "*segorzinho*" (small segor), "casa de *segores*" (house of *segores*) and two full sentences. The responses that did not use the base *segor* were: "A casa deles" (their house), two full sentences, "lugar com muitas cores" (place with many colors), "lugar cheio de roupa" (place full of clothes), "lugar cheio de doença" (place full of diseases), "cidade" (city), "bem grande" (very big), "caverna" (cave), "cheio" (full), and "quarto" (bedroom).
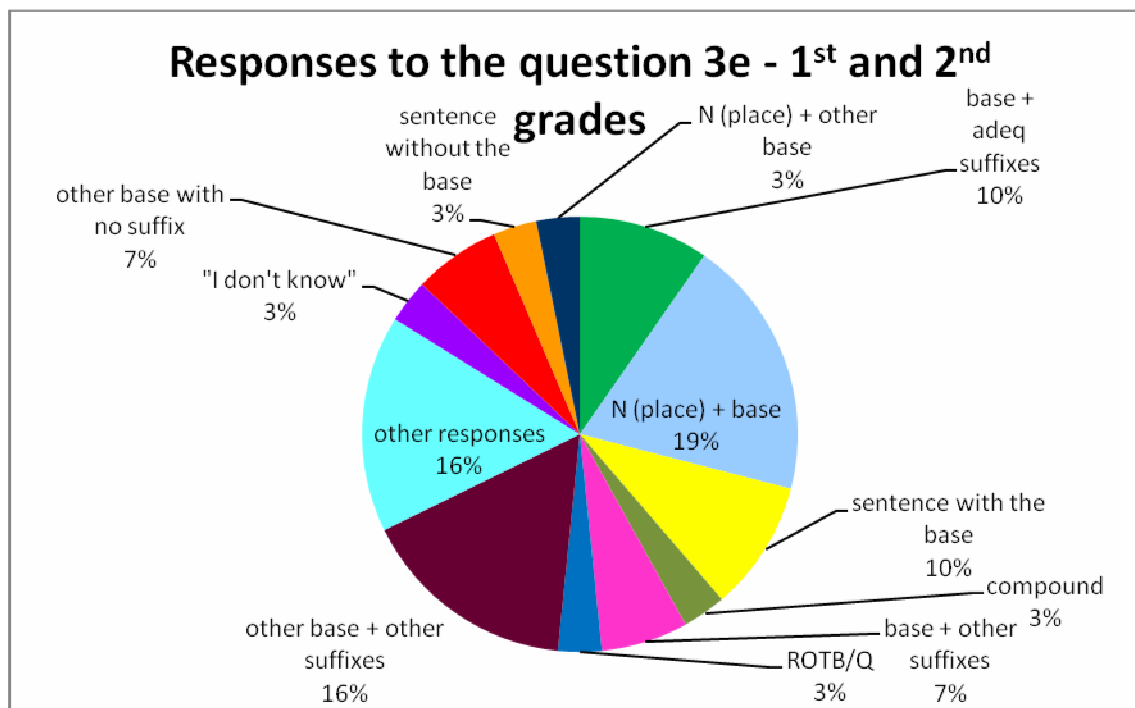
**Figure 26:** Responses to the question 3e – 1ˢᵗ and 2ⁿᵈ grades

13% of 1ˢᵗ and 2ⁿᵈ graders produced adequate responses. The responses were *mafateiro*, *mafatolândia* and *mafatacampo*. In the 2ⁿᵈ grade, each child gave a different response. This may reveal that a transparent suffix or a productive suffix to add the meaning for "a place full of" to the base *mafata* is not yet available to children in this age. The other responses for this grade that used the base *mafata* were: "Casa de *mafatas*" (house of *mafatas*), "reino de *mafatas*" (*mafatas* kingdom) and a full sentence. The responses that did not use the base *mafata* were: "Colégio" (college), "lugar cheio de facas[52]" (place full of knifes), and "árvore" (tree). One child said s/he did not know the answer. For the 1ˢᵗ the other responses that used the base *mafata* were: "Casa das *mafatas*" (house of *mafatas*), "*mafatos*", "família de *mafatas*" (family of *mafatas*), "monte de *mafatas*" (many *mafatas*), "*mafatinha*" (little *mafata*), "*mafatas*", "campo de *mafatas*" (field of *mafatas*), and two full sentences. Among these responses, "casa de *mafatas*" and "campo de *mafatas*" are related to spatial locations. The responses that did not use the base *mafata* were: "País" (country), "sítio" (farm), "lugar cheio de pulgas" (place full of fleas), "cidade cheia de árvores" (city full of trees), "lugar cheio de comida" (place full of food), "muito grande" (very big), "país *paflata*" (no translation – *paflata* is a coined word), "caverna" (cave), "um monte" (many) and

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[52] The child who gave this response commented, during the appliance of the test, that "mafata" and "uma faca" are similar. "You just have to change the "t" and the "f", he said. This comment reveals refined phonological awareness.

"caderno" (copybook). The responses with the structure "lugar cheio de" plus noun seem to take into account the supposed content of the nonce word *mafata*. Responses like "sítio" and "caverna" are spatial locations.

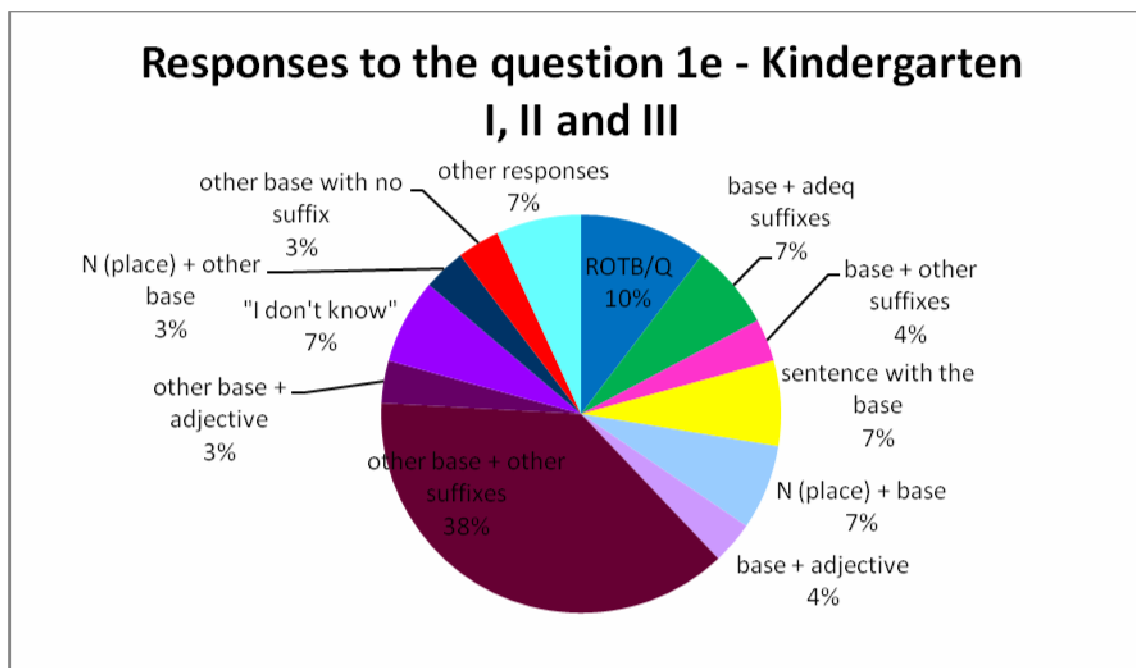Let's now examine at the results for Kindergarten.



Figure 27: Responses to the question 1e – Kindergarten I, II and III

This question requires an answer to "a place full of flopo is a". Kindergarten children gave two adequate responses: *Flopolândia* and *flopado*[53]. For the Kindergarten III the others were: Repetition of the base *flopo*, "*flopão*" (big *flopo*), a full sentence, "monte de *flopo*" (many *flopos*) and "montão de *flopos*" (a lot of *flopos*), which used the base, and "cérebro" (brain), "floresta" (forest), "montão" (lot of something), which did not use the base *flopo*. In the Kindergarten II one child just repeated the question and another said "*flopo* médio". The other responses were: "Festa" (party), "urso" (bear), "lugar bonito" (beautiful place), "cadeira" (chair), "mundo" (world), "floresta" (forest) and "canteiro" (flower bed). In the Kindergarten I one child used a full sentence with the base *flopo* and the other responses did not use the base. The responses were: "Tubarão" (shark), "pinheiro"[54] (pine tree), "*tirrapo*" (nonce word, no translation) and "animal" (animal). One child said that s/he did not remember the answer. Most of the responses used another bases with inadequate suffixes.

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[53] The suffix "-(a)do" is used in this sense in real words like "almoxarifado" (warehouse).
[54] There was a pine tree (Christmas tree) in the room in which I applied the tests. Sometimes, when children did not know what to answer, they looked around and said a word that referred to something in the room, like "chair", "pine tree", "window" and so on.

**Responses to the question 2e - Kindergarten I, II and III**

- other base with no suffix 10%
- "I don't know" 10%
- other base + other suffixes 45%
- ROTB/Q 10%
- base + adeq suffixes 4%
- other responses 4%
- base + other suffixes 7%
- N (place) + base 7%
- sentence with the base 3%
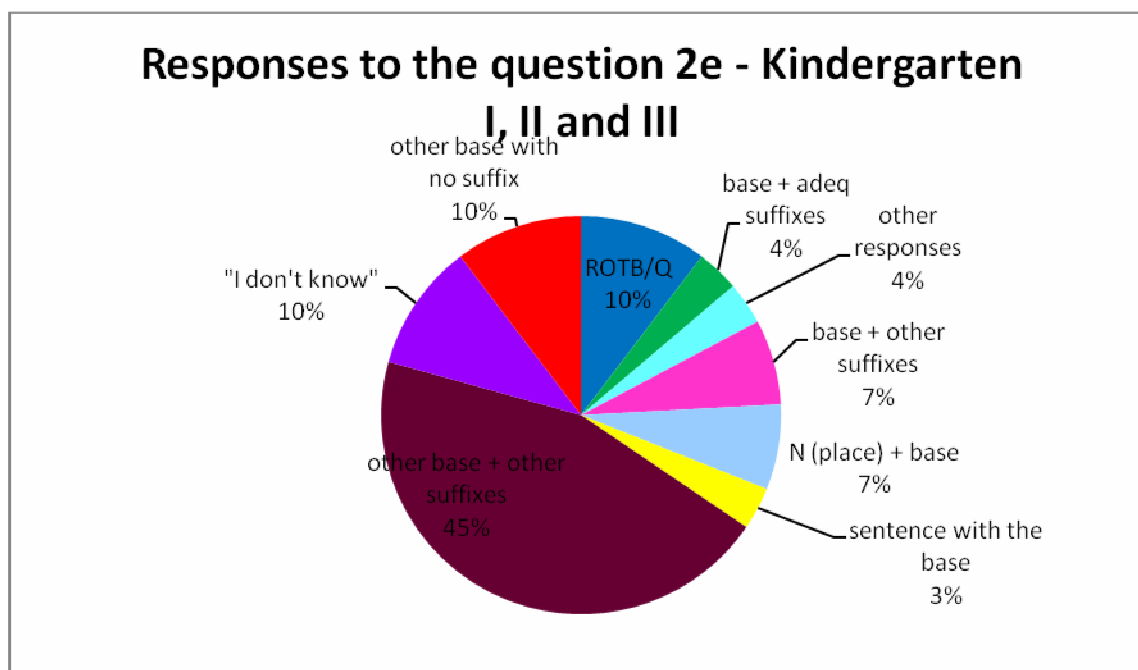
Figure 28: Responses to the question 2e – Kindergarten I, II and III

To answer the question "a place full of *segor* is a", just one child in the Kindergarten provided an adequate response with the suffix "-lândia". Most of the responses were other bases with inadequate suffixes. The responses given by Kindergarten III that used the base *segor* were: Repetition of the question, "lugar grande só para *segor*" (big place just for *segor*), "*segorão*" (big *segor*), "cidade de *segores*" (city of *segores*), "monte de *segorão*" (many *segorão*[55]) and "segoristas". The responses that did not use the base *segor* were: "cérebro" (brain), "cidade" (city), "floresta" (forest) and "cheio" (full). For  Kindergarten II the responses were: "Urso" (bear), "*profo* médio" (nonce word, no translation), "mundo" (world), "três" (three), "flor" (flower), "canteiro de regar" (flower bed to shower), "praia" (beach) and "*panta*" (nonce word, no translation). In the Kindergarten I, one child used the structure "lugar muito, muito cheio de *segor*" (a place very, very full of *segor*) to emphasize how much full of *segor* the place is and another child used a full sentence with the base *segor*. The other responses used other bases: "Aquário" (aquarium), "pinheiro" (pine tree), "semente" (seed), and one child said that s/he did not know.

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[55] It is common in Portuguese to mark the plural just in the determinant.
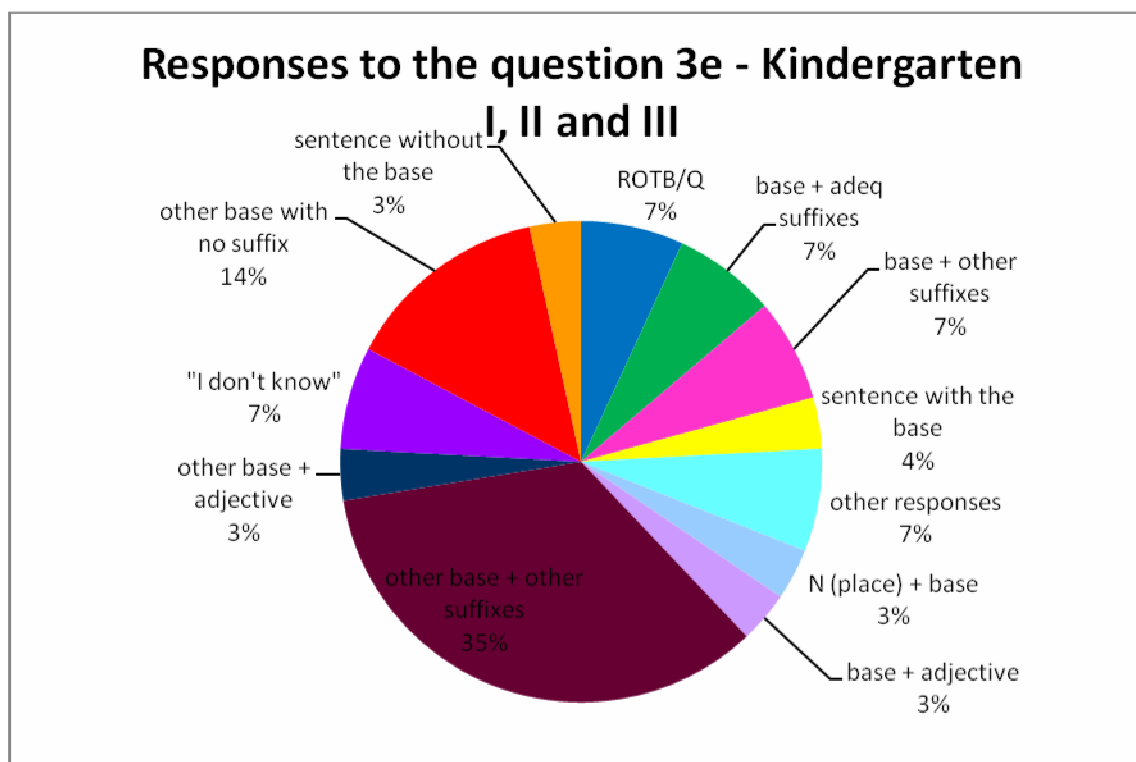
Figure 29: Responses to the question 3e – Kindergarten I, II and III

The Figure 29 points out a great variability of responses. However just 7% of the responses were considered adequate because presented the base *mafata* with an adequate suffix. These responses were *mafatolândia* and *mafateiro*. The other responses, for Kindergarten III were: One repetition of the base *mafata*, "*mafatão*" (big *mafata*), "*mafatas* bastante" (many *mafatas*), "selva de *mafatas*" (jungle of *mafatas*), "corpo" (body), "campo" (field), "lugar cheio de sementinhas" (place full of little seeds), and "floresta" (forest). The responses "selva de *mafatas*", "campo" and "floresta" are spatial locations, and the former used the base *mafata*. For Kindergarten II the responses were: "Urso" (bear), "profo médio" (nonce word), "mundo" (world), "lugar lindo" (beautiful place), "TV" (TV), "flor" (flower), "casa" (house), "praia" (beach), and a full sentence. Only three of these responses are related to spatial locations: "Mundo", "casa" and "praia". For Kindergarten I the responses were: "Lugar cheio, cheio de muita *mafata*" (place full, very full of many *mafata*), "*mafata* bem pequenininha" (tiny *mafata*), which used the base *mafata*, and "quadrado" (square), "luz" (light), "*tlico*" (nonce word, no translation), "lugar" (place), which did not use the base *mafata*.

In Berko's results for the formation of adjectives, the adults unanimously said that a dog covered with quirk is a quirky dog, while 64% of the children formed the compound quirk dog. No child, again, used a derivational suffix. In the question "a person full of *flopo*,

*segor* or *mafata* is", children in my study were able to provide derivational suffixes. Let's examine at the following table to see the results.

Table 4 – Percentage of adequate responses for questions 1f, 2f and 3f for children

| Percentage of adequate responses for questions 1f, 2f and 3f | | | |
|---|---|---|---|
| | **Group 1** | **Group 2** | **Group 3** |
| **1f** | 12 (50%) | 7 (23%) | 4 (14%) |
| **2f** | 13 (54%) | 7 (23%) | 3 (10%) |
| **3f** | 11 (46%) | 7 (23%) | 3 (10%) |

The Table 4 also indicates an increasing percentage of adequate responses from Group 3 to Group 1. It is important to remark that there was a difference between the 2nd graders' performance and the 1st graders' performance on the Group 2: While the 2nd grade reached almost 50% of adequate responses in all questions (5 out of 10), the 1st grade reached 10-14% (2-3 out of 21). From a qualitative point of view it is important to notice that, except for the youngest grades – Kindergarten II and I, all groups presented children who were able to answer the questions in an adequate way and that there is an improvement across the ages.

Following figure shows the adult's responses to questions 1f, 2f and 3f.
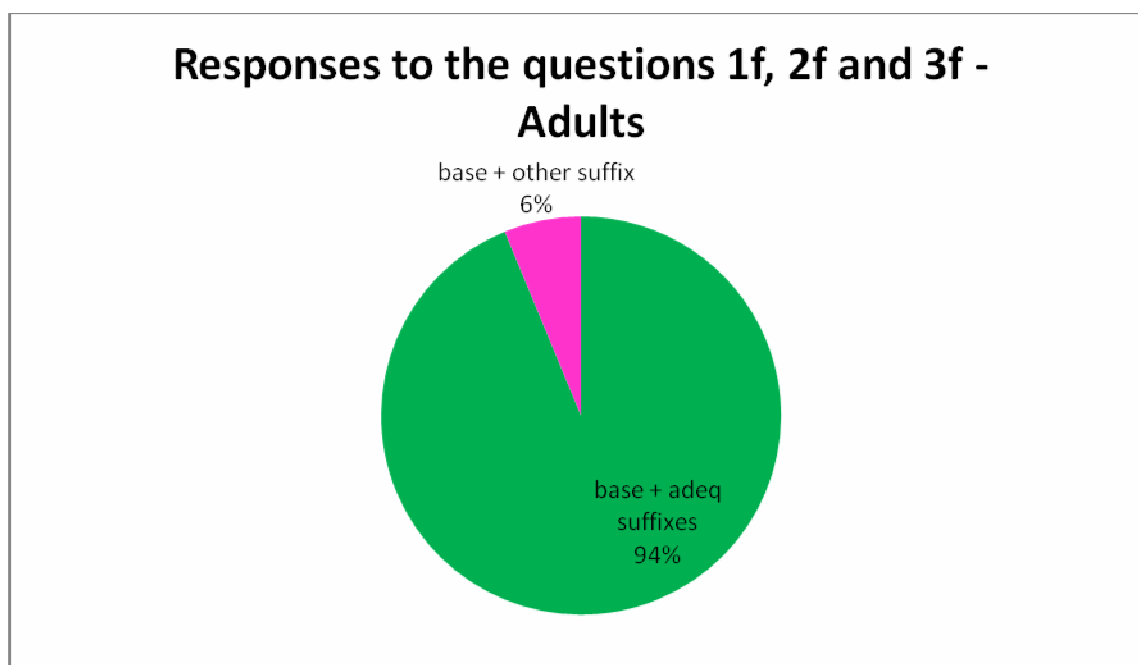


Figure 30: Responses to the questions 1f, 2f and 3f – Adults

According to this figure, almost all adults provided an adequate response. The most frequent suffix was –ada (*flopada*, *segorada*/*segorzada*, *mafatada*) (21 out of 32). The other suffixes used were –ida (*flopida*), -ento (*segorento*) and a formation with the adequate prefix

em- and the adequate suffix –ada (*emafatada*). The inadequate suffixes used were –ona (*mafatadona*) (augmentative) and –za (*mafataza*) (without a specific meaning).

Let's now inspect the responses given by Group 1 children to the questions F.



**Responses to the question 1f - 3$^{rd}$ and 4$^{th}$ grades**

"I don' know" 4%

other base + other suffixes 8%

sentence without the base 4%

other responses 29%

base + adeq suffixes 38%

base + other suffixes 4%

base + adeq suffix and prefix 9%

compound 4%
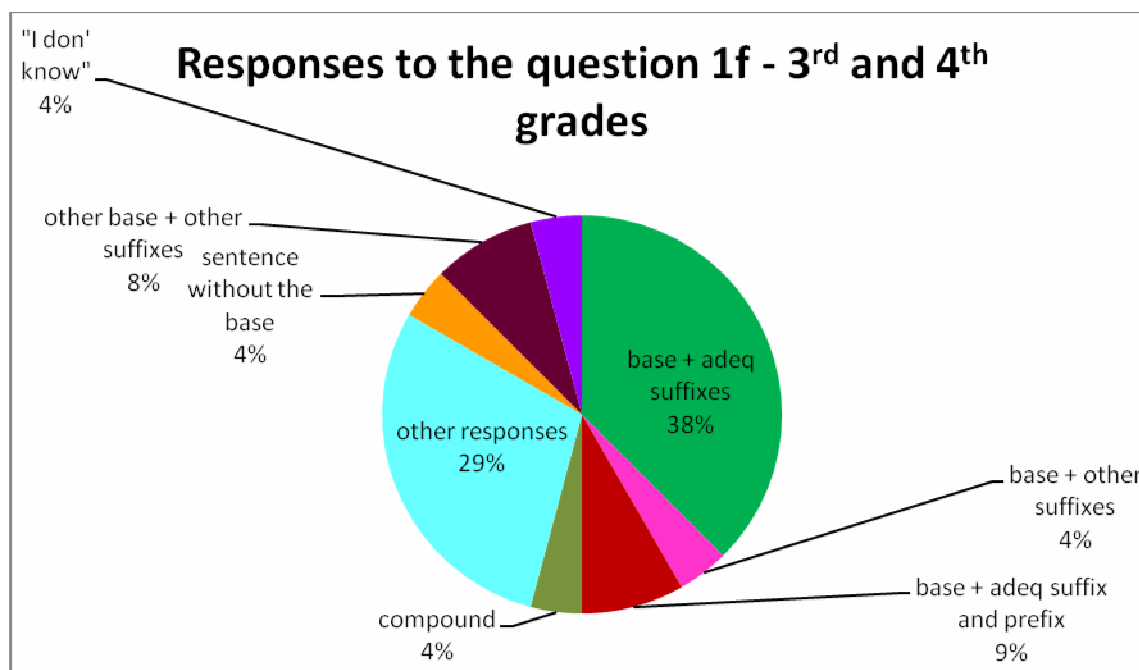
Figure 31: Responses to the question 1f – 3$^{rd}$ and 4$^{th}$ grades

The question 1f is "a person full of flopo is" and the child was asked to provide an adjective to answer it. In this question it appears a different kind of response, which adds a prefix and a suffix at the same time, like in "**en**flop**ada**". This process is called parasynthesis. It appeared in the adult's and the children's responses, as the figures showed. For this group, half of children were able to provide adequate responses, using adequate suffixes added to the base *flopo*, presenting compounds or parasynthesis.

The most frequent suffix in the 3$^{rd}$ and in the 4$^{th}$ grade was –ada (*flopada*): Alone or with the prefix –en, in a parasynthetic form. Other adequate suffixes used were: -enta (*flopenta*), -ida (*flopida*) and –osa (*floposa*). These suffixes are used in the formation of adjectives. Except for –osa, all the other suffixes were used by adults as well. The other responses were not considered adequate either because they did not use an adequate suffix, like in "*flopla*" (coined word), or because they did not use the base *flopo*, like in "cheia de flor" (full of flowers), "na escola" (in the school), "com frio" (cold), or used a full sentence. It is important to highlight that because of the structure of the question (a person full of *flopo*, *segor* or *mafata* is", children sometimes answer with prepositional phrases, like "na escola" or with a present continuous verbal form, as we will see further on. As we can see here, the

adequate suffix used in the question is the most frequent response for adults as well. Other responses seems to take into account the supposed content of the nonce word *flopo*: "Doente" (sick), "cheia de roupas" (full of clothes), "com um vestido cheio de flor" (with a dress full of flower), "cheia de espinhos" (full of thorns) and "alérgica" (allergic).
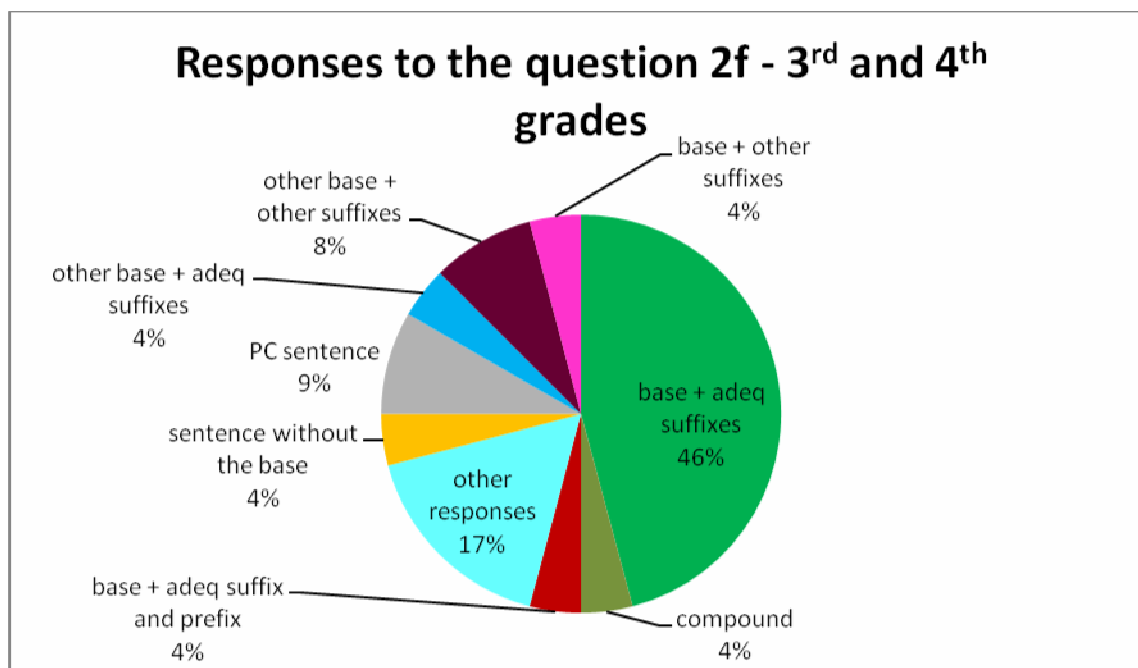


Figure 32: Responses to the question 2f – 3rd and 4th grades

54% of the responses to the question "a person full of *segor* is" presented an adequate structure. Again, the most frequent suffix used in adequate responses was –ada (*segorada*), like in adult's responses. The other responses for 4th grade were: "Segorra" (female *segor*, with an extra "-r"), "pessoa *segor*" (*segor* person), a full sentence, "melecada"[56], "no sítio" (in the farm) (prepositional phrase), and "aprendendo" (learning) (present continuous sentence). The 3rd grade, in contrast to 4th grade, presented other adequate responses, with other appropriated suffixes: "*Segorbenta*", "*segorida*", "*segorosa*" and "*ensegorada*". The inadequate responses were: "Sem *segor*" (without *segor*), "cultivando *segor*" (cultivating *segor*), which used a present continuous verbal form plus the base, "alegre" (happy), "cheia de acessórios" (full of accessories), "muito cega" (vey blind) and "cheia de cravos" (full of spikes), which seem to take into account the supposed content of the nonce word *segor*.

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[56] I could not find a translation for this word.
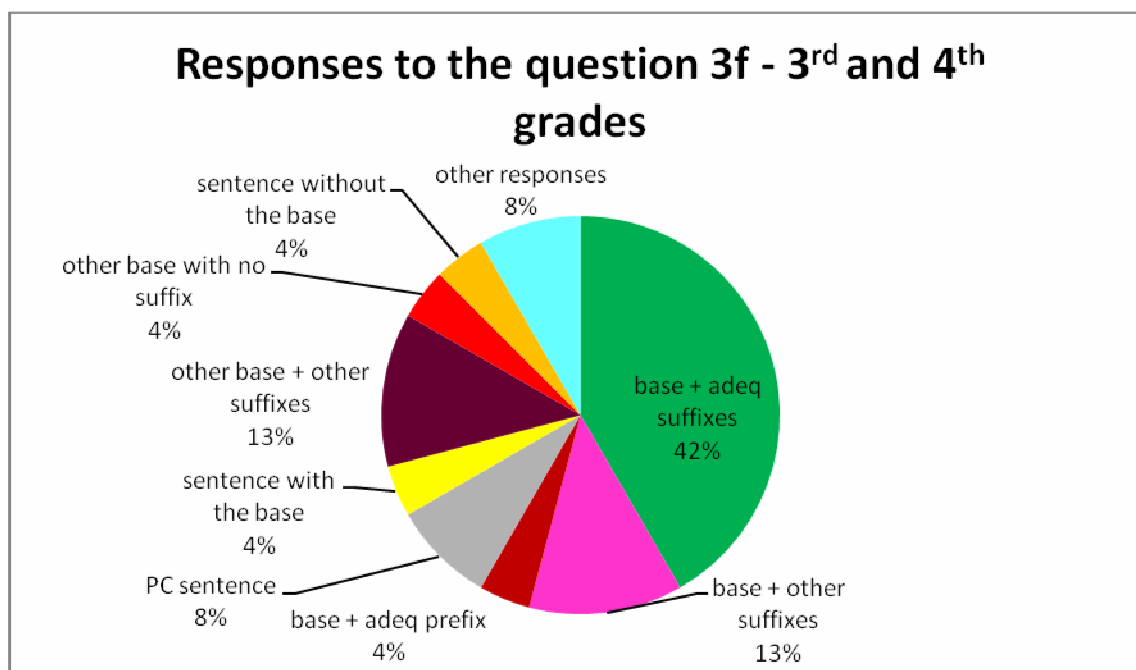
Figure 33: Responses to the question 3f – 3<sup>rd</sup> and 4<sup>th</sup> grades

The question 3f used the base *mafata*. The result is similar to the other questions F. 46% of the responses were considered adequate and almost all of them presented the suffix –ada (*mafatada*). Other adequate suffixes used were –eira and -ida. The other responses were not considered adequate either because they did not presented an adequate suffix, like "mafatora", "mafataza", "mafatando" (present continuous sentence with the base *mafata*) or "enfata" (which presented only the prefix en-, which cannot derivate an adjective from a noun because prefixes do not change the grammatical class of a word), or because they did not use the base *mafata*, like: "Sapateiro" (shoemaker), "grande" (big), "feliz" (happy), which is an adjective; "cheio de olhos por todo o corpo porque é um alien" (full of eyes all over the body because it is an alien); "aluno" (student); "cheia de raiz (full of root); and "cheia de espinhos" (full of thorns) or because they use a present continuous verbal form, like "viajando" (traveling). One sentence with the base *mafata* was also used.

The following figures show the 1<sup>st</sup> and the 2<sup>nd</sup> graders' responses to the questions 1f, 2f and 3f.
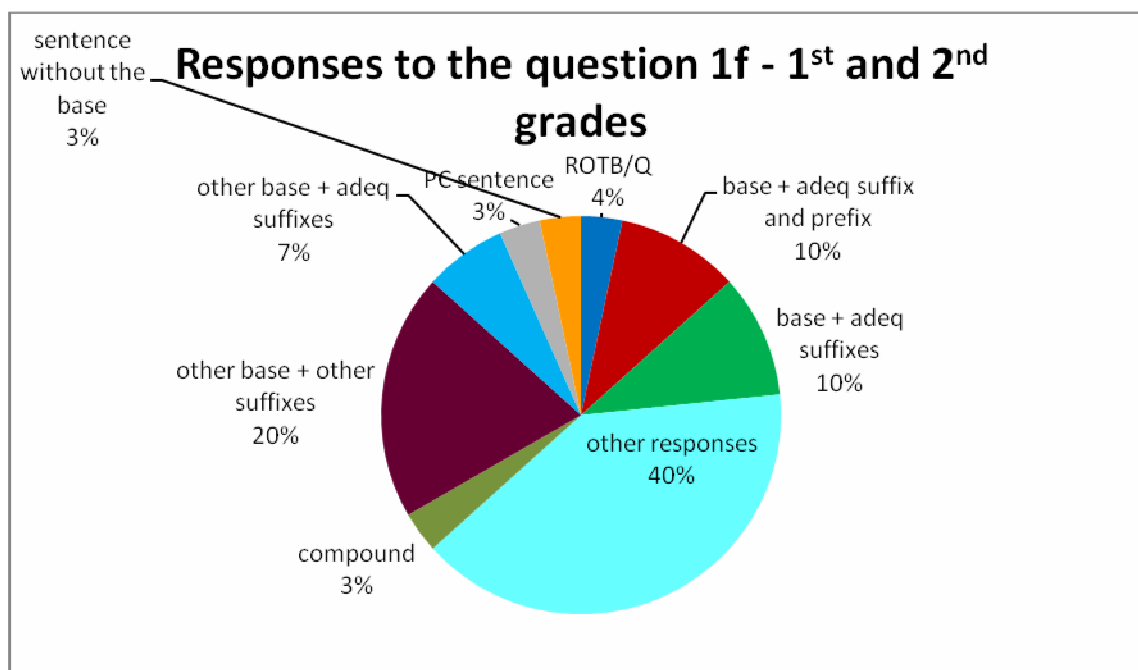
Figure 34: Responses to the question 1f – 1st and 2nd grades

26% of this group's responses were considered adequate because presented adequate suffixes and prefixes added to the base *flopo* or because formed appropriated compounds. 2nd grade produced the majority of the adequate responses: "*Enflopada*", "*flopada*", "*flopocheia*" and "*enfloporosa*". Other 2nd graders' responses also used the base *flopo*, but they are not adequate: "Cheia de *flopos* pelo corpo" (full of *flopos* in the body) and "carregada de *flopos*" (loaded of *flopos*). One child just repeated the base. Two other responses were given, but they did not use the base *flopo*: "Cheia de flores" (full of flowers) (phonological similarity) and "grande" (big). Again, the most frequent suffix used by children matches with the most frequent in adults' responses: -Ada. The high percentage of "other responses" is due to the 1st graders' responses, which presented prepositional phrases, with the preposition "com" (with) plus adverbials and nouns.
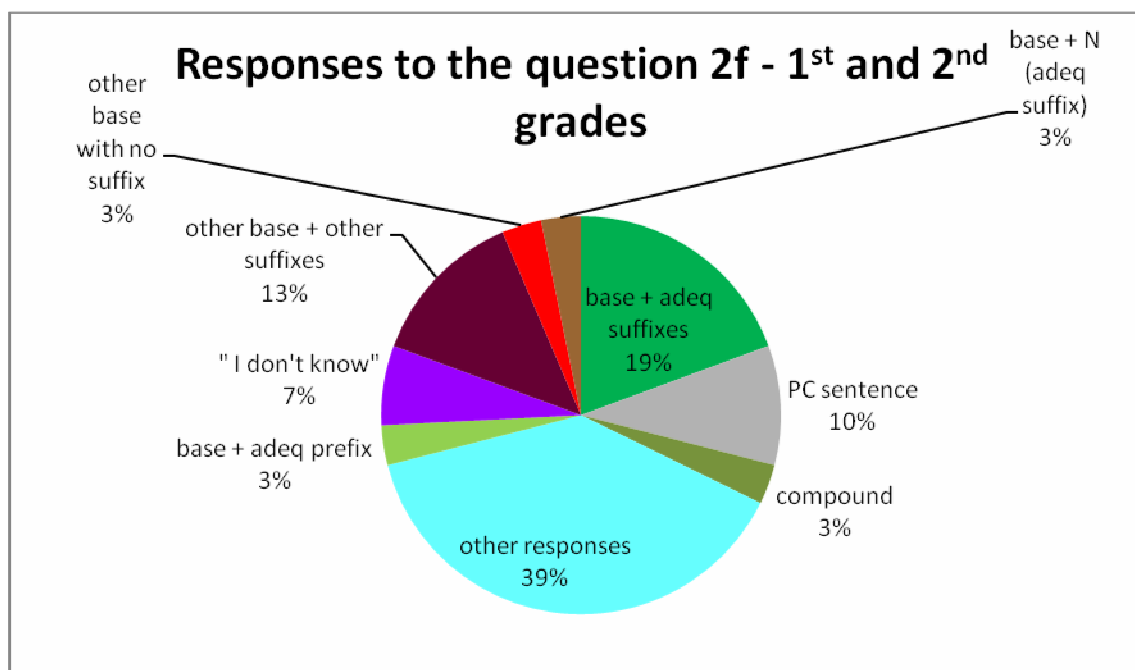
Figure 35: Responses to the question 2f – 1$^{st}$ and 2$^{nd}$ grades

There was a great variability of responses to this question related to the 1$^{st}$ and the 2$^{nd}$ grades. This is a different picture when compared to the results for 3$^{rd}$ and 4$^{th}$ grades in this same question. In the 2$^{nd}$ grade each child gave a different response. Three of them used the base –ada (*segorada*). Another adequate response was "*segorcheia*", in which "cheia" works as a suffix. There was the use of present continuous with the base as well. The other responses were: "Com fome" (hungry), "cheia de pêssego" (full of peaches) (the word "pêssego" ends like the nonce word "*segor*" begins), "vários" (several) and a sentence with present continuous. One child said that s/he did not know the answer.

There were 3 adequate responses in the 1$^{st}$ grade, and all of them with the suffix –ada (alone or with a linking vowel and/or a consonant). However, the most frequent response given by 1$^{st}$ grade children was prepositional phrases again (with or without the base *segor*). Apart this kind of construction, there were several kinds of responses: "Com uma roupa cheia de *segores*" (with clothing full of *segores*), "infectada de *segores*" (infected by *segores*), and "toda cheia de *segores*" (completely full of *segores*), "uma pessoa morta" (a dead person), "cheia de cadeiras" (full of chairs), "bolhas" (bubles), "doente" (sick), "gritando também" (screaming as well), "um monte" (many), "não" (no), and "cheia de criança minúscula" (full of minuscule child).
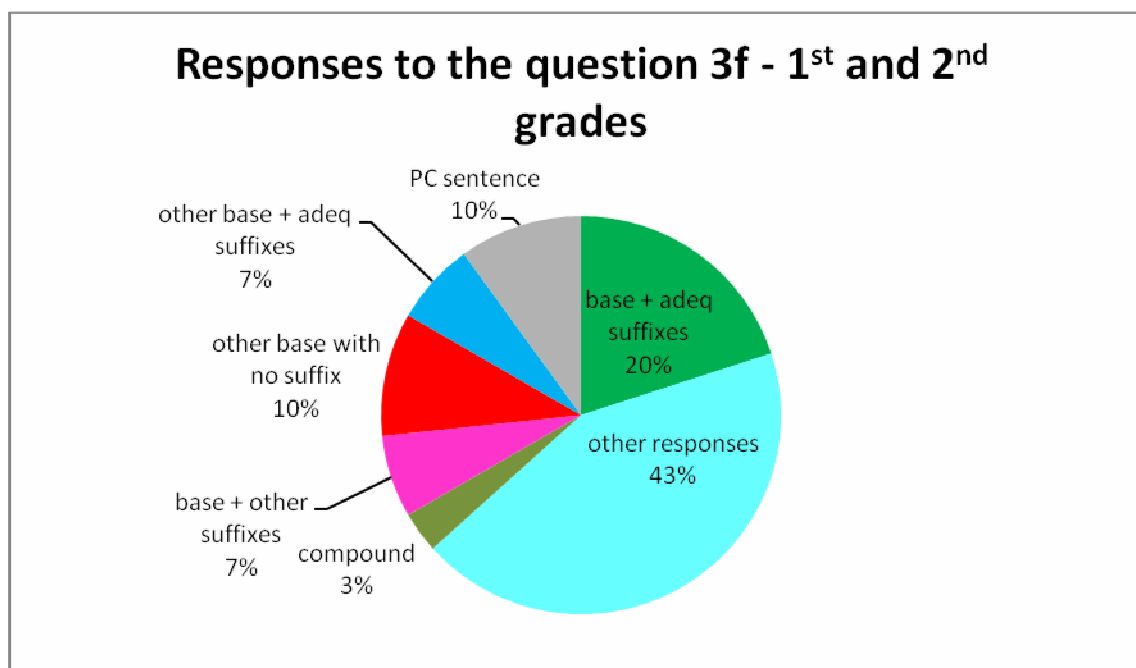
Figure 36: Responses to the question 3f – 1st and 2nd grades

In this question 2nd graders and 1st graders also showed a different performance: While half of 2nd graders were able to provide adequate responses (5 out of 10), just two children did the same in the 1st grade (2 out of 21). Among the 2nd graders' responses, 4 used the suffix –ada (*mafatada*) and 1 used the compound "mafatacheia", in which the word "cheia" functions as a suffix. Again the suffix –ada was the most frequent, like in the adults' responses. Another 2nd graders' response were: "Com vários[57] mafatas" (with several mafatas), "feliz" (happy), "cheia de facas" (full of knifes), "assustada" (scared) (which also present the suffix –ada), and "fazendo o bem" (doing good).

In the 1st grade the adequate suffix –ada was used. The majority of the other responses seems to take into account the supposed content of the nonce word *mafata*. The inadequate responses were: "Infectada de mafatas" (infected by mafatas), "mafatinha" (little mafata), "com roupa de mafatas" (with clothing of mafatas[58]), and "cheia de mafatas pequenas" (full of little mafatas), "enfeitiçada" (enchanted), "com flor" (with flower), "com muitos coelhos" (with several rabbits), "cheia de picada de mosquito" (full of mosquito bite), "cheia de gentes" (full of people), "cheia de formigas de fogo" (full of fire ants), "cheia de comida" (full of food), "flor" (flower), "gritando" (screaming), "trabalhando" (working), and "sim" (yes).

The following figures illustrate the responses for Kindergarten.

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[57] The child used a male pronoun with a female noun.
[58] This use of the nonce word *mafatas* shows that the child could provide a plural suffix to the base.
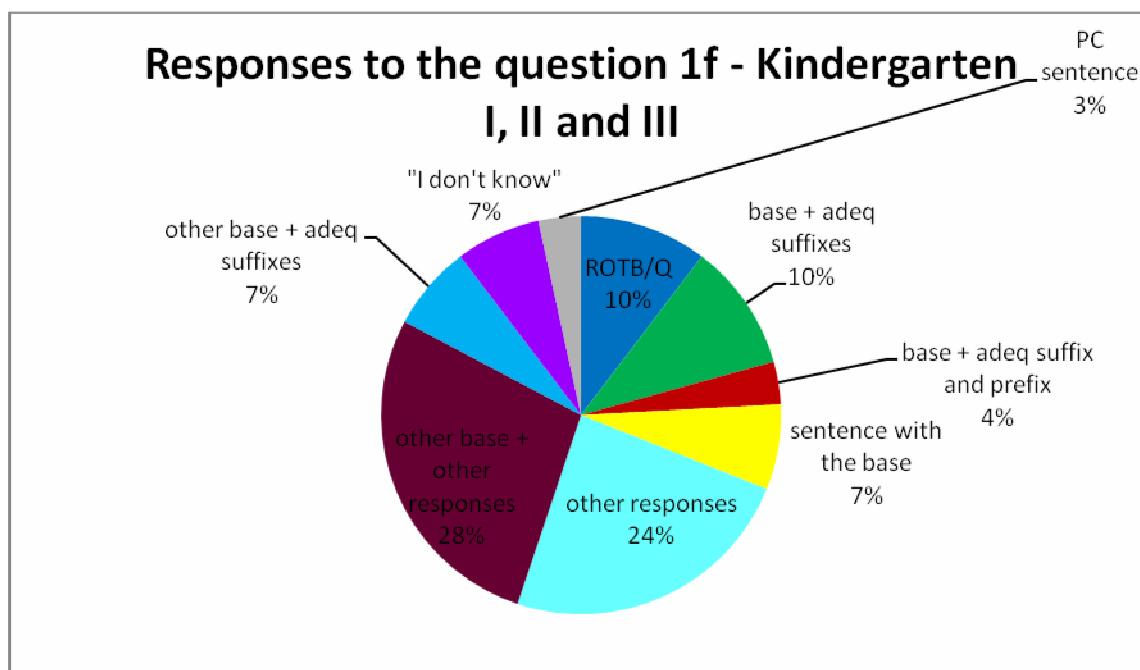
Figure 37: Responses to the question 1f – Kindergarten I, II and III

14% of the Kindergarten children were able to provide an adequate response to the question "a person full of *flopo* is". They belong to Kindergarten III. The adequate responses were "*flopada*" and "*enflopada*", all with the suffix –ada. It matches with the adults' most frequent responses. The responses which did not use the base *flopo* seem to take into account the supposed content of the nonce word *flopo*: "Cheia de pele" (full of skin), "bastante bola pequeninha" (many tiny ball), "gorda" (fat), "envergonhada" (ashamed), "coberta" (covered) (this response provided a synonymous to the word "cheia"), and "toda engasgada" (completely choked), "doente" (sick), "cheia de flores" (full of flowers) (phonological similarity), "média" (mean), "de roupa" (with clothes), "água" (water), "cheia de pinheiro" (full of pine tree), "bonita" (beautiful), and "doente" (sick), or used a prepositional phrase or used a present continuous verbal form: "no mundo" (in the world), "vestida" (dressed), and "carregando maçã" (loading apple). One child said that s/he did not know the answer and another one used a full sentence with the base *flopo*. These responses like "cheia de alguma coisa" (full of something) were classified as "other responses".
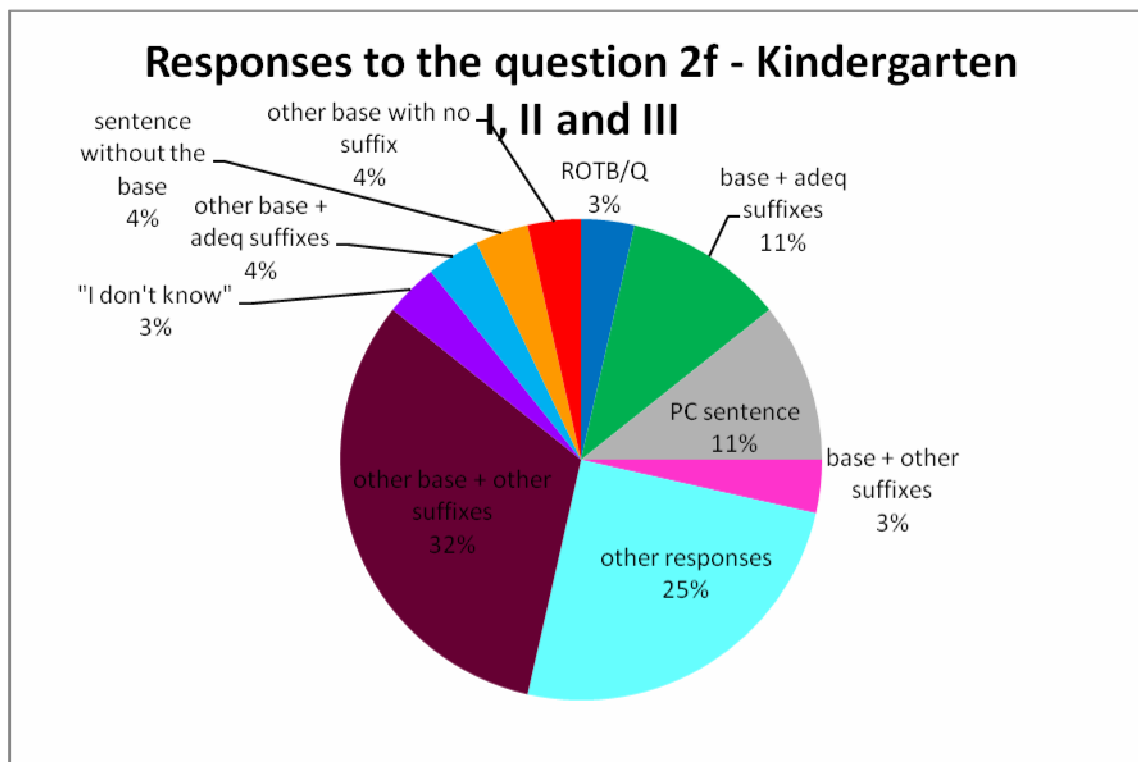
Figure 38: Responses to the question 2f – Kindergarten I, II and III

To this question with the base *segor* 14% (3 out of 29) provided adequate responses, using the suffix –ada, which was the most frequent suffix in the responses. These 3 children belong to the Kindergarten III. Among the inadequate responses, 3 children repeated the base *segor* and the other responses were: "Vendendo *segores*[59]" (selling *segores*), "*segorão*" (big *segor*), "coberta de *segores*" (covered by *segores*), and "cheia de *segores*" (full of *segores*), "cheia de pele" (full of skin), "bolinhas nela" (little balls in her), and "toda desarrumada" (completely untidy), which presented the suffix –ada as well, "com roupa desses negócios aí"[60] (with clothing of those things there), "doente" (sick), "bonita" (beautiful), which is an adjective, "*profo* médio" (coined word), "*panta*" (coined word), "trabalhando" (working), "vestida" (dressed), "flor" (flower), "carregando maçã" (loading apple), a full sentence, "rato" (mouse), "com uma bandeira" (with a flag), "bonita" (beautiful), "cheia de dentes" (full of teeth) and "feia" (ugly). The words "bonita" and "feia" are adjectives. In the Kindergarten I and II each child gave a different response. This may indicate that a transparent suffix to this question is not available yet for children in this age.

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[59] In this response we can see that Kindergarten III children are capable of using the plural applied to the nonce word *segor*.

[60] In this response, the expression "desses negócios aí" replace the nonce word segor. The child probably forgot the word in the production moment.
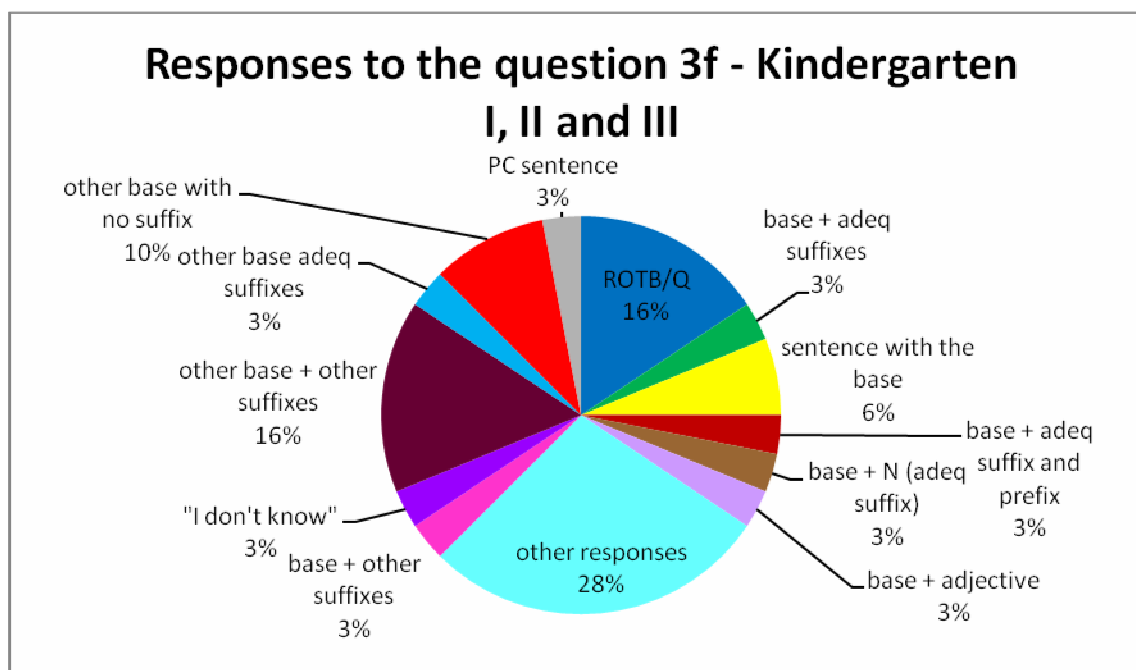
Figure 39: Responses to the question 3f – Kindergarten I, II and III

Again just 3 children gave adequate responses to this question and all them belong to Kindergarten III. The suffix used was –ada. Apart from the repetition of the base and the repetition of the question, the other responses were: Two full sentences, "mafata grande" (big mafata), "coberta de mafatas" (covered by mafatas), "trabalhando com mafatas" (working with mafatas), and "de mafatas" (of mafatas), "cheia de pele"[61] (full of skin), "doente" (sick), "cheirosa" (pleasantly smelling), "profo médio"[62] (nonce word), "de roupa" (with clothing), "no mundo" (in the world), "esse aqui"[63] (this here), "vestida" (dressed), "flor" (flower), and "com maçã" (with apple), "ratché do skate" (nonce word), "cheia de tinta" (full of ink), "bonita" (beautiful), "toide" (nonce word), and "feia" (ugly). In this question Kindergarten II and I presented a result similar to the previous question: Each child gave a different response.

Now let's inspect the results of questions C and D about augmentative, a kind of derivation that Berko did not analyze. In these questions, adults and children were asked to complete the sentence "a big *flopo*, *segor* or *mafata* is a" and "a very big *flopo*, *segor* or *mafata* is a". I will start with the results for questions 1c, 2c and 3c for children and then the figures for adults and children.

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[61] This response was given by the same child in question 1f and 2f as well.
[62] This response was given by this child in other questions as well.
[63] The child who gave this response was pointing to his/her finger at the production moment.

Table 5 – Percentage of adequate responses for questions 1c, 2c and 3c for children

| Percentage of adequate responses for questions 1c, 2c and 3c | | | |
| --- | --- | --- | --- |
| | **Group 1** | **Group 2** | **Group 3** |
| **1c** | 10 (42%) | 9 (29%) | 1 (3%) |
| **2c** | 12 (50%) | 9 (29%) | 1 (3%) |
| **3c** | 12 (50%) | 8 (26%) | 2 (7%) |

Again we can notice that the percentage increases across the ages, from the Kindergarten to the 3rd and the 4th grades. The youngest groups provided few adequate responses to the questions and in the Group 1 half of children were able to provide appropriated responses. Perhaps a transparent suffix is not yet available to the youngest children.

All adults provided adequate responses to these questions, using the augmentative suffixes –ão (male) or its allomorph –zão and –ona (female), producing *flopão*, *segorzão* and *mafatona*. The first one was the most frequent (19 out of 31). The allomorph –zão was used with the base *segor* (4 out of 32), as I expected since *segor* ends in a consonant, and the suffix –ona was used with the base *mafata*, which is a female form (since ends with the thematic vowel –a-). The suffix choice was unanimous to question C as it happens to question B, related with diminutive. For adults a transparent suffix is easily noticeable. Now let's check if for children this happens too.
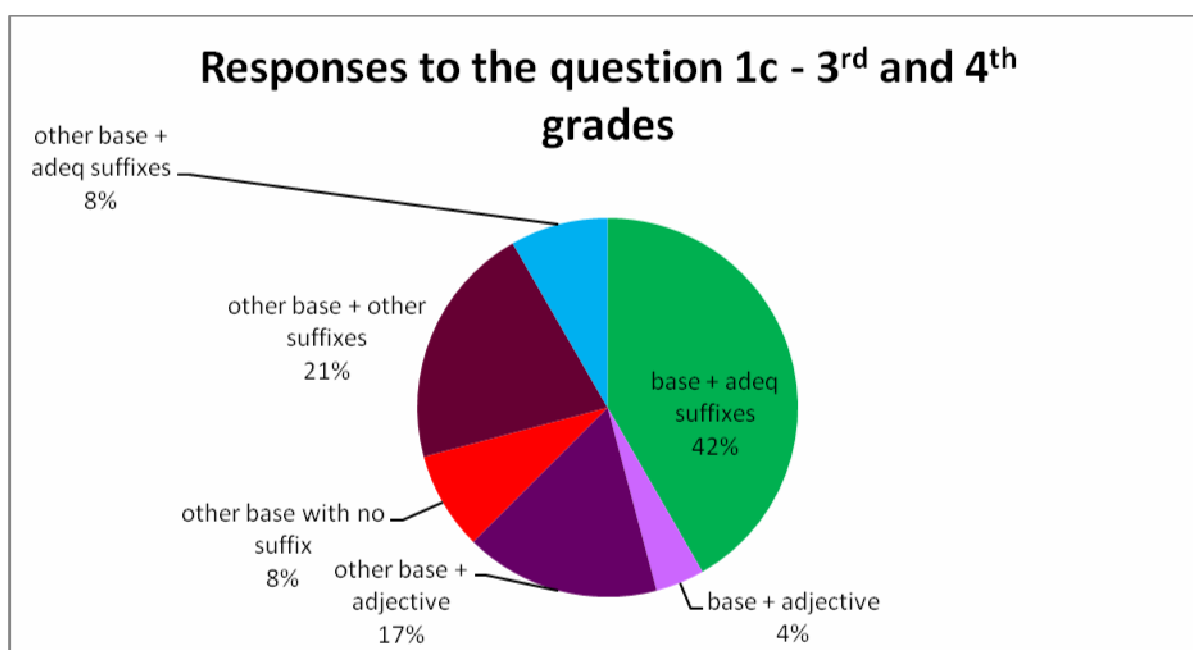


Figure 40: Responses to the question 1c – 3rd and 4th grades

For the 3<sup>rd</sup> and the 4<sup>th</sup> grade, a picture similar to the adults' is shown: The adequate responses had only one suffix provided: –ão (alone or with the linking consonant –z)[64], producing *flopão* or *flopozão*. Almost half of children provided an adequate response (10 out of 24). The other responses for these two grades seem to take into account the supposed content of the nonce word *flopo*: "Lobo grande" (big wolf), "flocos grande"[65] (big flakes) (phonological similarity), "gavião" (sparrow hawk), "globo" (globe) "grandão" (very big), "pássaro" (bird), "gelo grande" (big ice), "árvore" (tree), "flor muito grande" (very big flower) (phonological similarity), "cachorro" (dog), "pólen" (pollen), and "pequeno" (small) (this last responses did not seem to take into account the supposed content of the nonce word *flopo*). Another response was "*flopo* invisível", which was not considered adequate because it did not use a suffix. Moreover, the adjective "invisível" does not convey the idea of augmentative.
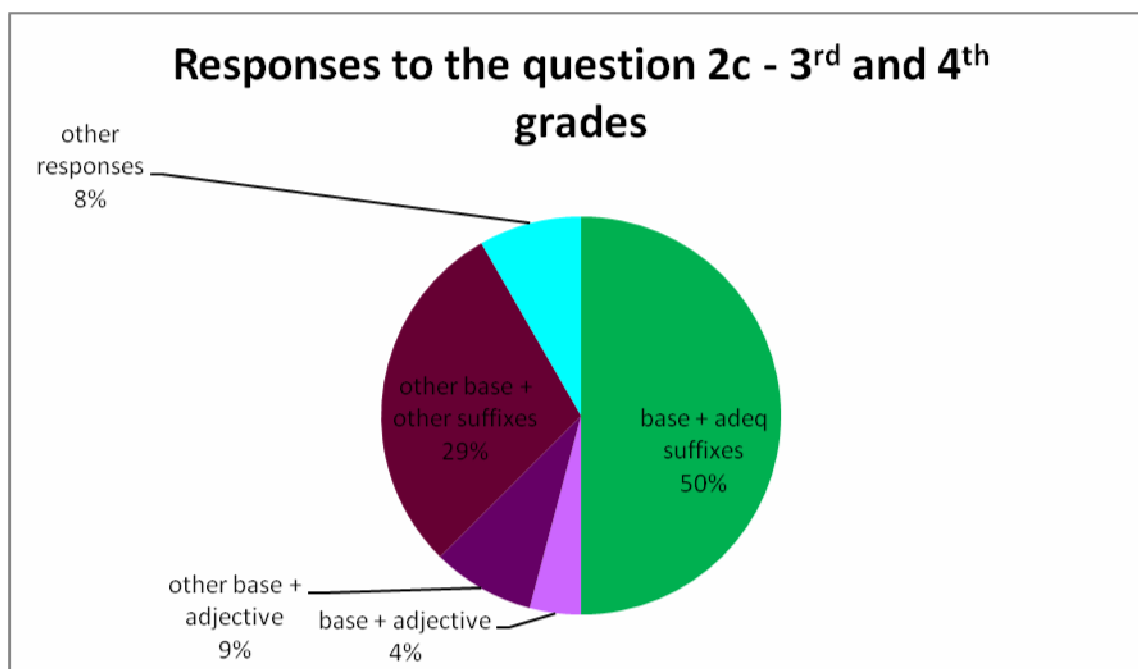


Figure 41: Responses to the question 2c – 3<sup>rd</sup> and 4<sup>th</sup> grades

Half of children provided an adequate response to the question "a big *segor* is a" in the 3<sup>rd</sup> and the 4<sup>th</sup> grades (12 out of 24). All adequate responses presented the suffix –ão with the base *segor* (alone or with the linking consonant –z). In this question, as expected, the suffix with the linking consonant –z (its allomorph) was used more frequently than the suffix alone.

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[64] The use of the linking consonant –z with flopo was not expected, since in general the linking consonant should be used with words that end with a consonant.
[65] The child used the plural mark only in the noun, not in the adjective.

The other responses for 4th grade were: "Cegonha grande"[66] (big stork) (phonological similarity), "passarinho grande" (big bird), "formigueiro" (anthill), and "árvore" (tree). For 3rd grade the other responses were: "*Segor* pequeno" (small *segor*), "gigante" (giant), "elefante" (elephant), "estojo" (pencil case), "adulto cego"[67] (blind adult) (phonological similarity), "pequeno" (small), "cabra" (goat), and "livro" (book). Except for "pequeno" these responses seem to take into account the supposed content of the nonce word *segor*.
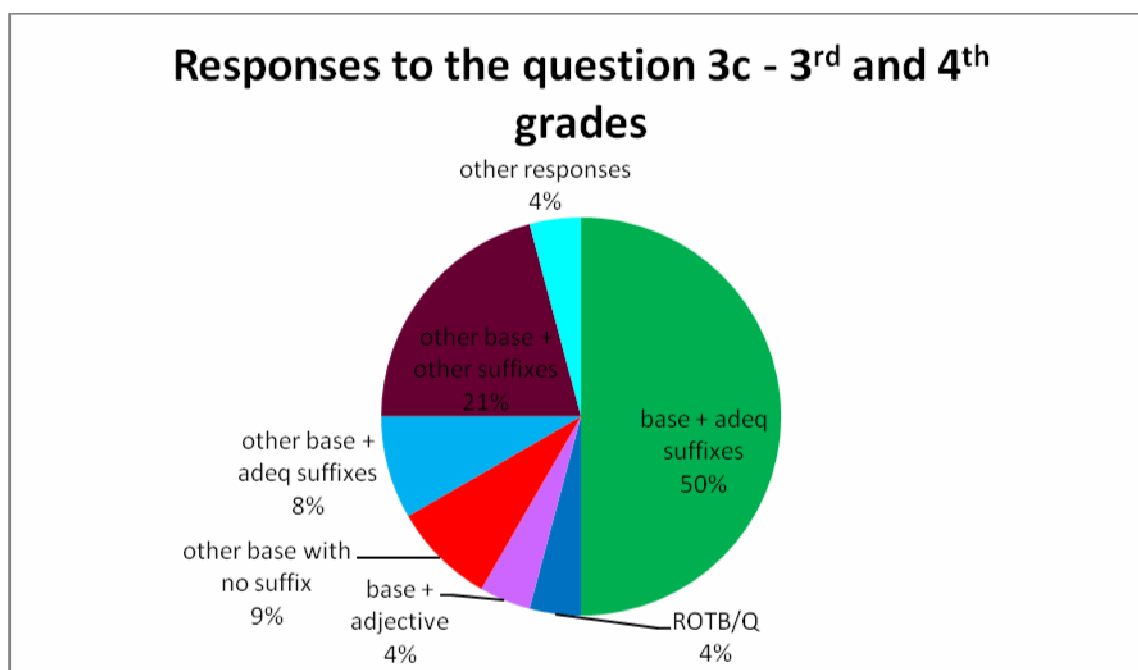


Figure 42: Responses to the question 3c – 3rd and 4th grades

50% of the responses in the 3rd and the 4th grades used the structure base with adequate suffixes. The suffix –ona was the most frequent to 4th grade because this suffix is applied to female nouns, like *mafata*. In opposition to the 4th grade, the suffix –ão (*mafatão*) was more used than the suffix –ona in the 3rd grade. The suffix –ão was accepted as adequate as well because there are cases of female nouns that receive the suffix –ão in the augmentative form, like "mulherão" (big woman). The other responses for 4th grade were: "Tênis" (tennis), "tatuzona" (big armadillo) (with the suffix –ona), and "bola de futebol" (football ball). For 3rd grade they were: "*Mafata* pequena", "grandona" (very big), "Cristo Redentor" (Christ the Redemeer), "lápis" (pencil), "mato médio" (medium-size forest), "pequenina" (tiny), "perereca" (toad), and "cadeira" (chair).

The following figures illustrate the 1st and the 2nd graders' responses.

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[66] For the question 2b (a small *segor* is a), this child answered "cegonha pequena" (small stork).
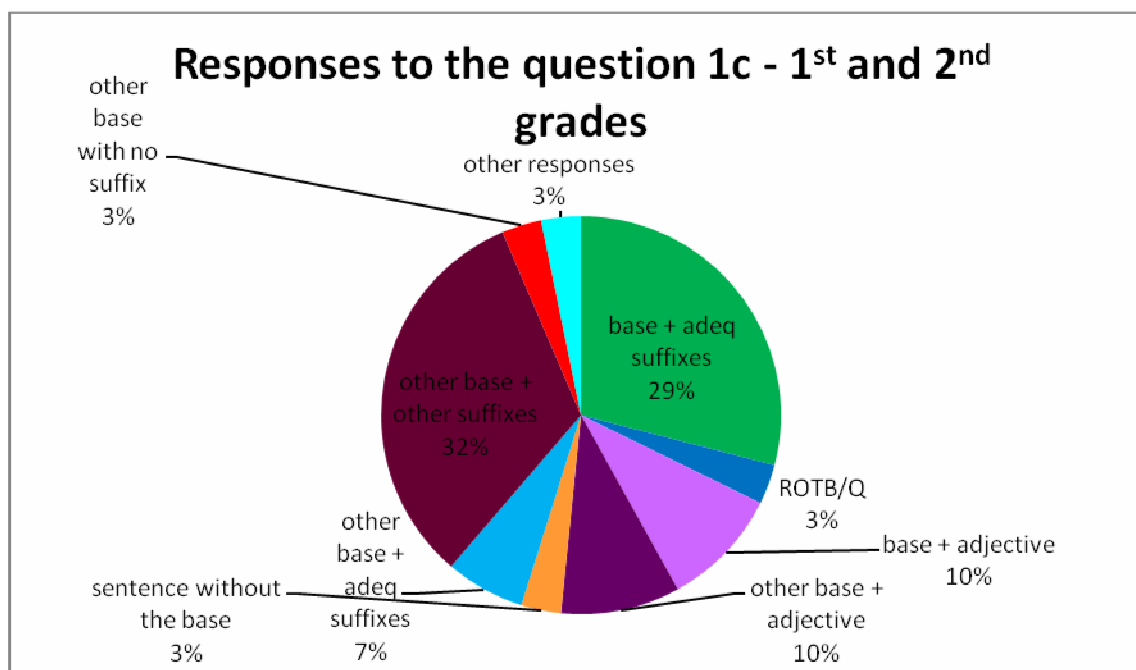[67] For the question 2b, this child answered "criança cega" (blind child), which is very coherent.

Figure 43: Responses to the question 1c – 1$^{st}$ and 2$^{nd}$ grades

29% of the 1$^{st}$ and 2$^{nd}$ grade children provided adequate responses to the question "a big *flopo* is a", being 5 from 2$^{nd}$ grade (5 out of 10) and 4 from 1$^{st}$ grade (4 out of 21). Except for one repetition of the base and for two repetition of the question, the 1$^{st}$ and the 2$^{nd}$ grade presented the same choice to represent the augmentative that the 4$^{th}$ and the 3$^{rd}$ grades did: The suffix –ão. The other responses for the 2$^{nd}$ grade were: "Flocão" (big flake) (phonological similarity), "flor grande" (big flower) (phonological similarity), and a full sentence. For the 1$^{st}$ grade the other responses were: "Adulto" (adult), "foca grande" (big seal) (phonological similarity), "árvore" (tree), "elefante" (elephant), "avião" (plane), "coisa grande" (big thing), "vaporzão" (big steam) (with the suffix –zão), "pequeno" (pequeno), "floquinho" (little flake) (phonological similarity), "cavalo" (horse), "urso" (bear), "dinossauro" (dinosaur), and "gigante" (giant). Except for "pequeno" and "floquinho" these responses seem to take into account the supposed content of the nonce word *flopo*.
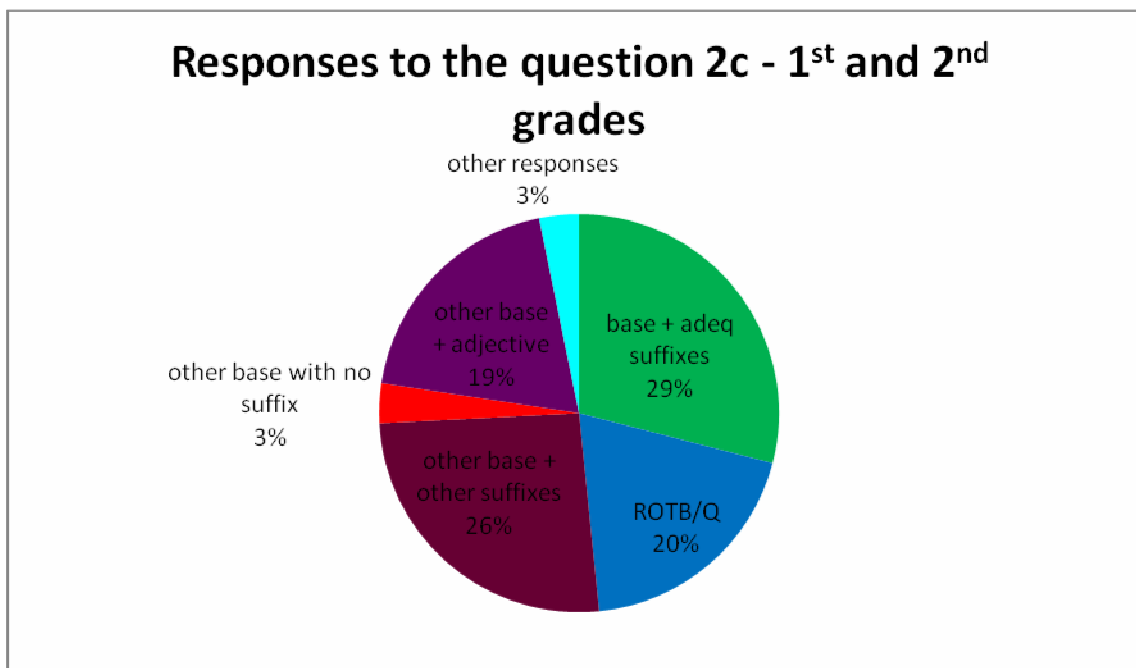
**Responses to the question 2c - 1st and 2nd grades**

Figure 44: Responses to the question 2c – 1st and 2nd grades

In this question, 5 out of 10 2nd grade children and 4 out 21 1st grade children gave adequate responses. All of them used the base *segor* and the suffix –ão (most of them with the liking consonant –z), producing *segorão* or *segorzão*. The other responses for 2nd grade were: "Prédio" (building), "pêssego grande"[68] (big peach) (phonological similarity), and "coração" (heart). For 1st grade they were: "Rato gigante" (giant mouse), "girafa bem grande" (very big giraffe), "grande grandão" (big very big), "gigante" (giant), "casa" (house), "médio" (mean), "elefante" (elephant), "pessoa" (person), "vaca" (cow), "formiga grande" (big ant) and "homem gigante" (giant man).

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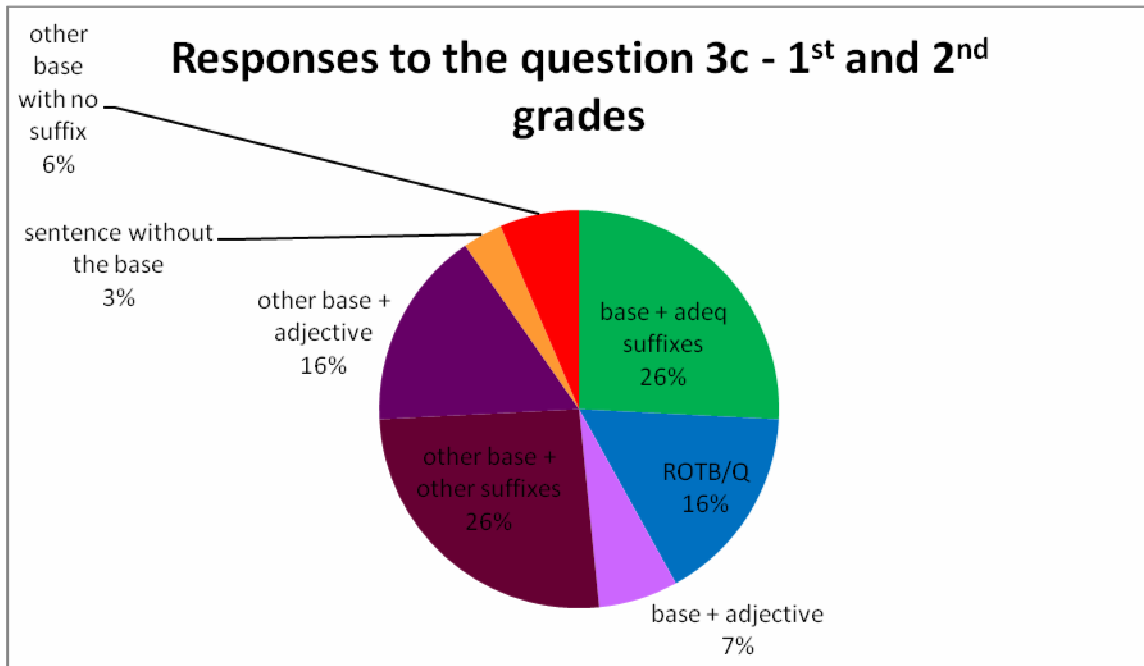[68] For the question 2b (a small *segor* is a), this child answered "pêssego pequeno" (small peach).

Figure 45: Responses to the question 3c – 1st and 2nd grades

A similar result was reached for the question 3e: 26% of the children were able to provide an adequate response (5 out 10 in the 2nd grade and 3 out of 21 in the 1st grade). Almost all of the rersponses used the suffix –ona and just one used the suffix –ão. For the 2nd grade, one child repeated the base *mafata* and another one used this base with the adjective "gigante" (giant). The other responses did not use the base *mafata*: "Cidade" (city), "faca grande" (big knife), and a full sentence. For 1st grade the responses were: "Pulga gigante" (giant flea), "Coelho bem grande" (very big rabbit), "janela" (window), "mesa" (table), "lâmpada" (lamp), "fatia bem grande" (very big slice), "média" (average), "girafa" (giraffe), "tubarão" (shark), "pedra" (stone), "parede" (wall), "sol" (sun), and "fada grande" (big faerie) (phonological similarity).

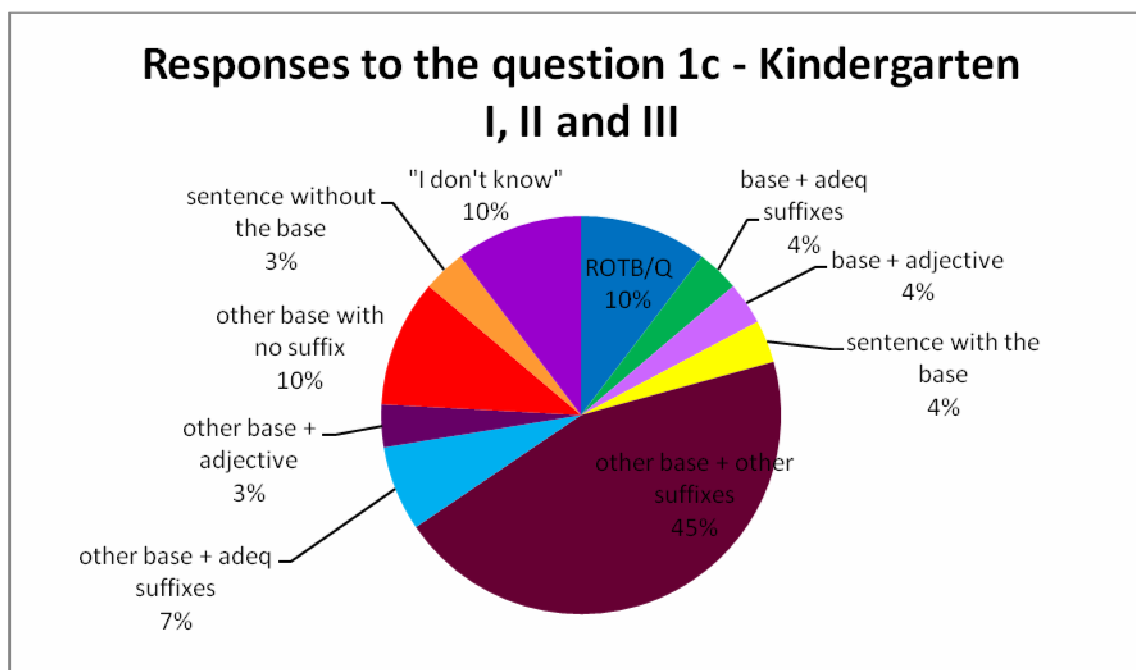The following figures show the Kindergarten children's responses for question C.

Figure 46: Responses to the question 1c – Kindergarten I, II and III

The majority of the responses given by Kindergarten children was classified as other responses with other suffixes. This may points out that a transparent suffix to indicate augmentative is not yet available for children in this age. Just one child, in the Kindergarten III, gave an adequate response, producing *flopão*. The other responses for Kindergarten III included one repetition of the base, "boca" (mouth), "bola" (ball), "clopo" (nonce word), "flocão" (big flake) (phonological similarity and use of the suffix –ão), "semente bem grande" (very big seed), "médio" (mean), "abelha" (bee), "maior" (biggest), "floco" (flake) (phonological similarity). These responses seem to take into account the supposed content of the nonce word *flopo*.

For Kindergarten II, one child said "*flopo* pequeno" (little *flopo*) and two others repeated the question. Moreover they produced: "Flor" (flower) (phonological similarity), "médio" (mean), "gato" (cat), "grande" (big), "cachorro" (dog), "pequeno" (small), "árvore" (tree), and a full sentence. For Kindergarten I, the responses seem to take into account the supposed content of the nonce word *flopo*: "Caranguejo" (crab), "pinheiro" (pine tree), "*tirrapo*"[69] (coined word), and "animal" (animal).

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[69] This coined word was used by the same child in response to the question 1e.
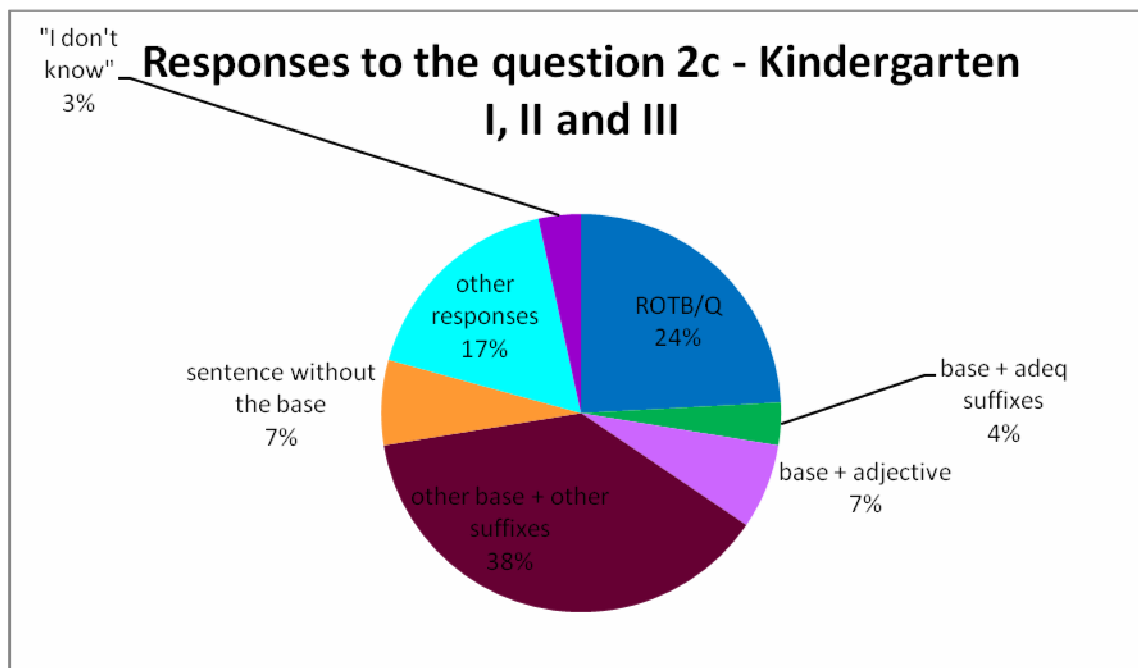
Figure 47: Responses to the question 2c – Kindergarten I, II and III

The same result was produced to this question: Only one Kindergarten III child provided an adequate response, using the suffix –ão with the linking consonant –z. Moreover, for Kindergarten III there were repetitions of the question and repetitions of the base. The other responses that did not use the base *segor* were: "Orelha" (ear), "barriga de elefante" (elephant's stomach), "grandão" (very big), "borboleta" (butterfly), and "maior" (biggest), and a full sentence. For Kindergarten II, children one child repeated the question and another said "*segor* pequeno". The other responses that did not use the base *segor* were: "Casa" (house), "médio" (mean), "árvore" (tree), "grandão" (very big), "grande" (big), "cachorro" (dog), "pequeno" (small), "papaguaio"[70] (parrot), and a full sentence. For Kindergarten I the responses were: "Segor muito grande" (segor very big), a repetition of the question, "carro" (car), "cadeira" (chair), and "cabeça" (head). One child said that s/he did not know the answer.

It is important to highlight that with the nonce word *segor* the allomorph –zão was use more frequently than the suffix –ão, as I expected, since this nonce word ends with a consonant. This result shows us that children are sensible to morphophonological constraints.

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[70] The child said "papaguaio" instead "papagaio".

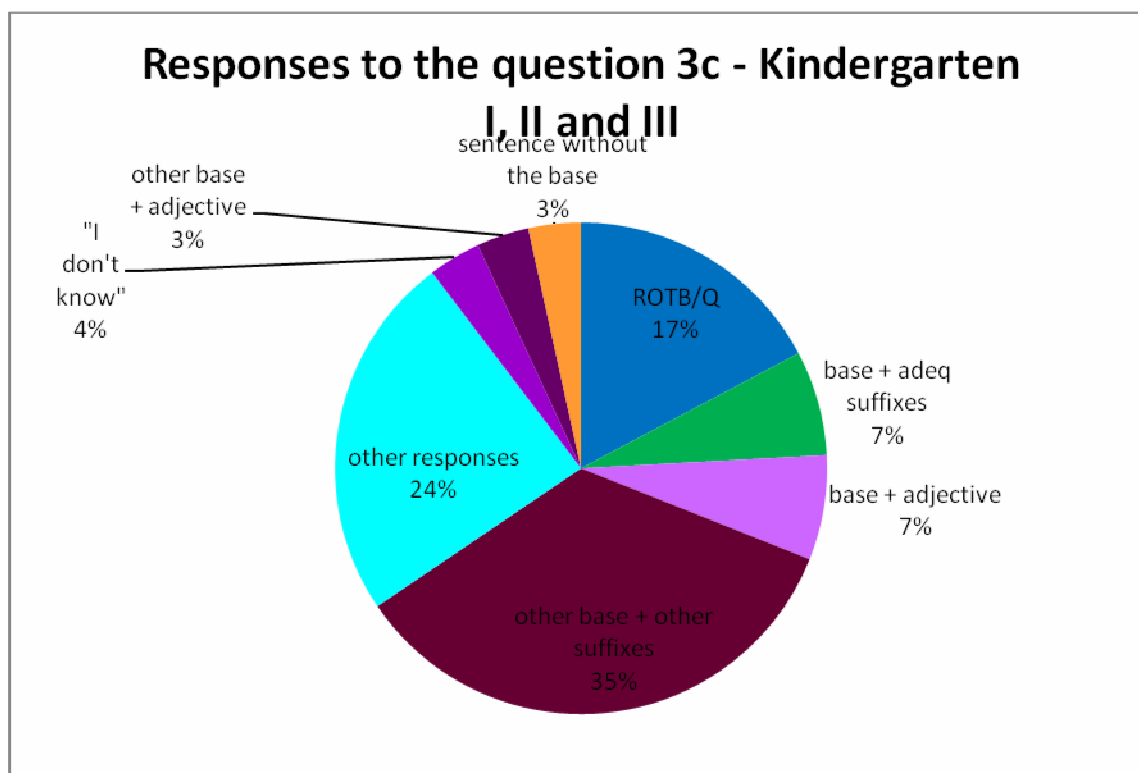**Responses to the question 3c - Kindergarten I, II and III**

Figure 48: Responses to the question 3c – Kindergarten I, II and III

To this question, two Kindergarten III children used an adequate suffix with the base. The suffix used was –ona (*mafatona*). Furthermore, three children of this grade repeated the question or the base and produced other responses like: "Princesa" (princess), "bandeja" (tray), "baleia" (whale), "grandão" (very big), "borboleta" (butterfly), "maior" (biggest), and "grande" (big). For the Kindergarten II, one child repeated the question and another one said "*mafata* pequena" (small *mafata*). In addition, the other responses were: "pequena" (small), "cadeira" (chair), "bloco grandão" (very big block), "grande" (big), "cachorro" (dog), "areia" (sand), and a full sentence. For the Kindergarten I the responses were: A repetition of the question, "*mafata* muito grande" (very big *mafata*), "carro" (car), "cadeira" (chair), "cabeça" (head), and one child said that s/he did not know the answer.

In order to check if children know a transparent suffix to "very big" – and if there is a productive suffix – I added to the Test 1 a question "a very big *flopo*, *segor* or *mafata* is a". The following table shows the results for questions 1d, 2d and 3d for children.

Table 6 – Percentage of adequate responses for questions 1d, 2d and 3d for children

| Percentage of adequate responses for questions 1d, 2d and 3d | | | |
|---|---|---|---|
| | **Group 1** | **Group 2** | **Group 3** |
| **1d** | 7 (29%) | 3 (10%) | 0 |
| **2d** | 7 (29%) | 4 (13%) | 2 (7%) |
| **3d** | 8 (33%) | 3 (10%) | 3 (10%) |

Table 6 shows that the percentage for adequate responses for children is low to question D. This may indicate that a transparent suffix is not available for children or that there is not a productive suffix to this function in Portuguese. To confirm this last hypothesis, let's check the responses given by adults to this question.
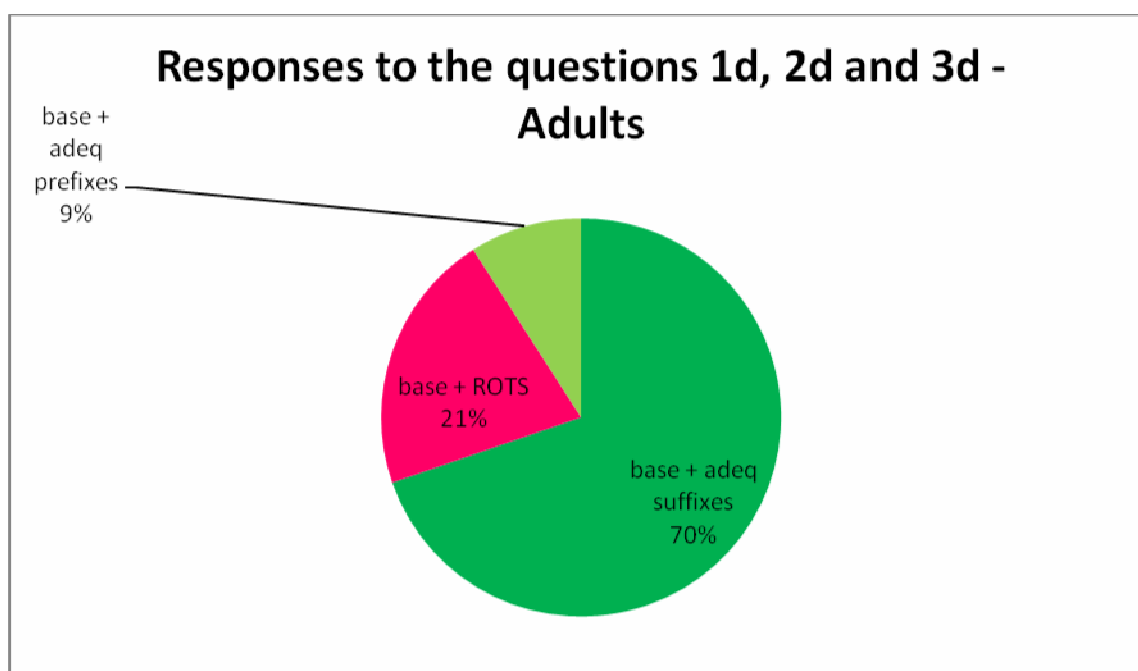


Figure 49: Responses to the questions 1d, 2d and 3d – Adults

Adults gave 3 kinds of responses to the question "a very big *flopo*, *segor* or *mafata* is a": They used augmentative suffixes, like –ão or –ona (and its allomorphs), and a suffix that is used to express something really big, -aço (*flopaço*, *segoraço* and *mafataço*), like in "nossa! Que tapetaço!" (wow! This is a huge carpet"). This suffix is also used to indicate intensity in general, like in "golaço" (really impressive goal) or "mulheraço" (very beautiful woman). Adults also used the base *flopo*, *segor* or *mafata* with a repetition of the suffix –ão, like in *flopãozão*, as if the repetition add augmentative information: The suffix –ão used once means "big", the suffix used twice or three times means "very big" or "more than simple big". The

third kind of responses given by adults to this question was the use of the prefixes "mega" and "hiper", which convey the meaning of something very big. Apart from the repetition of the suffix –ão, the most frequent suffix used was –aço, which may indicate that a transparent and productive suffix is available in Portuguese and is used by adults. Now we can inspect if children use these recourses as well.
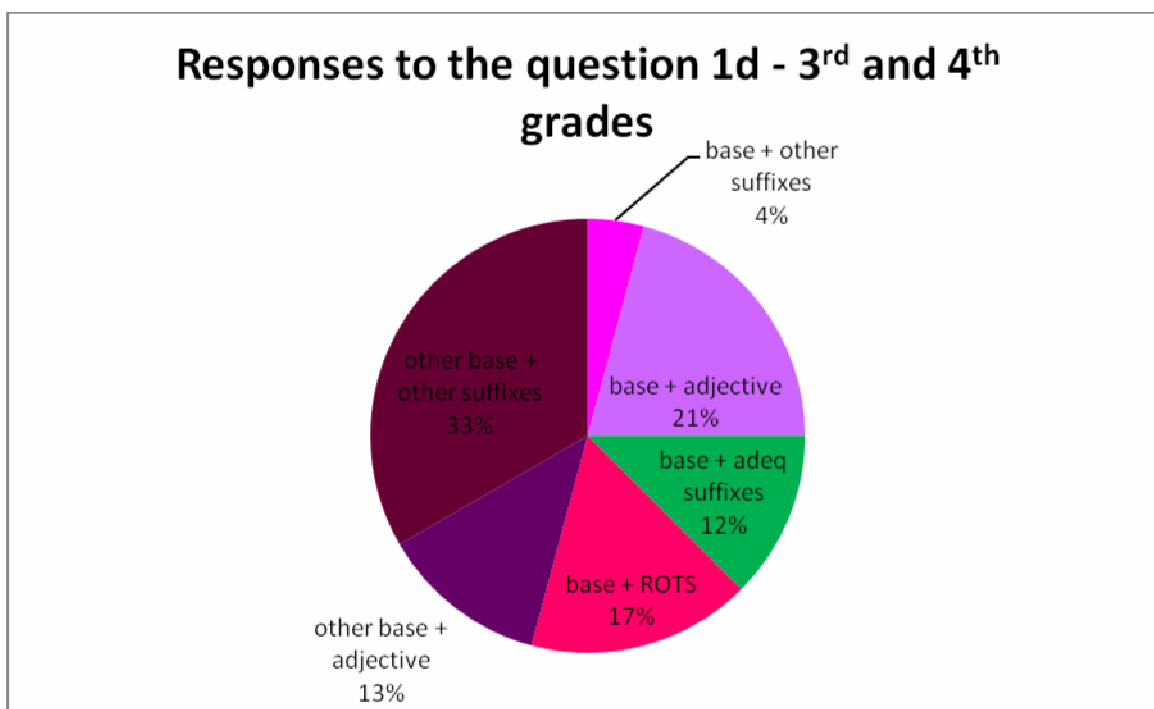


Figure 50: Responses to the question 1d – 3rd and 4th grades

The figure 50 shows that 3rd and 4th grades produced 29% of adequate responses. The most frequent kind of responses was the use of the base *flopo* with repetition of the suffix –ão. The only adequate suffix used in the responses was –ão. No child used the second most frequent suffix in the adults' response, –aço. This may indicate that this suffix is not transparent for children and that the children did not show the same preference that adults did. For the 4th grade, the most frequent response was the use of the adjectives "gigante" (giant) and "grandão" (very big), which were included in the category "other base with adjective". The other responses were: "*Flopolinso*" (coined suffix), "*flopo* enorme" (enormous *flopo*), "revista grande" (big magazine), "papagaio" (parrot), and "planeta" (planet).

For 3rd grade one child used the base with the adjective "gigante" (giant) and the other responses were: "Enorme grandão" (enormous very big), "elefante" (elephant), "prédio" (building), "flor extra grande" (extra big flower) (phonological similarity), "globo" (globe), "cavalo" (horse), "árvore" (tree), and "muito pequeno" (very small). As we can see, the

responses are related to big-sized referents. This may indicate that the children tried to take into account the supposed content of the expression "very big *flopo*".
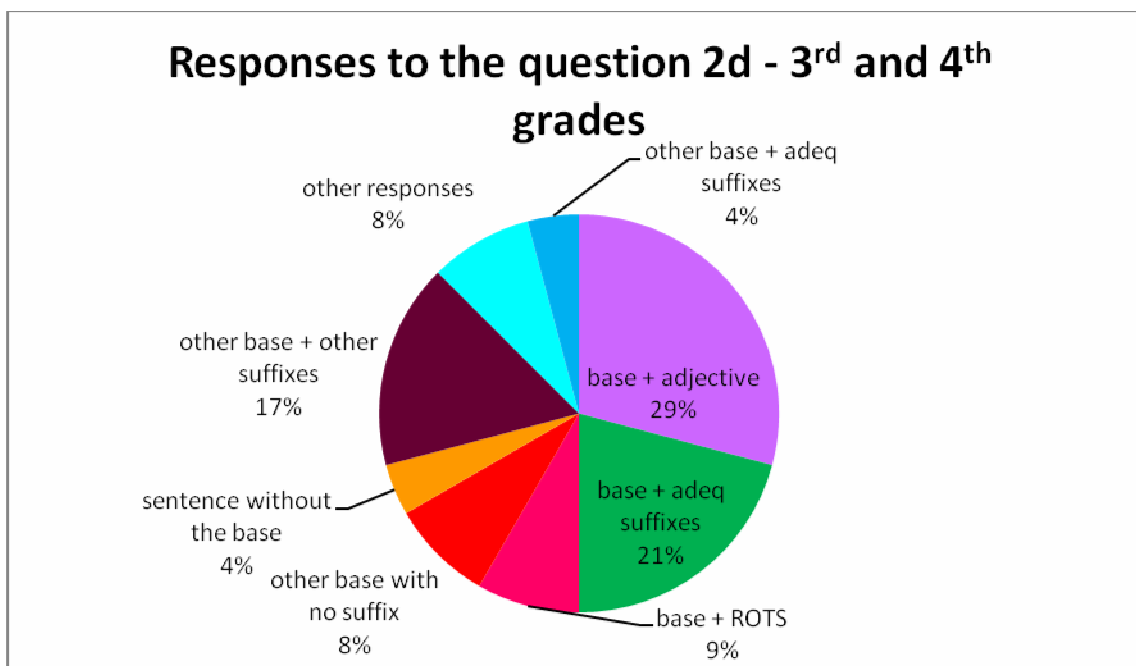


Figure 51: Responses to the question 2d – 3rd and 4th grades

To this question (a very big *segor* is a), the 3rd and the 4th grade presented 30% of adequate responses, using the base *segor* with the suffix –zão (or –gão, which is another allomorph of –ão) or repeating the suffix –ão twice. Another frequent kind of response was the use of the base with the adjectives, "*segor* gigante" (giant *segor*), "*segor* enorme" (enormous *segor*), and "*segor* grande" (big *segor*). Other responses for the 4th grade were: "*Segor* super" (*segor* super), "gavião" (sparrow hawk), "nave" (ship), and a full sentence.

For the 3rd grade there was a big variability of responses for the 3rd grade. Each child gave a different response. This may indicate that a transparent suffix is not available yet for this age. The inadequate responses were: "*Segor* gigante" (giant *segor*), and "*segor* muito pequeno" (very small *segor*), "gigantesco" (gigantic), "prédio" (building), "salão de futebol" (football hall), "adulto grande cego" (big blind adult), "muito pequeno" (very small), "urso" (bear), and "país" (country). All these responses are related to the idea of "very big", except for "muito pequeno".
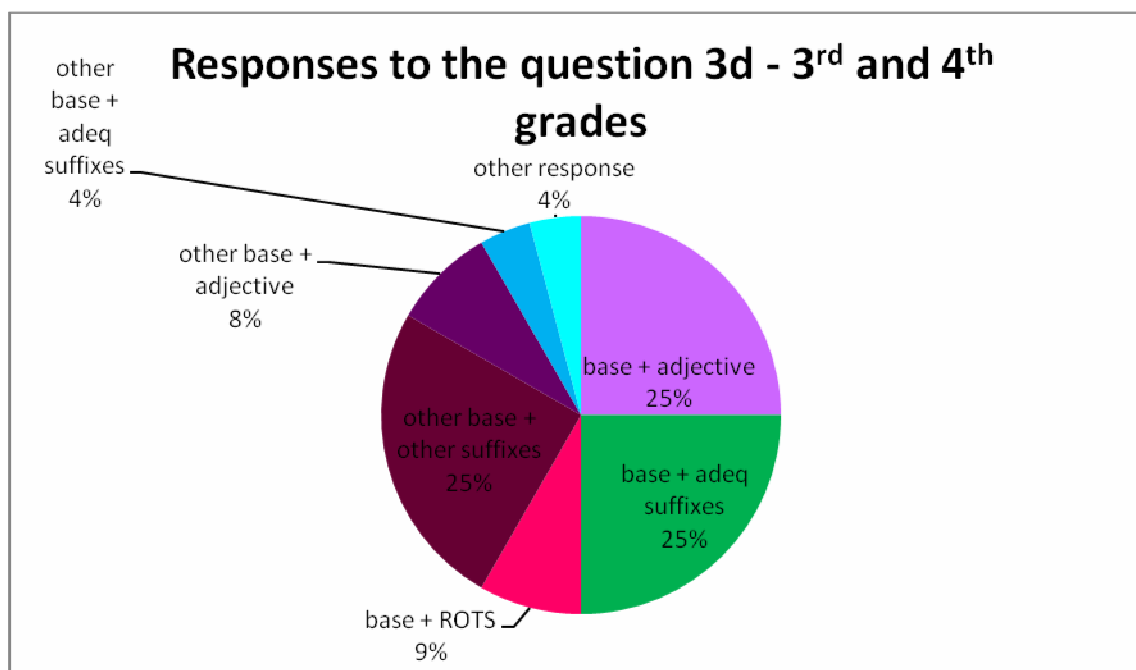
Figure 52: Response to the question 3d – 3rd and 4th grades

Children in the 3rd and in the 4th grade provided 34% of adequate responses to this question with the base *mafata*. The results are very similar to this question with the bases *flopo* and *segor*. The suffixes –ões and –ona (or its allomorph) were considered adequate because they convey the idea of augmentative. Again the structure base with adjectives, which was not considered adequate because it does not involves the appliance of affixes to the nonce words of the tests, was very frequent, especially with the adjective "gigante" (giant). This result confirms the fact that a transparent suffix that conveys the meaning of "very big" is not available for children. For 3rd grade a great variability was registered again. Each child in the 3rd grade gave one different response. Again no child used one of the adults' most frequent suffix (-aço). The inadequate responses for 3rd and 4th grades were: gavião (sparrow hawk), "hiper grande" (hyper big), "as torres gêmeas" (the twin towers), "caderno" (copybook), "mata grande" (big forest), "muito visível" (very visible), "vaca" (cow), "caixa" (box), "*mafata* muito pequeno"[71] and a full sentence.

The following figures illustrate the responses to the questions 1d, 2d and 3d for the 1st and the 2nd grades.

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[71] The child used the female noun "mafata" with a male adjective "pequeno".
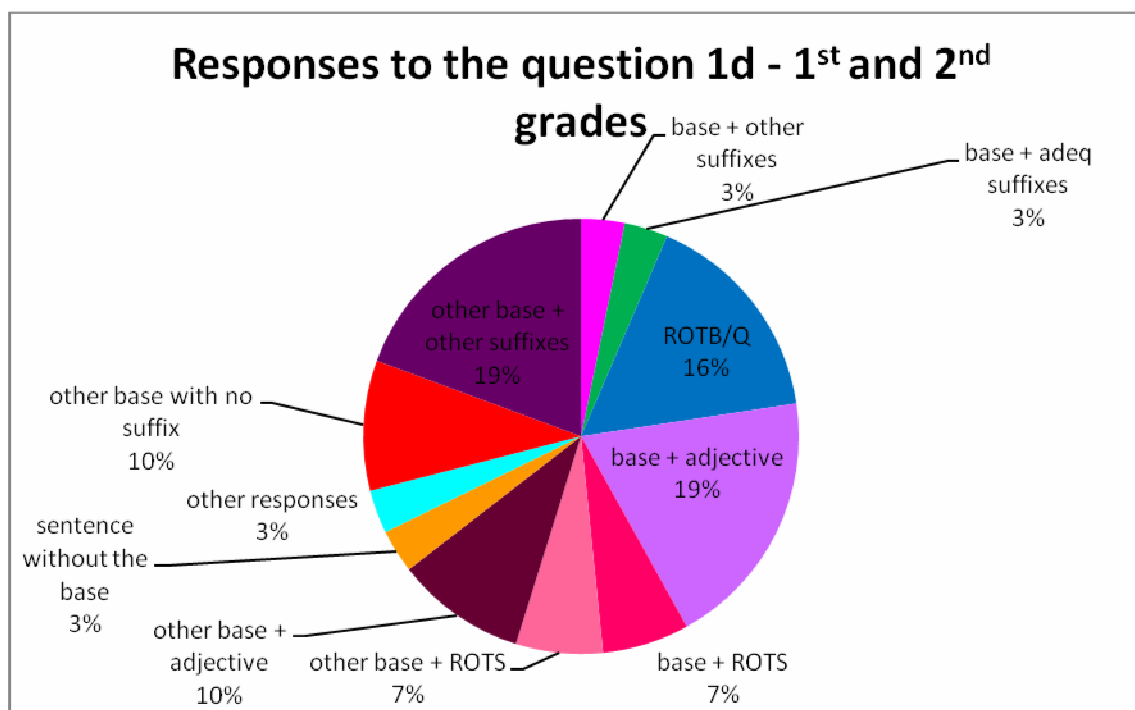
Figure 53: Responses to the question 1d – 1$^{st}$ and 2$^{nd}$ grades

Only 10% (3 out of 31) of this group were able to provide an adequate response. The structures used were the applying of an adequate suffix –ão to the base *flopo* and the repetition of the suffix –ão with the base *flopo*. Some children (4 out of 10) used the adjective "gigante" (giant) with the base in response to this question. The adjectives "gigante" and "gigantão" (very giant) also appeared. Two children repeated the base and another one repeated the question. The other responses used other bases: "Flocãozão" (big flake) (phonological similarity), "flor muito grande" (very big flower) (phonological similarity), a full sentence, "floco gigante" (giant flake) (phonological similarity), "céu" (sky), "girafa" (giraffe), "dinossauro" (dinosaur), "coisa muito enorme" (very enormous thing), "vaporzãozãozão" (very big steam) (with repetition of the suffix -ão), "floquinho" (little flopo) (phonological similarity), "muntu" (nonce word), and "vulcão" (volcano). We can see that all these response are related with the idea of "very big", except for "floquinho", which is in the diminutive form.
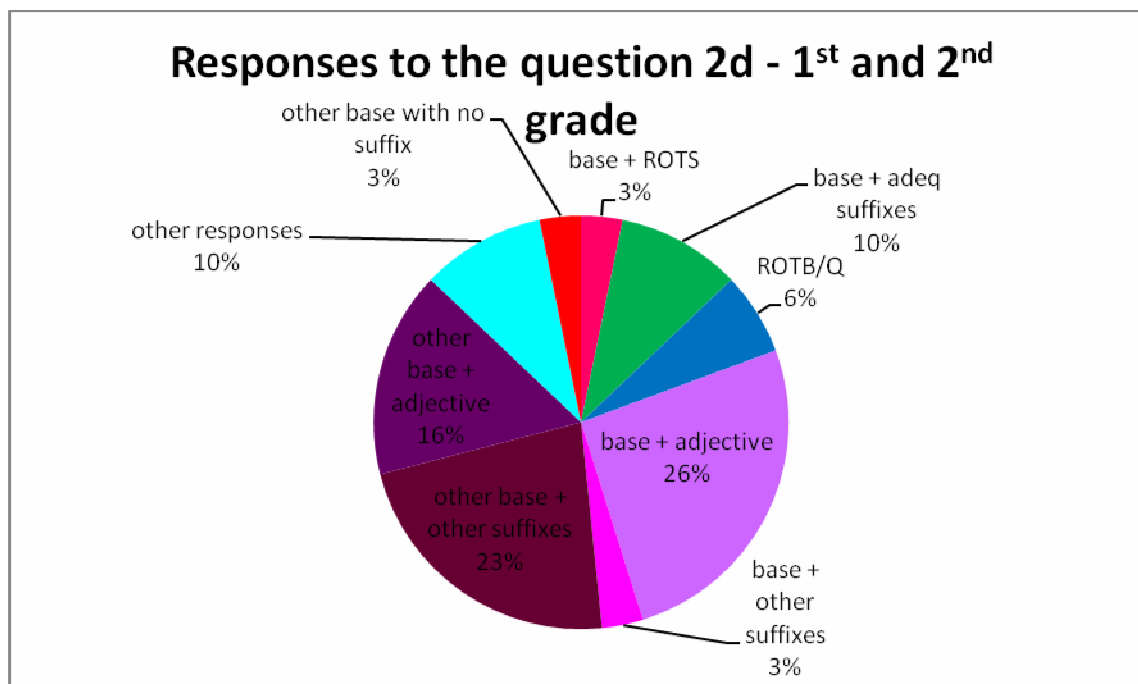
Figure 54: Responses to the question 2d – 1st and 2nd grades

To this question, "a very big *segor* is a", only 13% children provided an adequate response: One of them used the repetition of the suffix –ão with the base *segor* and the others used the base with the suffix -ão. No child used the suffix –aço, used by adults. The most frequent response for 2nd graders was "*segor* gigante". There were two adequate responses, with the suffix –ão, used with the linking consonant –ç- and with repetition. Apart from these responses, there were repetitions of the base and of the question. The other responses were: "Mundo" (world), "pêssego muito grande" (very big peach) (phonological similarity), and "caixa" (box).

For the 1st grade a great variability of responses was verifiable. However, only one response was considered adequate: -Ão (with the linking consonant –z-). The other responses were: "*Segor* gigante" (giant *segor*), "*segor* enorme" (enormous *segor*), "grandão *segor*" (very big *segor*), "*segor* bem grande" (very big *segor*), "*segorzinho*" (little *segor*), "rato muito, muito gigante" (very, very giant mouse), "girafa muito grande" (very big giraffe), "gigante" (giant), "prédio" (building), "doença muito forte" (very strong disease), "grande" (big), "dinossauro" (dinosaur), "girafa" (giraffe), "céu" (sky), "planeta" (planet) and "homem gigantesco" (gigantic man). All responses are related to big-size referents.
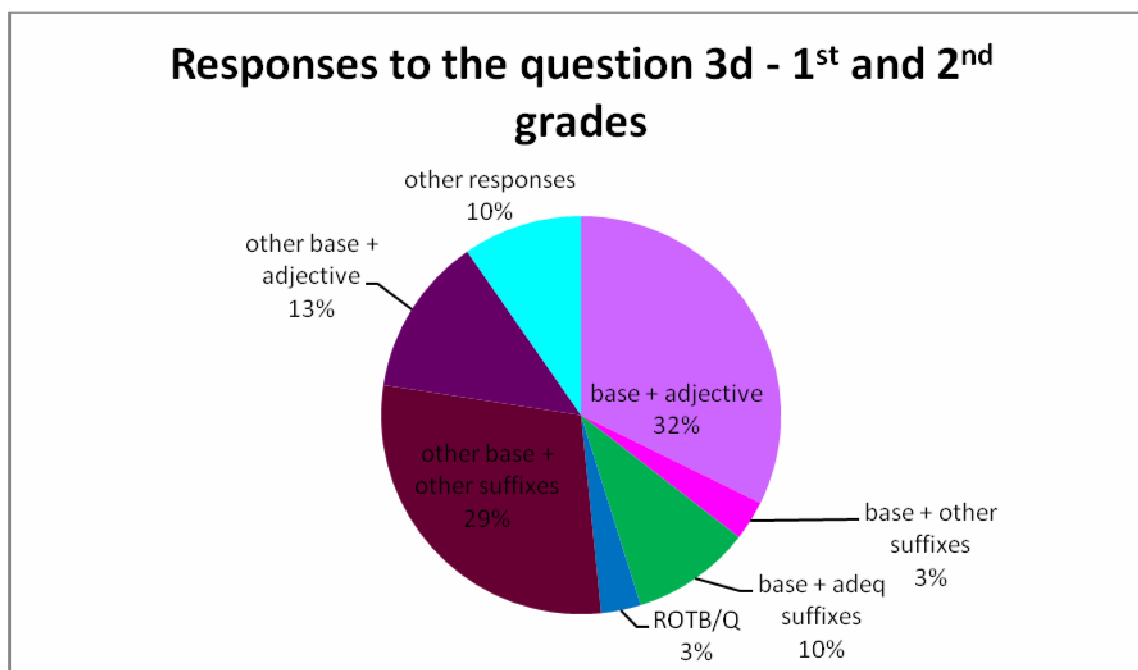
**Responses to the question 3d - 1ˢᵗ and 2ⁿᵈ grades**



Figure 55: Responses to the question 3d – 1ˢᵗ and 2ⁿᵈ grades

To this question, "a very big *mafata* is a" only 10% of the children gave an adequate responses, applying the suffix –ona (female form of the suffix –ão) to the base *mafata*. The most frequent response for 2ⁿᵈ grade was "*mafata* gigante" (giant *mafata*). There were repetition of the base and repetition of the question. The other responses for 2ⁿᵈ grade were: "Pessoa" (person), "faca muito grande" (very big knife), and "árvore" (tree). For 1ˢᵗ grade they were: "*Mafata* gigante" (giant *mafata*) (the most frequent among the responses that used the base *mafata*), "*mafata* enorme" (enormous *mafata*), "grandona *mafata*" (very big *mafata*), "*mafata* infinita" (infinite *mafata*), "*mafatinha*" (little *mafata*) "cadeira" (chair), "coelho grande demais" (too big a rabbit), "mundo" (world), "casa" (house), "toalha bem grande" (very big towel), "fatia bem grande, bem grandona" (very big slice), "grande" (big), "elefanta" (elephant), "gigante" (giant), "dinossauro" (dinosaur), "espaço sideral" (sidereal space), and "espaço" (space). Almost all responses are related to the idea of "very big", which may indicate that children understood the question, but were not able to apply a suffix to the base *mafata* or just chose not do it.

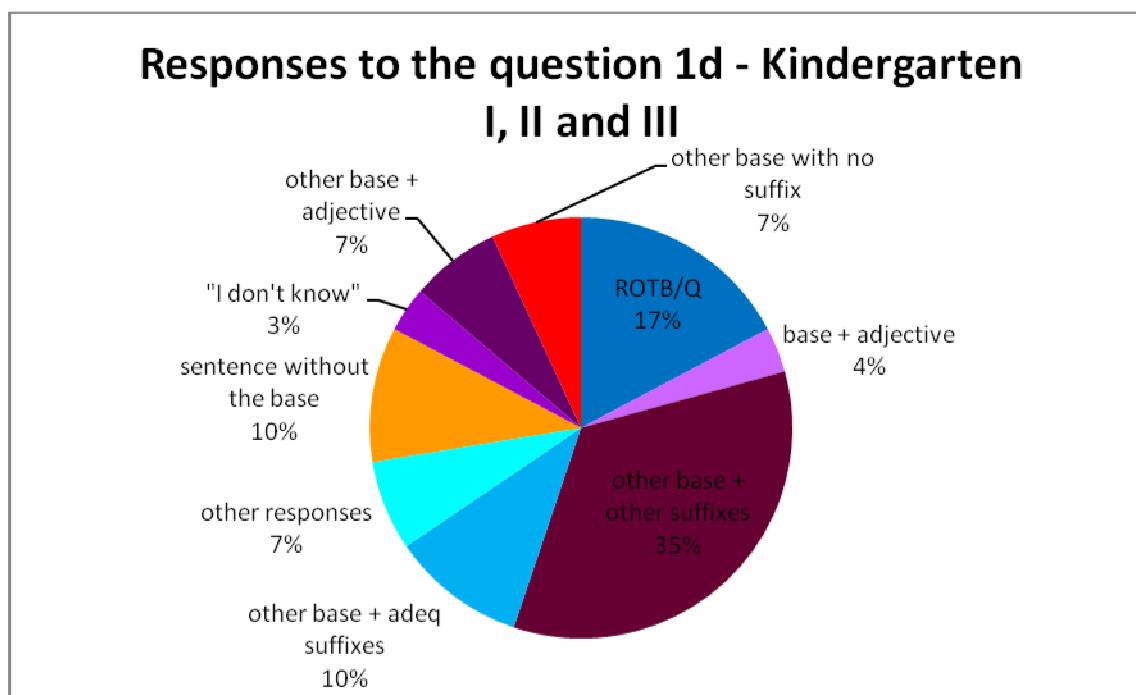Let's inspect the results for Kindergarten to question D.

Figure 56: Responses to the question 1d – Kindergarten I, II and III

No child in Kindergarten I, II or III provided an adequate suffix to the question 1d, which is "a very big *flopo* is a". This may indicate that neither the recourse of repetition of the suffix –ão is available yet for children of this age. 5 out of 29 children repeated the base or the question and the other responses were: "Cabeça" (head), "bandeja" (tray), "floco muito grande" (very big flake) (phonological similarity), "sementão" (big seed), "grandão" (very big), "flocão gigante" (giant big flake), "flor" (flower), "mais maior" (more biggest), "gigantesco" (gigantic), "flopo grande grandão" (big very big flopo) and another one said "flopo médio" (mean flopo), "nave" (ship), "médio" (mean), "girafa" (giraffe), "grandão" (very big), "muito grande" (very big), "gato" (cat), "pequeno" (small), "montanha" (mountain), "flopo grande" (big flopo), "peixe" (fish), "formiga" (ant), and 3 full sentences. One child said that s/he did not know the answer. These responses either tried to take into account the supposed content of the word *flopo* or were related to the idea of "very big".
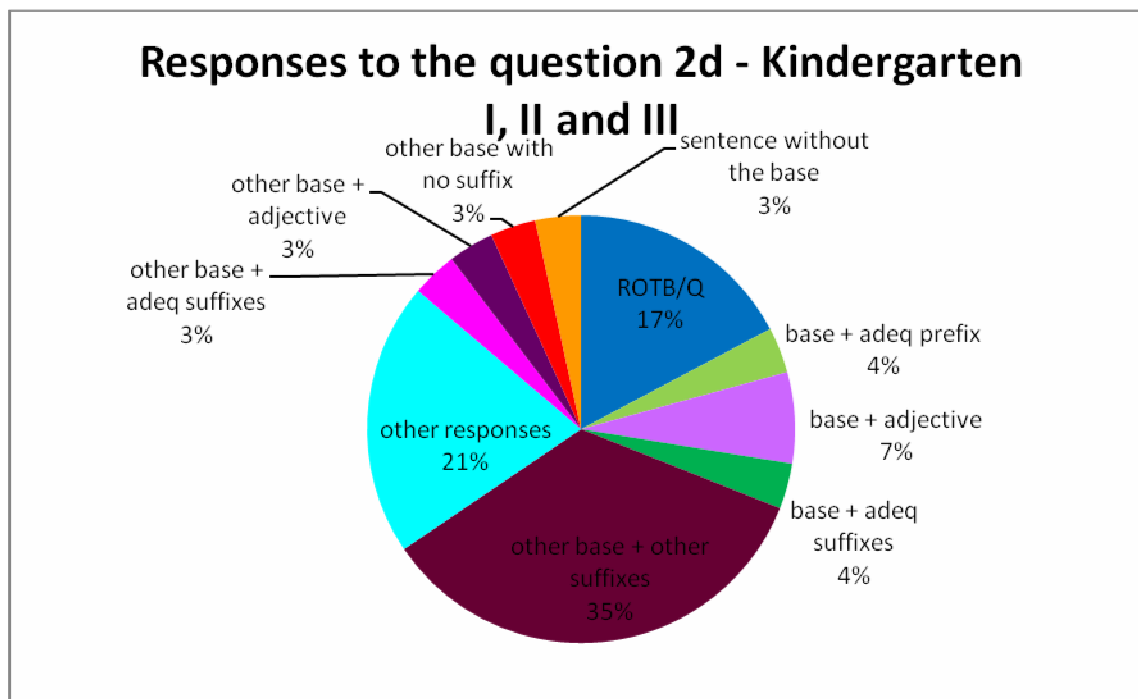
Figure 57: Responses to the question 2d – Kindergarten I, II and III

To the question 2d, "a very big *segor* is a", 2 (out of 29) responses were considered adequate, and they used the suffix –ão. For Kindergarten II 2 children repeated the base and other 2 said "*segor* gigante" (giant *segor*). The other responses were: "Cabeça"[72] (head), "bandeja"[73] (tray), "o tamanho do mundo" (the size of the world), "muito mais grande" (more, more big), "flor" (flower), and "mais maior"[74] (more biggest). For Kindergarten II the response were: "Segor médio" (average segor), "gigante" (giant), "médio" (mean), "grandão" (very big), "mato" (jungle), "blocão" (big block), "grande" (big), "cachorro" (dog), "pequeno" (small), "árvore" (tree), and a full sentence. Each child gave a different response. For Kindergarten I the responses were: "*Segor* muito, muito grande" (very, very big *segor*), "nave" (ship), "mesa" (table), "boca" (mouth), "seplor gigante" (coined word, no translation), and a full sentence.

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[72] This response was also given to question 1d by the same child.
[73] This response was also given to question 1d by the same child.
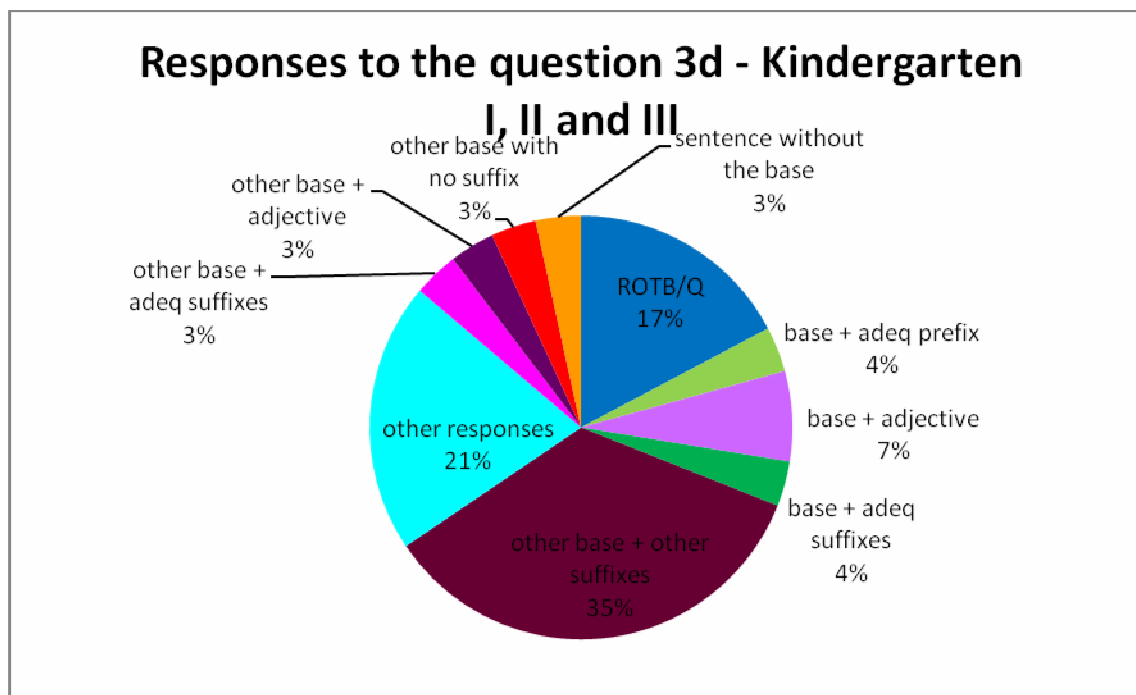[74] This response was also given to question 1d by the same child.

Figure 58: Responses to the question 3d – Kindergarten I, II and III

To this question, "a very big *mafata* is a", only 2 responses, from Kindergarten III, were considered adequate because they used the augmentative suffix –ona and the prefix mega-. In the Kindergarten III each child gave a different response. Apart the adequate responses, children produced: "*Fata* gigante" (giant *fata*) (without the first syllable of the nonce word *mafata*), "cabeça" (head), "banquinho" (little bank), "do tamanho do mudo"[75] (the size of the world), "grandalhão" (very big), "trabalhador" (workman), "mais maior" (more biggest), and "gigante" (giant). For Kindergarten II 2 children repeated the question and the other responses were: "Boca gigante" (giant mouth), "médio" (mean), "colchão" (mattress), "grandona" (very big), "grande" (big), "gata" (cat), "pequena" (small), "montanha" (mountain), and a full sentence. For Kindergarten I the responses were: "*Mafata* muito, muito grande" (very, very big *mafata*), "nave" (ship), "mesa" (table), "boca" (mouth), "*seplor* gigante" (nonce word, no translation) and one child said that s/he did not know the answer.

Grouping the responses to the questions A, B, C, D, E and F related to the three bases (*flopo*, *segor* and *mafata*), we can examine children performance and notice differences between the questions, analyzing if one was more difficult or which one was easier for children. The following figures show the quantity of adequate and inadequate responses for all questions, for each group: 3rd and 4th grades, 1st and 2nd grades and Kindergarten I, II and

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[75] This response was also given to question 2d by the same child.

III. For the 3$^{rd}$ and the 4$^{th}$ grades there were 72 responses, for the 1$^{st}$ and the 2$^{nd}$ grades there were 93 and for the Kindergarten I, II and III there were 87.
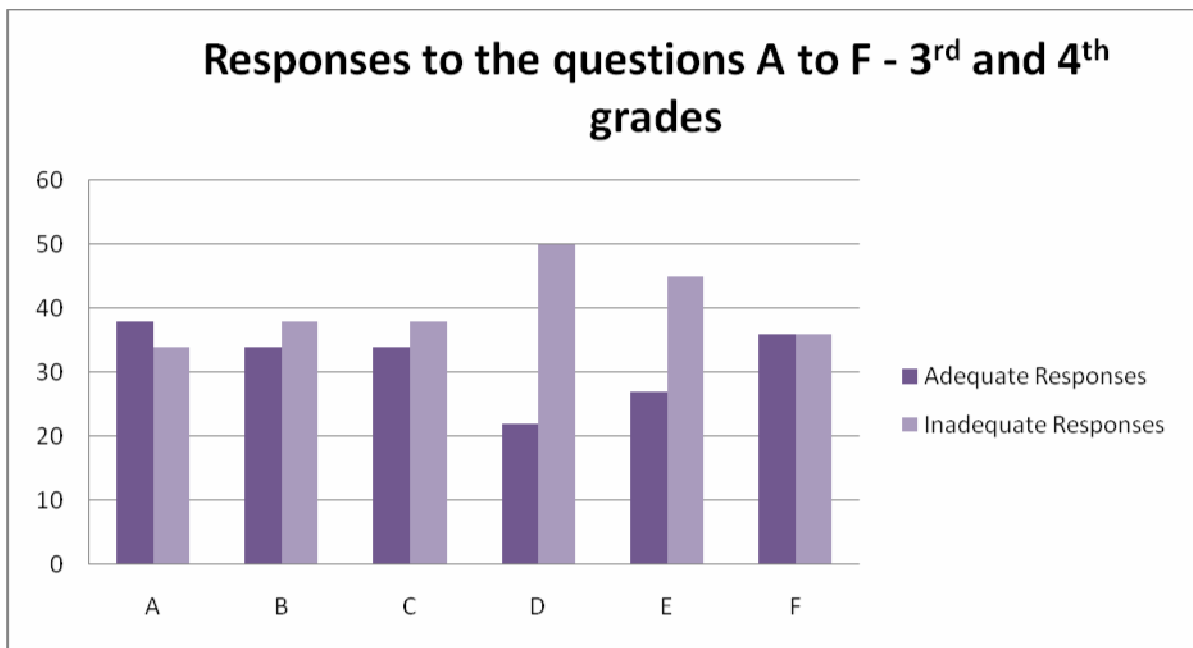


Figure 59: Responses to the questions A to F – 3$^{rd}$ and 4$^{th}$ grades

Figure 59 illustrates the performance for the 3$^{rd}$ and the 4$^{th}$ grades on all questions. We can notice that there is a balance between adequate and inadequate responses and that the performance is similar in almost all questions, except for questions D (a very big *flopo*, *segor* or *mafata* is a) and E (a place full of *flopo*, *segor* or *mafata* is a) in which there were more inadequate responses. For this group it seems that question D was more difficult because it presented the worse performance, with the highest quantity of inadequate responses. Children presented a good performance on all the other questions but only question A (a person who works with *flopo*, *segor* or *mafata* is a) showed more adequate than inadequate responses. This may point that the question A was the easiest one for the 3$^{rd}$ and the 4$^{th}$ grades.
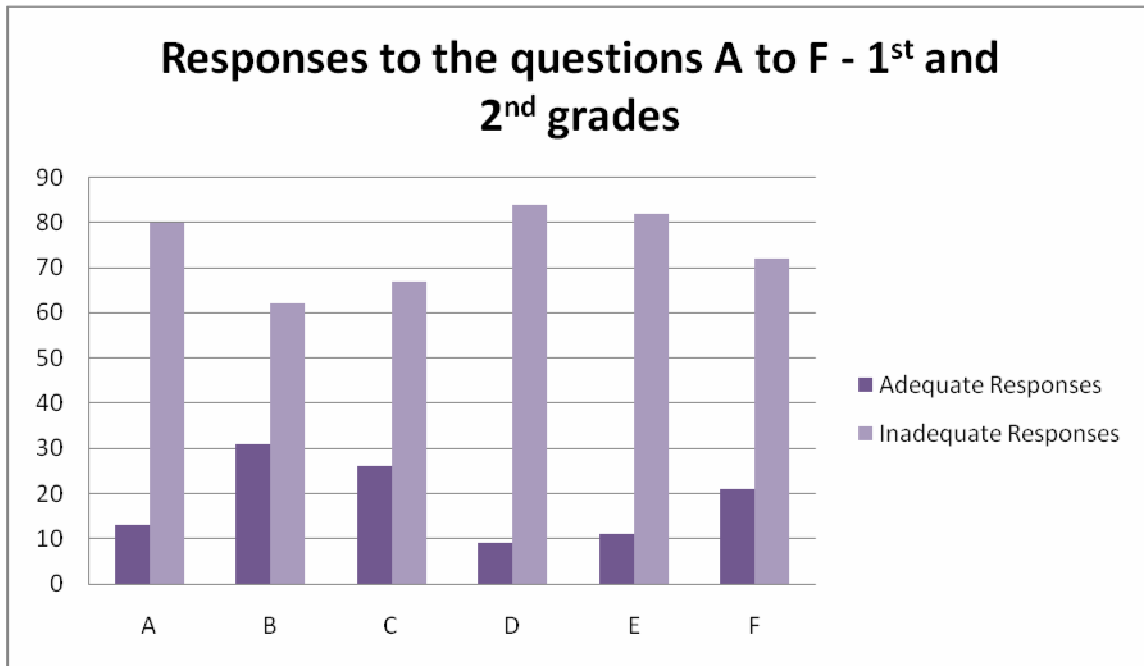
Figure 60: Responses to the questions A to F – 1st and 2nd grades

This group provided less adequate responses than the 3rd and the 4th grades. In all questions there were a higher amount of inadequate responses. For the 1st and the 2nd grades it seems that the questions D and E were the more difficult ones because children presented the lowest amount of adequate responses. Apparently, the best performance was in the question B (a small *flopo*, *segor* or *mafata* is a), which shows the highest amount of adequate responses, followed by the question C (a big *flopo*, *segor* or *mafata* is a) and F (a person full of *flopo*, *segor* or *mafata* is).
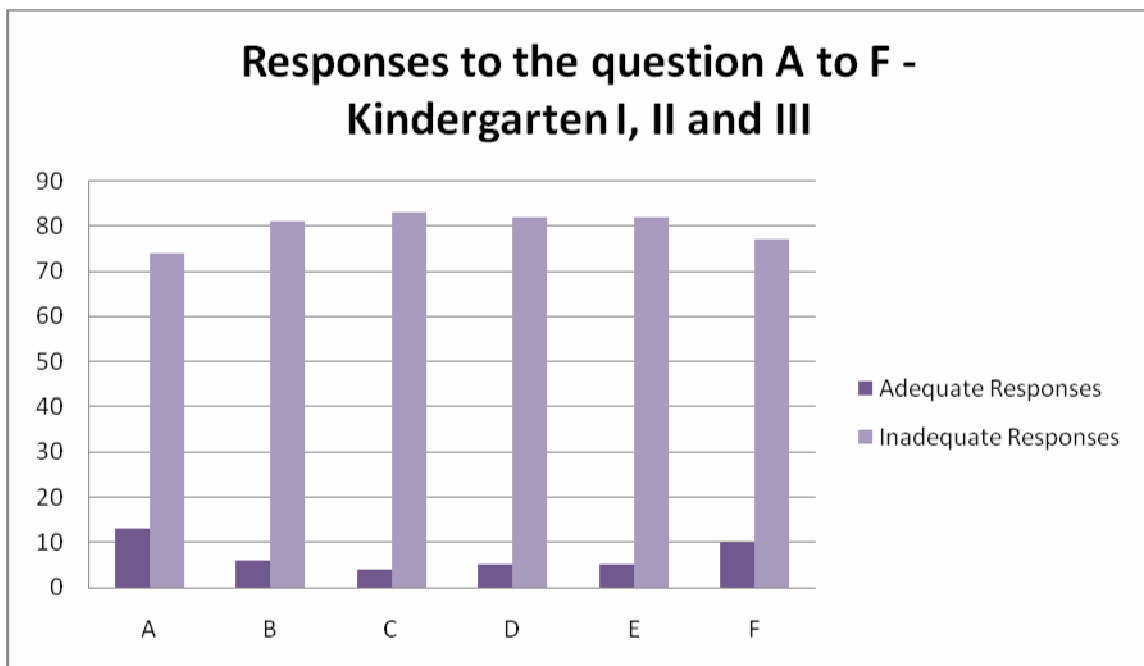


Figure 61: Responses to the questions A to F – Kindergarten I, II and III

The Kindergarten I, II and III presented even less adequate responses than the 1<sup>st</sup> and the 2<sup>nd</sup> grades. The majority of adequate responses is due to the Kindergarten III performance because Kindergarten I and II did not present adequate responses to most of the questions. The best performance was on the question A (a person who works with *flopo*, *segor* or *mafata* is a), followed by performance on the question F (a person full of *flopo*, *segor* or *mafata* is).

Summing up, apparently the questions A, B and F were the easiest ones and the questions D and E were the most difficult for children. The question C was easy for the 1<sup>st</sup> and the 2<sup>nd</sup> grades, but it was difficult for the Kindergarten. A and F were the easiest questions for the first and the third groups and B and C were the easiest for the second group. All groups presented a good performed on question F.

To check if children produce the same suffixes that adults do the following figures show the most frequent suffixes (among the adequate responses) for adults and for children in the questions A, B, C, D, E and F . It is important to remember that Kindergarten I, II and III presented few adequate responses. The figures show the results in percentage because this is the only way to compare the response for all groups, since the groups exhibit different amount of subjects. The quantity of adequate responses varies according to the performance in each question.

Let's examine the results for question A (a person who works with *flopo*, *segor* or *mafata* is a).
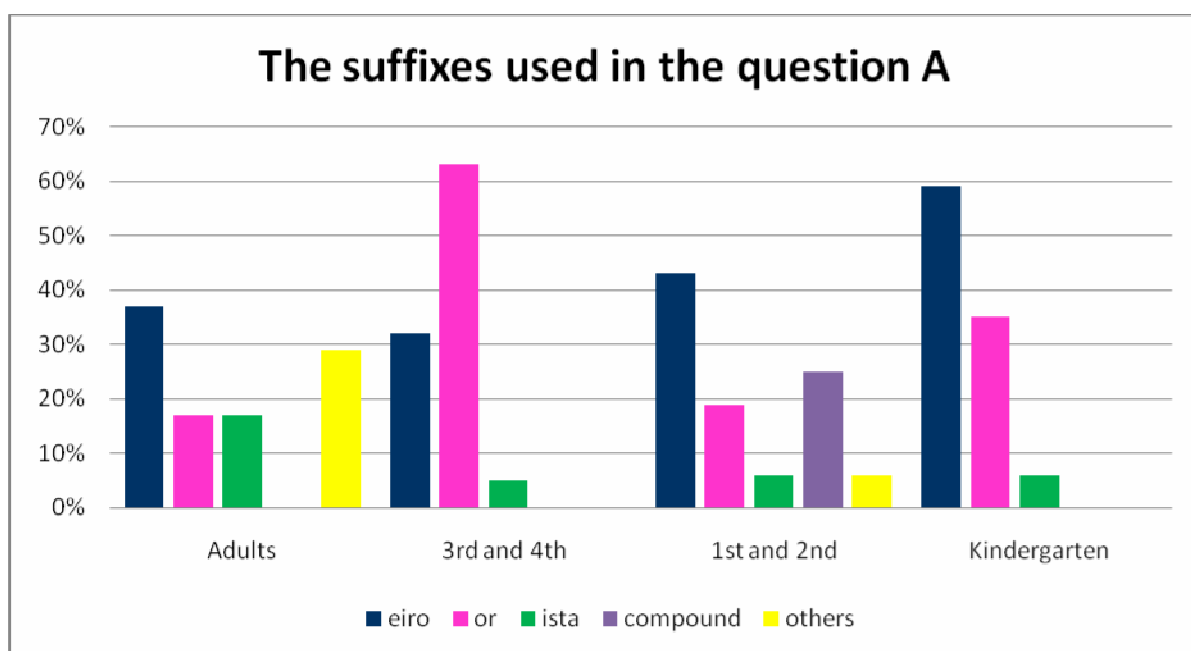


Figure 62: The suffixes used in the question A

The Figure 62 illustrate the percentage of use of several suffixes in the adequate responses provided by adults, 3$^{rd}$ and 4$^{th}$ graders, 1$^{st}$ and 2$^{nd}$ grades and Kindergarten children. The most frequent suffixes were –eiro, -or, -ista – Portuguese agentive suffixes. Compounds were frequent for the 1$^{st}$ and the 2$^{nd}$ grades, so they were included in the figure and I added "others" to include other kinds of adequate responses that exhibit few occurrences. All groups presented high percentage of use of the suffix –eiro to answer the question. This may indicate that to this question children show the same preference in comparison to adults. This may also point out that the suffix –eiro is the most productive agentive suffix. For the 3$^{rd}$ and the 4$^{th}$ grades the most frequent suffix was –or, but the second most frequent was the same used by adults. Adults as much as the 3$^{rd}$ and the 4$^{th}$ grades and the Kindergarten did not use compounds. However, for the 1$^{st}$ and the 2$^{nd}$ grades this was the second most frequent response. Adults provided a great amount of other responses, using other adequate agentive suffixes to answer this question. They also showed the same quantity of use of the suffixes – or and –ista. Children used the suffix –ista few times.

Let's check the results for the question B (a small *flopo*, *segor* or *mafata* is a).

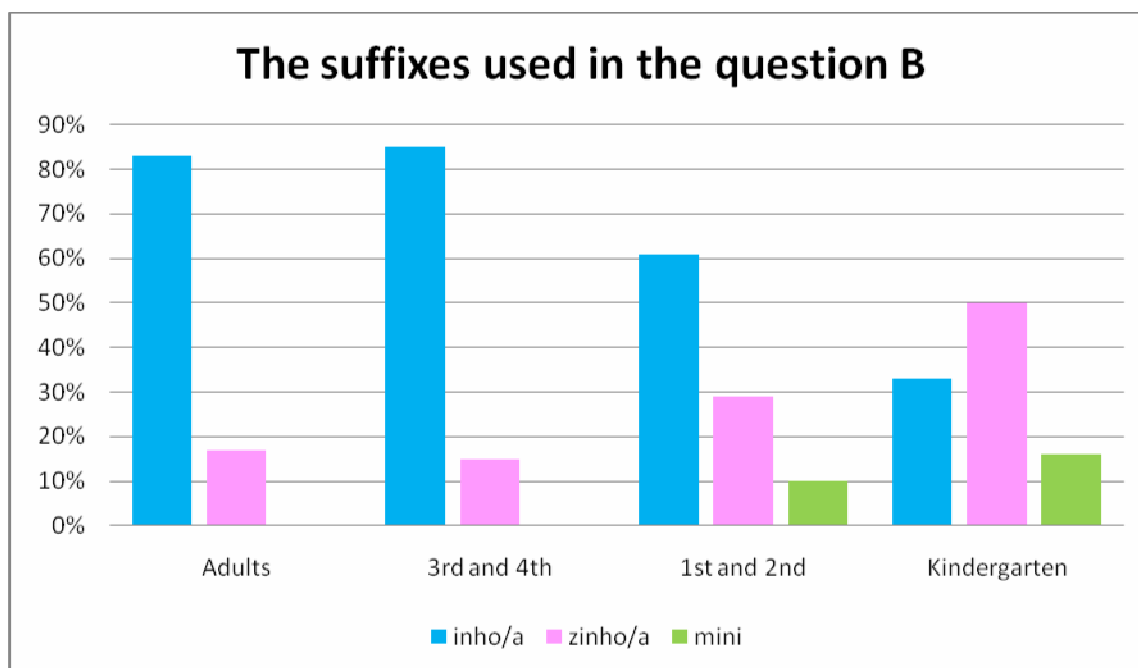

Figure 63: The suffixes used in the question B

The only suffix used by adults and by children to answer the question B was –inho (and its allomorphs). There is no doubt that, according to this data, this is the productive diminutive suffix in Portuguese. To create a figure that show the groups' performance, I compared the results for the suffixes –inho, -zinho and the only used prefix mini-.

The percentage of use of the suffix –zinho was lower than the percentage for -inho, as expected, since it was supposed to be used just with the base *segor*, which ends with a consonant. As Kindergarten provided more adequate responses to the question with the base *segor*, the allomorph –zinho exhibited the highest percentage. The suffix –inho presents the highest percentage of use among all adequate responses to all questions, reaching 80% of use for adults and for the 3$^{rd}$ and the 4$^{th}$ grades. Just few children in the 1$^{st}$ and the 2$^{nd}$ grades and in the Kindergarten used the prefix mini-.

The following figure shows the results for the question C (a big *flopo*, *segor* or *mafata* is a).
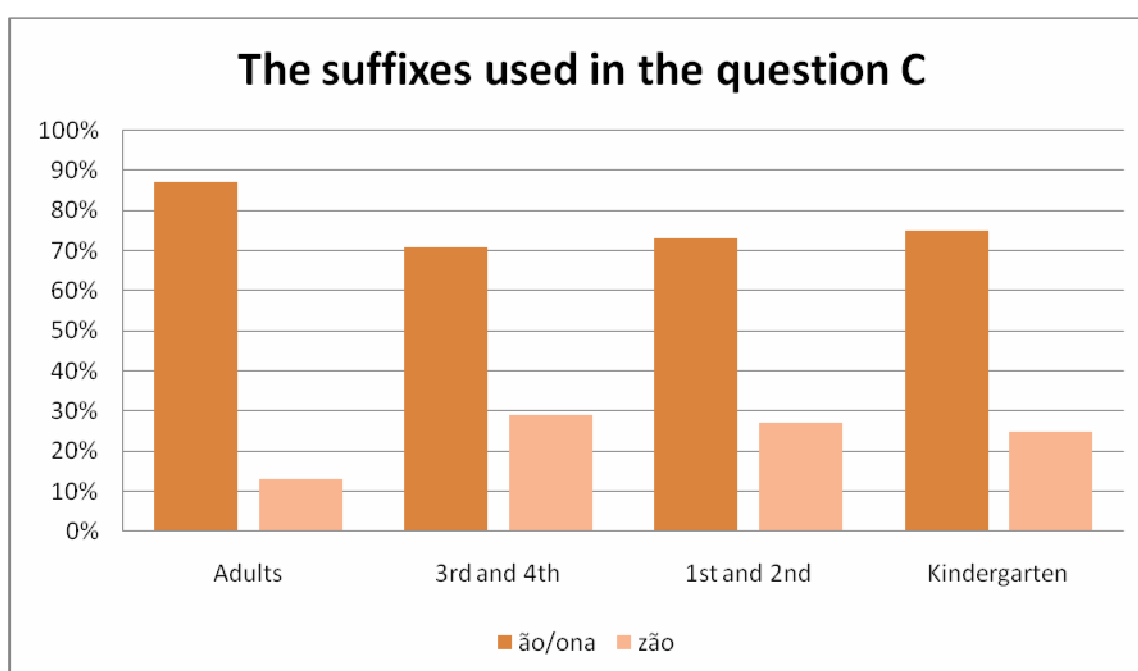


Figure 64: The suffixes used in the question C

Only the suffix –ão, its female form -ona (and its allomorphs) were used to answer the question C. The suffix –ão also reached high percentages of use for all groups. It was, with –inho, the the suffix which showed the highest percentage of use among the adequate suffixes. The allomorph –zão, as the allomorph –zinho, was expected only to the question related to the base *segor*. Because of this, it presented the lowest percentage for all groups. All groups showed the same preference as adults to this question and all of them exhibited high percentages of use of the suffixes –ão and –ona. It is important to highlight that this was the most difficult question for Kindergarten and although there is a high percentage of use, there were few adequate responses to this question.

Let's examine the suffixes used in adequate responses to the question D (a very big *flopo*, *segor* or *mafata* is a).
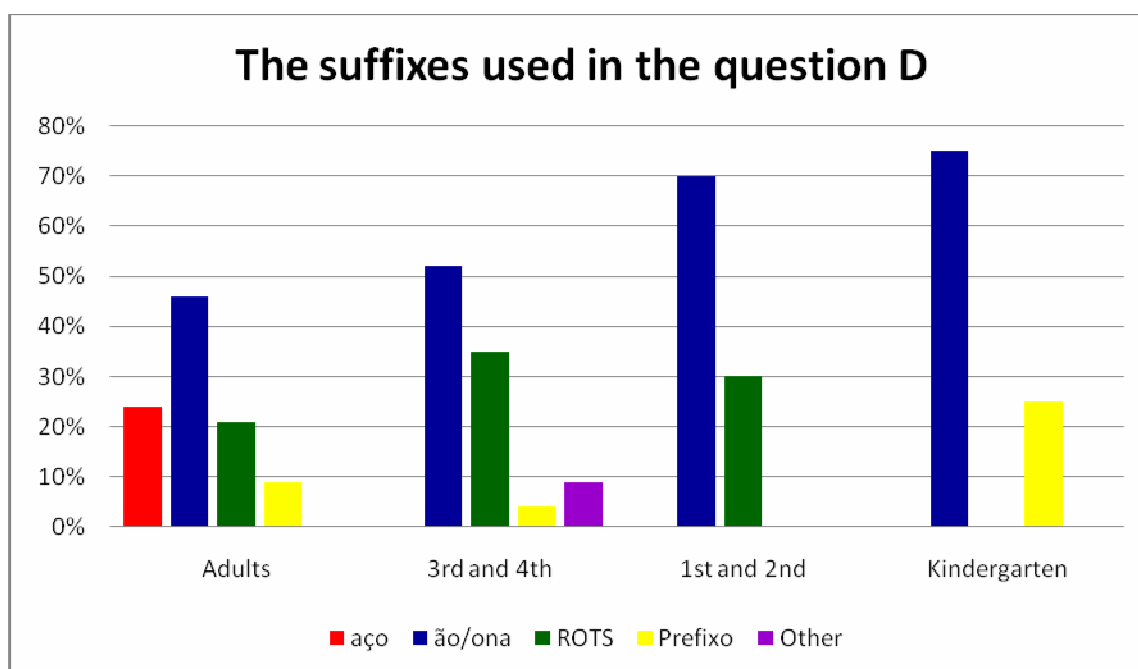


Figure 65: The suffixes used in the question D

The responses to the question D showed interesting results. When I invented the questions for the Test 1, I hypothesized that this question would be difficult for children, and the intention was to check if children would identify a suffix like –aço as a productive one to answer this kind of question. Adults used the suffix –aço, but the most frequent suffix was –ão/ona, the same used to refer to "a big *flopo*, *segor* or *mafata*". Another hypothesis was that adults as much as children would use prefixes like hiper-, super- or mega- to construct a response. This resource was not much used. The suffix –ão or the female form –ona were the most used by all groups and the percentage of use of this suffix increased from adults to Kindergarten. It is important to remember that this was the most difficult question for all children groups. An interesting resource was discovered in the responses: the repetition of the suffix –ão (like in *flopãozão*). It is possible to interpret this use as if they tried to add intensity in the augmentative meaning of the question, increasing the quantity of suffixes, instead of searching for only one suffix to express the idea of "very big". I hypothesize that using the suffix once indicates that something is big, but using the suffix twice or three times indicates that something is more than just big, it is very big. This resource was used more times by the $3^{rd}$ and the $4^{th}$ grades and by the $1^{st}$ and the $2^{nd}$ grades. Prefixes were used by adults, the $3^{rd}$ and the $4^{th}$ grades and the Kindergarten, but not too many times. Only the $3^{rd}$ and the $4^{th}$

grades presented other responses. For this question, we can notice that children showed the same preference as adults, but they did not use the suffix –aço, which was the second most frequent among the adult's adequate responses.

The following figure inspect the responses to the question E (a place full of *flopo*, *segor* and *mafata* is a).
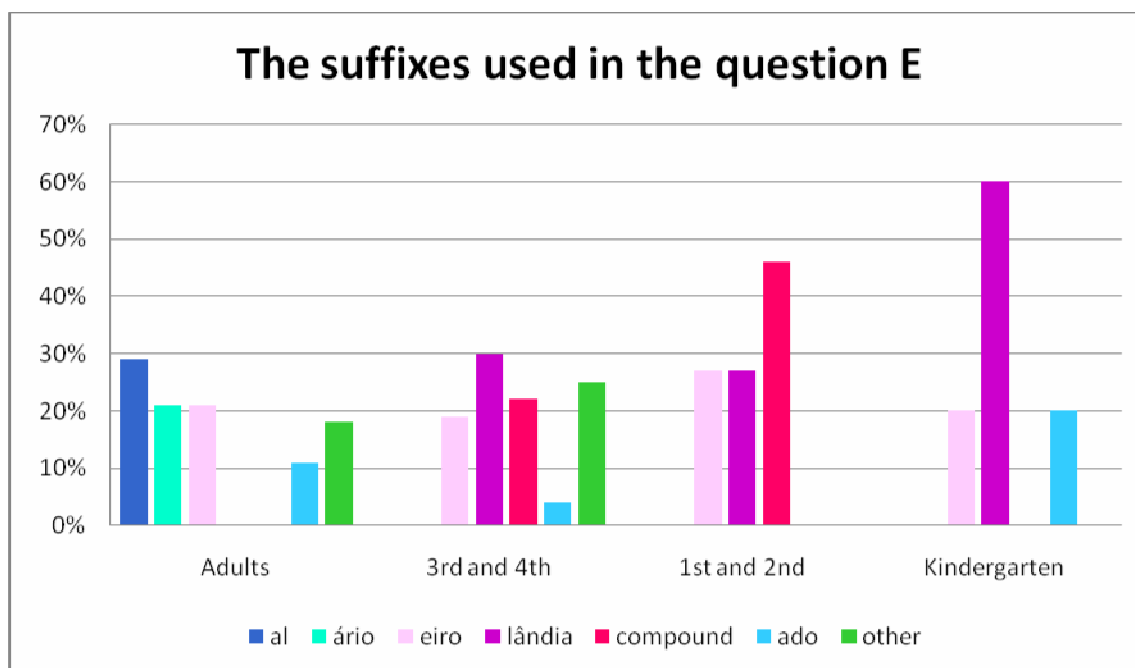


Figure 66: The suffixes used in the question E

A great variability of responses was used to answer the question E. In this question adults' preference was not the same as children's preference. The suffix –al was the most frequent among the adequate responses provided by adults, while for children there are different preferences. The 3rd and 4th grades the Kindergarten preferred the suffix –lândia, while the 1st and the 2nd grade preferred compounds. In addition, the suffix –eiro was the only used by all groups. Children used the suffix –lândia frequently while adults did not use it at all. Compounds were used by 3rd and 4th graders and by 1st and 2nd graders. The suffix –ado was used by all groups except for the 1st and the 2nd grades. In terms of productivity, it seems that there are different results for adults and for children, since the former presented –al, -ário and –eiro as most productive ones and the children presented –lândia, -eiro and compounds as most productive ones.

To conclude the examination of the most frequent suffixes in Test 1, let's check the results to the question F (a person full of *flopo*, *segor* or *mafata* is).
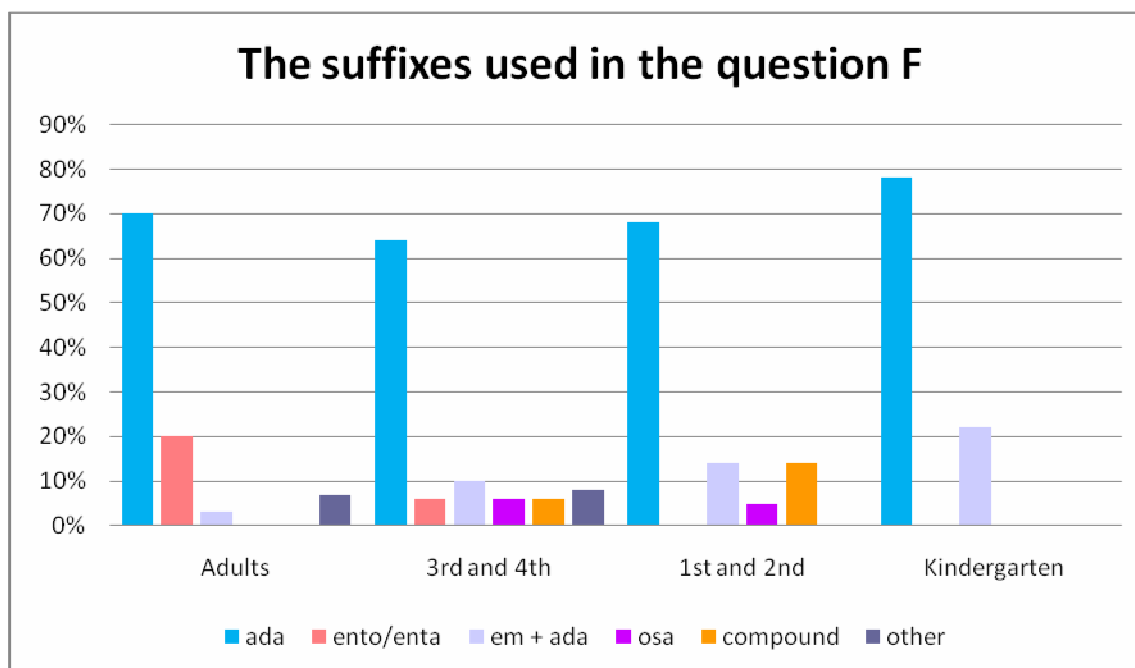
Figure 67: The suffixes used in the question F

To this question a great variability is noticeable as well. However a common preference is easily identifiable: The suffix –ada. This suffix presented high percentage of use, reaching more than 60% in all groups. Moreover this may indicate that to construct adjectives Brazilian Portuguese speakers choose the suffix –ada. This is only a trend since I have few data to state that this is really the most productive suffix. All the other adjectival suffixes showed low percentages of use.

The responses for the questions A to F show interesting points:

- For question A (a person who works with *flopo*, *segor* and *mafata* is a)

  o Children used the suffix –eiro, which was the most frequent in adults' responses, but they also used the suffix –or frequently;

  o The word "trabalhador" (workman) appeared several times among the inadequate responses. This may indicate that children applied a right suffix, -or- to the verb of the question ("a person who works (trabalha) with *flopo*, *segor* or *mafata* is a").

- For question B (a small *flopo*, *segor* or *mafata* is a)

  o The most frequent response was the suffix –inho for adults and for children;

- o Augmentative forms appeared several times. I believe that children wanted to play with words, since I said that we would play a game of coining words, providing opposite responses.

- For question C (a big *flopo*, *segor* or *mafata* is a)

    - o The unanimous response was the suffix –ão for adults and for children;

    - o Diminutive forms appeared several times. The reason should be the same one for the appearance of augmentative forms in question B.

- For question D (a very big *flopo*, *segor* or *mafata* is a)

    - o The noun "gigante" appeared several times in response to question D. In the lack of an adequate suffix, children chosen a word, which may be an adjective or a substantive that represent the idea of "very big".

- For question E (a place full of *flopo*, *segor* or *mafata* is a)

    - o Adults and children showed different preferences;

    - o This question showed the greatest variability of responses, with no common preference;

    - o The expression "lugar cheio de N[76]" (place full of N) appeared several times. This may indicate that children are taking into account the supposed content of the nonce word.

- For question F (a person full of *flopo*, *segor* or *mafata* is)

    - o Children showed the same preference as adults, using the suffix –ada;

    - o The word "doente" (sick) appeared several times as a response to this question. This may indicate that children think that when a person is full of what they think that *flopo*, *segor* and *mafata* are, she is not well. In other words, the nonce words may have a negative connotation.

- The linking consonants were more frequently used with the nonce word *segor*, which ends with a consonant, as expected.

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[76] N = noun.

- According to the results of these tests, the relationship between morphology and phonology is strong. Several times children's answer s were influenced by phonological similarities, especially with the nonce word *flopo*, to which I believe it was easier to find similar words.

- There is no age effect for phonological similarity. It happened in every group.

It is important to remember that a detailed discussion about productivity is not the aim of this thesis. The important point provided by the survey of suffixes is to check if children are capable of providing adequate responses and of working with nonce words and the application of morphological resources. This analysis showed that children from Kindergarten III to the 4th grade (5:3 to 10:11) are in fact capable of working with the resources of the morphology derivation of Portuguese and of applying them to nonce words. The youngest groups did not show the same performance.

Now I present the results for Test 2.

### 4.2.2 Test 2

This test deals with the extraction of the base from derived words and with inflection of verbal forms. The following table shows the quantity and the percentage of adequate response for children of all groups. The first group, 3rd and 4th grades, presented 24 responses, the second groups, 1st and 2nd grades, 31, and the third group, Kindergarten I, II and III, 29. Due to the formulation of the test, each dhild provide one response to each question. It is important to highlight three points: (i) this test is more difficult than Test 1 (except for the verbal inflection part), (ii) according to Carlisle (2000), extracting the base is more difficult than derivating words, and (iii) some adults did not provide adequate responses to all questions on this test. Adequate responses were those in which children extracted the bases *zoque* and *plomo* on the first 7 questions and the base *mila* on the last question. Moreover those responses in which children were able to inflect verbal forms on the last questions (related to *mila*, *chugue*, *ferte*) were considered adequate. Inadequate responses were those in which other bases were provided, those in which there were no extraction of any base or those which consist in incorrect derived verbal forms (in the inflection part).

Table 7 – Quantity and percentage of adequate responses to Test 2

| | 3rd and 4th grades (N=24) | 1st and 2nd grades (N=31) | Kindergarten I, II, III (N=29) |
|---|---|---|---|
| Zoquinho | 5 (21%) | 8 (26%) | 4 (14%) |
| Zocão | 5 (21%) | 8 (26%) | 4 (14%) |
| Zocaria | 7 (29%) | 7 (23%) | 0 |
| Enzocada | 5 (21%) | 8 (26%) | 2 (7%) |
| Plominho | 4 (17%) | 8 (26%) | 1 (3%) |
| Plomão | 5 (21%) | 8 (26%) | 2 (7%) |
| Plomista | 4 (17%) | 5 (16%) | 1 (3%) |
| Mila | 21 (88%) | 22 (71%) | 18 (62%) |
| Chugue | 16 (67%) | 19 (61%) | 14 (48%) |
| Ferte | 16 (67%) | 14 (45%) | 5 (17%) |
| Milante | 3 (13%) | 3 (10%) | 1 (3%) |

This test may be divided in two parts: extraction of the base and verbal inflection. The results for these two parts, as we can see in Table 7, is very different. The questions about the words *zoquinho*, *zocão*, *zocaria*, *enzocada*, *plominho*, *plomão*, *plomista* and *milante* are related to decomposition while the questions about the words *mila*, *chugue* and *ferte* are related to inflection. This may explain the high percentages related to these three last words. Carlisle and Nomanbhoy (1993) state that children present a better performance on inflection than on derivation. These data are suggestive of a similar conclusion.

Analysing the part related to derivation, we can conclude that, although the quantity is not high, children in all groups are able to work with the extraction of the base in nonce words derivation, showing a similar result for all questions.

Analysing the part related to inflection, children presented a much better performance. In the inflection of the verbal forms *mila* and *chugue*, children in all groups were able to show a good performance. Kindergarten III presented a better performance than the 1st grade in this test, although this is not true for Test 1. Moreover there is an increasing in the percentage of adequate responses from the Kindergarten I, in which one child provided adequate responses in these two items, to the 4th grade, in which almost all children provided adequate responses. The questions about *mila* and *chugue* are about past tense formation. Although the verbal form "chugue" presents a 2nd conjugation class structure and, because of this it could be irregular, children inflected it as a 1st class conjugation form, in the same way exactly they

inflected the verbal form *mila*. Some children used the verbal thematic vowel –i- ($2^{nd}$ conjugation class) in the inflected form "chugu**i**u", but most times they used the verbal thematic vowel –a- ($1^{st}$ conjugation class), like in "chug**ou**"[77]. In the formation of progressive (ing forms)[78], the results are quite similar for all groups, except for the youngest groups, that could not give adequate responses.

In Berko's results, children's best performance was with the progressive. In my results, for most of groups the performance was similar for past tense formation and for the progressive. Only the youngest groups did not perform in the same way for the progressive.

The most difficult question seems to be the last one, in which children were asked to extract the base *mila* from the nonce adjective *milante*. Few children could do this and even few adults did. Perhaps it was difficult to identify the form "mila" inside "milante" because of the change between "ə" in "mil**a**nte" and "□" in "mil**a**". None of the questions seem to be easier than the other, except for the fact that inflection is easier than decomposition.

Now let's take a look at the results for Test 3.

### 4.2.3 Test 3

Test 3 consists of questions that involve word judgment. Children were asked to say whether the words are correct or incorrect and explain why, providing a correct form. The chosen words to be judged were morphological variant forms produced in general by children between 2 and 4 years of age during the process of language acquisition. The expected result is that the youngest groups are not capable of judging if the words are correct or incorrect because they may be still producing this kind of morphological forms. There are two kind of question: The first one asked if the verbal form, inserted in a sentence, produced by a doll, is correct or incorrect[79]. The second question asked the child to explain why the verbal form is incorrect. The right reponse to the first question is that the verbal form is incorrect and the right explanation depends on each question. For the question 1, a possible explanation is "this is incorrect because the correct form is "apagar" (instead of "borrachar"). For the question 2, a possible explanation is "this is incorrect because the correct form is "usava" (instead of "usia"). For question 3, "this is incorrect because the correct form is "fiz" (instead of "fazi").

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[77] The verbal thematic vowel –a- become –o- in the $1^{st}$ person past tense forms, like in "fal**ou**" from "fal**ar**" (it spoke from to spike) and "and**ou**" from "and**ar**" (it walked from to walk).

[78] "Ndo" forms in Portuguese.

[79] The experimenter asked: If this doll (whose name was chosen by each child) said "O chinelo serveu" (the slipper fit), is this correct or incorrect?

Finally for question 4, a possible explanation is "this is incorrect because the correct form is "serviu" (instead of "serveu"). These were the expected responses. However, other responses were considered adequate if they presented another verbal form related to the morphological variant form. There is one response per child to each question. The following figures show the results for the four questions for each group and then there are figures to compare the performance between all groups.
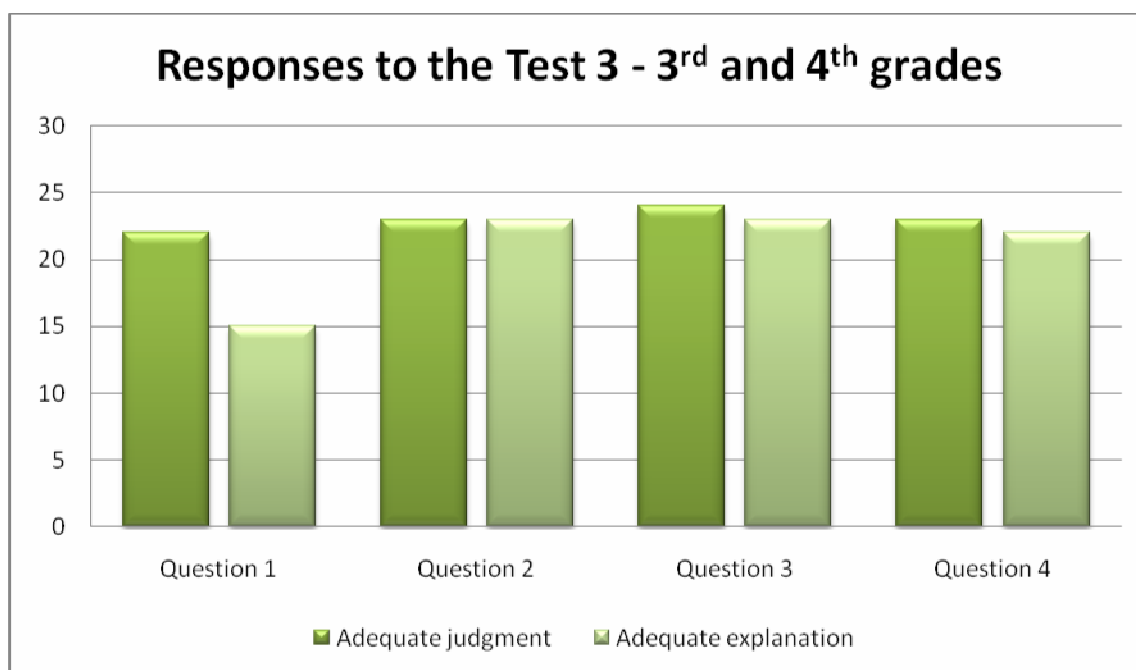


Figure 68: Responses to the Test 3 – 3rd and 4th grades

To this group N=24. It is possible to verify that the 3rd and the 4th graders were able to provide a great amount of adequate judgments and adequate explanations for all questions. This was a great performance. In the question 1 there were more adequate judgments than adequate explanations, maybe because it was more difficult to find the meaning of the nonce verbal form "borrachar". They know that this is incorrect, but some children were not able to provide the correct form "apagar".

Let's check the results for the 1st and the 2nd grades.
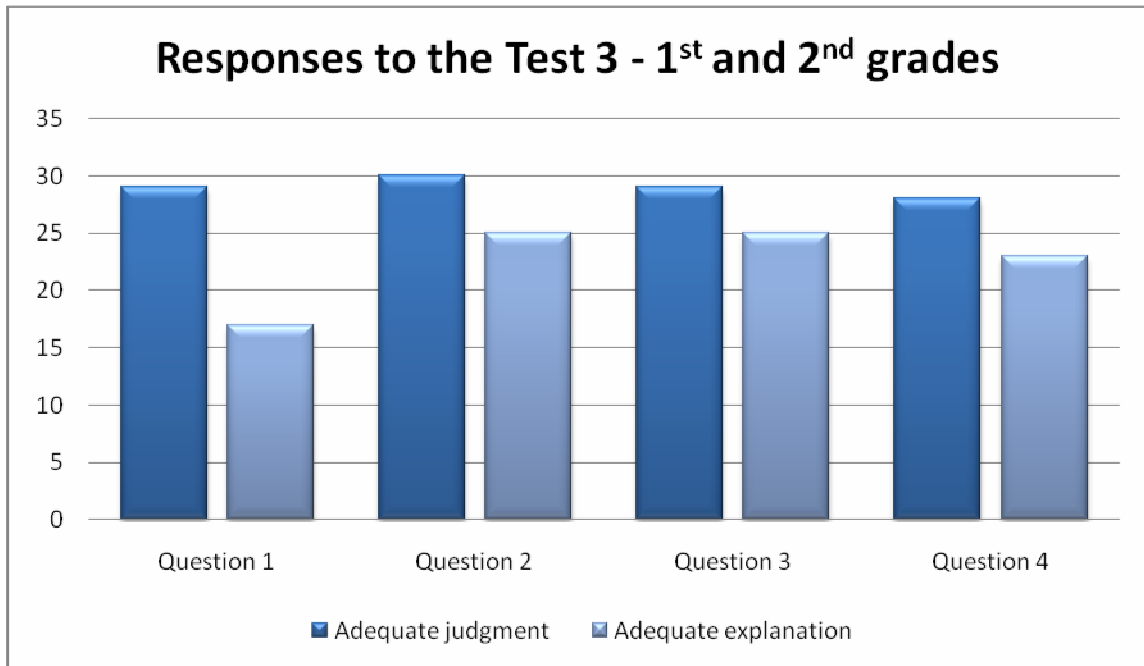
Figure 69: Responses to the Test 3 – 1st and 2nd grades

To this group N=31. A similar result to the earlier group is verified for the 1st and the 2nd grades. Children provided a great amount of adequate judgments and of adequate explanations; however the difference between adequate judgments and adequate explanations is a litte bigger than for the 3rd and the 4th grades. Again to the question 1, there are less adequate explanations than to the other questions. The 1st and the 2nd graders' performance is great in this test.

The following figure examines the responses provided by the Kindergarten I, II and III.
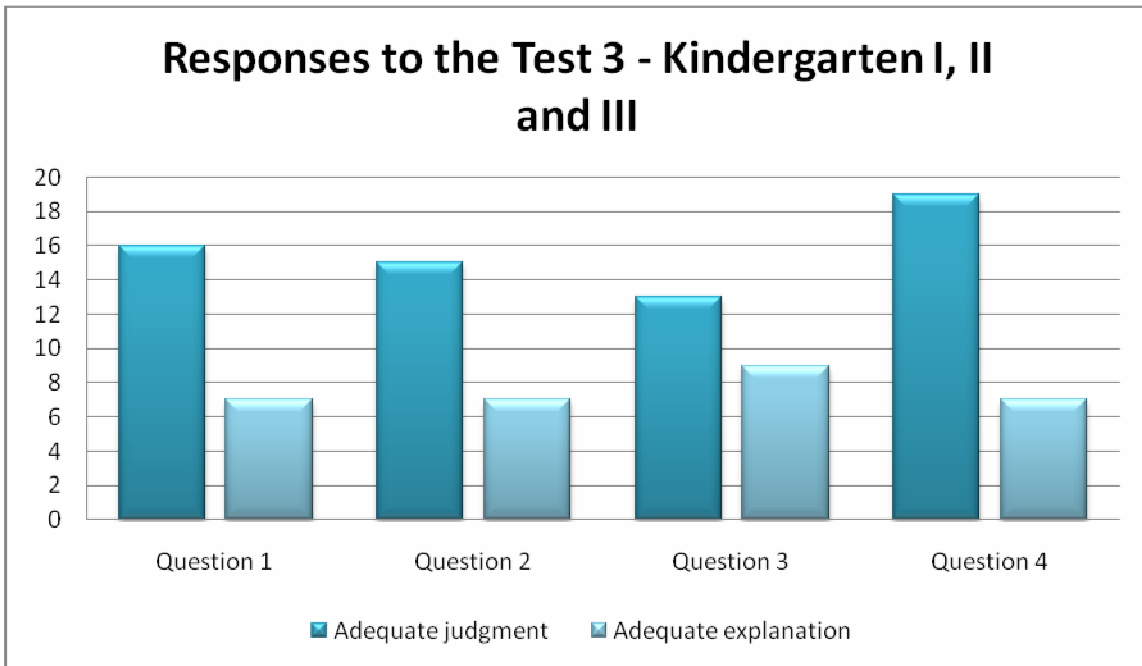
Figure 70: Responses to the Test 3 – Kindergarten I, II and III

To this group N=29. This figure shows that the Kindergarten's amount of adequate judgments and adequate explanations is lower than for the other groups. Moreover the difference between these two kinds of responses increases.

The following figure illustrates a comparison between all groups.
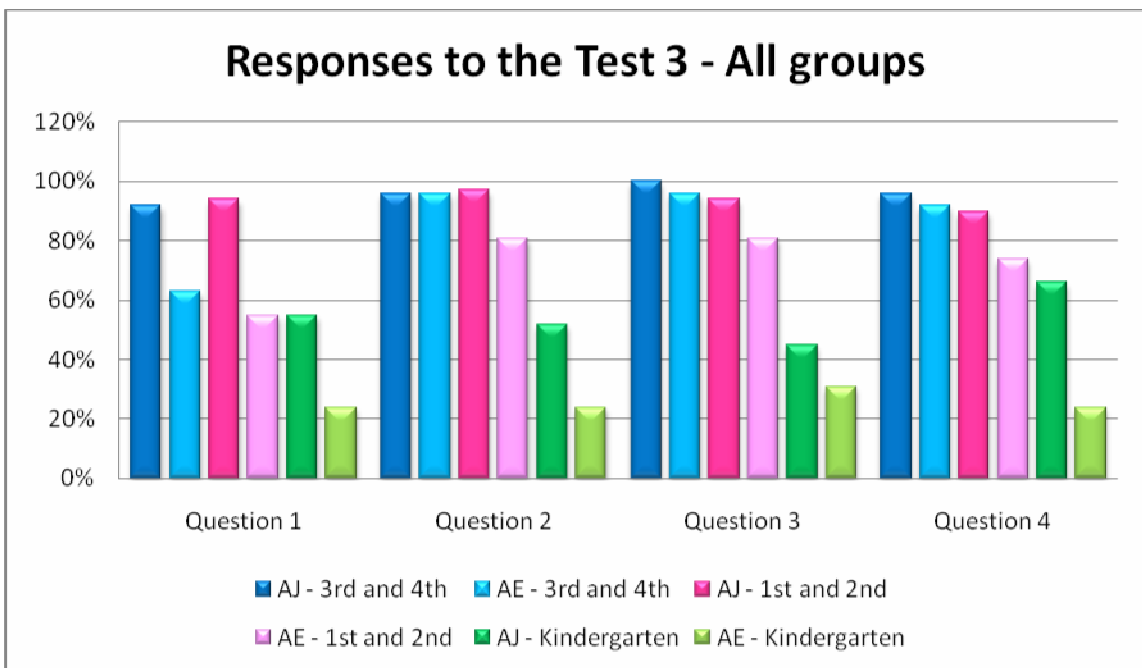


Figure 71: Responses to the Test 3 – All groups

This figure presents percentages in order to compare the performance between all groups. The responses in blue are related to the 3$^{rd}$ and the 4$^{th}$ grades, the responses in pink, to the 1$^{st}$ and the 2$^{nd}$ grades and the responses in green, to the Kindergarten. The first column of each color refers to adequate judgments and the second one to the adequate explanations. To the question 1 the 3$^{rd}$ and the 4$^{th}$ grades and the 1$^{st}$ and the 2$^{nd}$ grade presented lower percentages of adequate explanations. The Kindergarten presented the same percentage in almost all questions. Taking into account the performance on the adequate judgments, there is an improvement from Kindergarten to the 1$^{st}$ and the 2$^{nd}$ grade, but this group presents a similar result in comparison to the 3$^{rd}$ and the 4$^{th}$ grades. Nevertheless, taking into account the performance on the adequate explanations, there is a improvement from Kindergarten to the 1$^{st}$ and the 2$^{nd}$ grades and from this group to the 3$^{rd}$ and the 4$^{th}$ grades.

The following figure shows an analysis from a different point of view: The performance of all groups on each question.
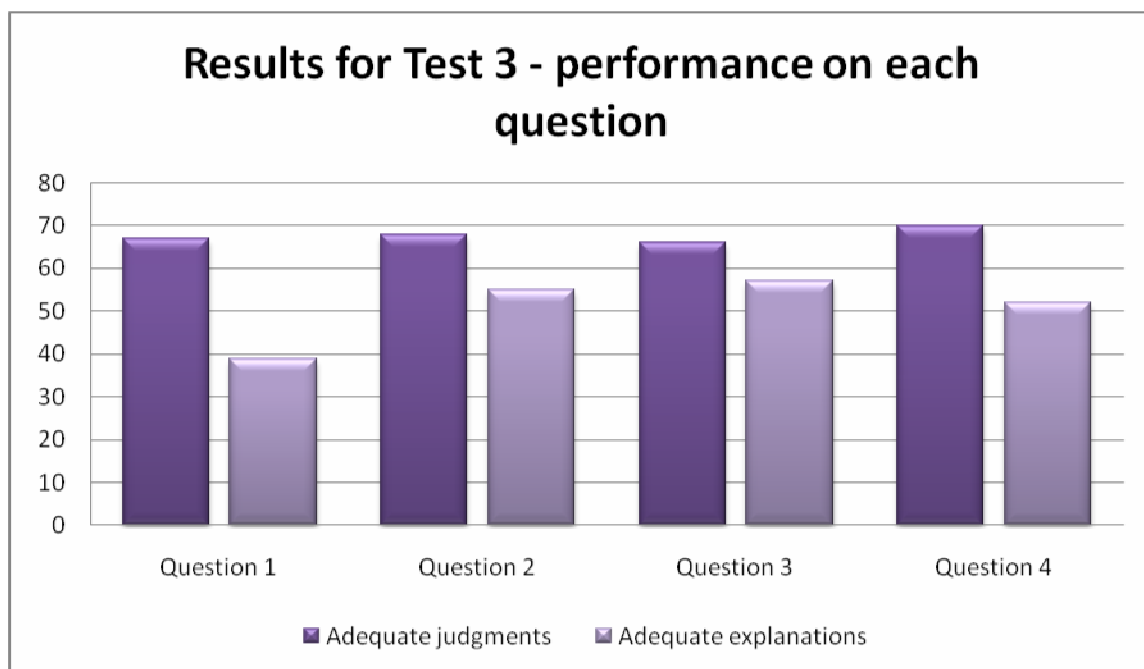


Figure 72: Results for Test 3 – performance on each question

Figure 72 illustrates that there are less adequate explanations than adequate judgments in all question, especially in the question 1, where there are even less adequate explanations. The representational redescription model will explain this behavior.

As I said before, there was more than one option that was considered adequate to explain why those forms were incorrect. However to each question there was one response that is more adequate than the other possibilities because this form present the same root, the

same tense (in the case of the questions 2, 3 and 4) and the same meaning (in the case of the question 1). These responses, as I mentioned before are: "apagar" to the question 1, "usava" to the question 2, "fiz" to the question 3 and "serviu" to the question 4. Let's examine the quantity and the percentage of use of each response in the following table.

Table 8 – Quantity and percentage of use of the most adequate explanations

|  | "apagar" | "usava" | "fiz" | "serviu" |
|---|---|---|---|---|
| 3rd and 4th | 12/21 (57%) | 3/23 (13%) | 13/23 (57%) | 20/23 (87%) |
| 1st and 2nd | 10/21 (48%) | 2/28 (7%) | 8/25 (32%) | 20/25 (80%) |
| Kdg I, II, III | 1/4 (25%) | 1/7 (14%) | 1/10 (10%) | 7/10 (70%) |

Recalling that for the 3rd and the 4th grades N=24, for the 1st and the 2nd grades N=31 and for Kindergarten I, II and III N=29. For the 3rd and the 4th grades, to the question 1, 12 out of 21 adequate responses were the verbal form "apagar", 3 out of 23 were the verbal form "usava", 13 out of 23 were the verbal form "fiz" and 20 out of 23 were the verbal form "serviu". For the 1st and the 2nd grades, 10 out of 21 were the verbal form "apagar", 2 out of 28 were the verbal form "usava", 8 out of 25 were the verbal form "fiz" and 10 out of 25 were the verbal form "serviu". For the Kindergarten I, II and III, 1 out of 4 was the verbal form "apagar", 1 out of 7 was the verbal form "usava", 1 out of 10 was the verbal form "fiz" and 7 out of 10 were the verbal form "serviu". There is an increasing percentage of use of the expected forms from Kindergarten to the 3rd and the 4th grades. Looking at the explanations, we can see that children were better in providing "serviu" as response to "serveu" than the other responses to their respective incorrect forms. I hipothethize that this is because between "serviu" and "serveu" there are fewer alterations to do (it is only one vowel), while between "borrachar" and "apagar" there is a whole word to change, and between "usia" and "usava" there is also change of inflectional suffix, and between "fazi" and "fiz" the whole structure of the verbal form is changed.

The results for Test 3 confirmed my hypothesis that the youngest children would not be able to judge these words morphologically. Some of them answered that "she cannot make a cake because she can burn herself" or "the slipper did not fit because it is too big", analyzing the words semantically. As in Test 1, the youngest children analyze words semantically and not yet morphologically. Some of the 4th grade children did that as well, but it was not all of them, as in Kindergarten I.

To summarize the results of the three tests, for Test 1 the youngest groups, the Kindergarten I and the Kindergaten II were not able to provide adequate responses in almost all questions of the test. In some cases, they gave responses that seem to take into account supposed the content of the nonce words. The 1$^{st}$ grade showed greater variability in several questions. From Kindergarten III to the 4$^{th}$ grade we could see an increasing performance. For the first part of Test 2 – extraction of the base – we saw a similar result: the Kindergarten and the Kindergarten II provided few adequate responses, and there was an increasing performance from Kindergarten III to the 4$^{th}$ grade. In the second part of the test – inflection – , the two younger groups could provide some adequate responses for past tense formation, and there was an increasing performance from the youngest to the oldest groups. For Test 3, again there was an increasing performance from the Kindergarten II to the 4$^{th}$ grade, and the youngest group, the Kindergarten I, was not able to judge the words correctly. In general, the results point out that there was an increasing performance from the youngest to the older groups. The youngest group, the Kindergarten I, answered the tests taking into account semantics, but not morphology. Perhaps the tests I invented were not able on elicit adequate responses from the youngest children. Maybe morphological awareness tests require high level of cognitive skills. It is my intention in the future researches to find other ways to elicit data from young children.

### 4.2.4 What RR model can tell us about the tests' results?

These three tests were developed to check the morphological awareness of children because they consist of off line tasks, in which children are asked to keep the information in mind, work on it and produce a response. This proceeding claims for intentional manipulation of data and, consequently other mental skills, different from those required to simple production. This is the main difference between levels E1 and E2 and E3 in the Representational Redescription model. When the representations are in E1 format, what we can see behaviorally is just production, not intentional manipulation of data – a kind of production through which we can see that the child is not looking at the input anymore and is extracting information from the representations that were redescripted. This kind of production seems to show a U-shaped development in the behavior, but in fact it is representational change in the mind, in which the child starts to analyze information. While information is in an Implicit level of representation, the analysis is not possible because the words are independently stored and the information is bracketed. Its components as a whole is

available, but its component parts are not. To become flexible and manipulable as data (E1 representations), as Karmiloff-Smith (1992) states, and accessible to metalinguistic reflection as well (E2/3 representations), the knowledge embedded implicitly in linguistic procedures (level I- representations) has to be re-represented. In E1 level, information is not bracketed anymore and is explicitly represented, but not yet available to conscious access. This results in productions that show that children are organizing their system. In other words, information is being redescripted. I have shown morphological variant forms produced by children from 2:1 to 8:1. Children with 8 years of age are in the 2$^{nd}$ grade. We can see productions that are related to the Implicit level at the same time in which we see production related to E1 level. In the same way, productions related to E1 level may be seen while the child already shows production related to E2 level. According to Karmiloff-Smith (1992), the end result of this various redescriptions is the existence in the mind of multiple representations of similar knowledge at different levels of detail and explicitness.

At level 2 representations are available to conscious access, but not yet to verbal report. As Karmiloff-Smith (1992) asserts, although many theorists reduce the consciousness to verbal reportability, the RR model postulates that E2 representations are accessible to consciousness, but that they are in a similar representational code as the E1 representations of which they are redescriptions. In my analysis I deem that when a child is able to produce off line tasks like the questions in Test 1 and Test 2, s/he reaches E2 level. Information in the mind is available to conscious access and this enables the child to manage off line tasks that demand that information is kept in the mind, processed and then the child produce a response. However, Test 3 involves other kinds of responses that go beyond the production of off line tasks, which involve verbal report. In Test 3 questions, children were asked to judge a word and provide an explanation of why that word is incorrect. This proceeding requires verbal report and consequently E3 level of representations. So why were some children in Test 3 capable of judging the incorrect word but not of providing an explanation? My answer to this question is that these children reached the E2 level, but not the E3 level. Test 3 illustrates behaviorally what happens internally in the mind and it is evidence that verbal report is not the only sign of consciousness. Children that have the knowledge redescriped in E2 format are able of judging correctness or incorrectness (acceptability) of a word, but they cannot yet explain why. When the children reach E3 level, they are able of giving verbal reports and of formulating good explanations about how language works. Another example of behavior that indicates E3 level is the intentional manipulation of morphological resources, as exemplified by the following conversation between a girl (Isb.) and her grandmather (G):

G. – Quem é essa? (Who is this?)

Isb. – Essa é a bailarina. (This is the ballet dancer).

Ela dança *balé* (She dances ballet)

Na ponta do *pé* (In the tip of her foot)

G. – Olha! Balé e pé rimaram! (Look at this! *Balé* and *pé* rhyme!)

Isb. – Claro, né! Por isso eu disse "do pé" e não "dos pé*s*!" (For sure! That's why I said "do pé" and not "do*s* pé*s*" (giving emphasis to the last 's', which marks the plural in Portuguese).

In this example we can see that the child is able to provide a verbal explanation of why she produced a rhyme. Not only she manipulates morphophonological data, but she also explains why she did it. She knows that she should say "pés" because ballet dancers have two feet, but she said "pé" in order to rhyme with "balé". Moreover, she demonstrates that she knows how plural is marked in her language.

It is important to highlight that there is no such thing as a "phase 3 child". As Karmiloff-Smith (1992) says, the child's representations are in E3 format with respect to a given microdomain. In this case, the child is in E3 format with respect to morphology. Another example of this is a boy who said, during the application of the Test 1, that "mafata" and "uma faca" are similar because you only have to change the "t" and the "c". This boy showed a refined phonological knowledge. He is probably in E3 format in the phonological format, but still in E1 format with respect to morphology because he was not able of working with nonce words and suffixes.

Another possible question is: Why a child with 8 years of age, as I showed in the data, who is probably on the 2$^{nd}$ grade, still produces morphological variant forms? There are two possible answers: Either s/he did not yet reach the E2 format, as many children in the 2$^{nd}$ grade who could not work with nonce words and morphological resources, or s/he is in E2 format, but, as the E1representations are still available in the mind, s/he produces forms which are related to E1 level.

Taking a look at the results of the tests, I deem that all levels are represented in the data that I have shown here. The youngest groups – the Kindergarten I and the Kindergarten II – are in E1 level and cannot work with off line tasks in an adequate way, although they have explicit representations, which are demonstrable with morphological variant forms; in Kindergarten III there are some children who already reached the E2 level and are able to deal with off line tasks, but are not yet able of verbal report, and there are some children who already reached E3 level because they could explain why the words in Test 3 were incorrect. We can verify evidence of E1, E2 and E3 levels in all grades. This fact corroborates Karmiloff-Smith's statement that the RR model is not age-related. Although there is an improving performance from Kindergarten I to the 4th grade, there are children in the 4th grade who were not able to work with nonce words and with morphological resources.

I stress the importance of two points in RR model: The postulation of E1 representations and of E2 representations, since other theorists did not recognize that there is a level of explicitness before linguistic awareness and that there is conscious acess before verbal report. My data suggest the existence of these two levels of representation and that the representational changes result in behavior changes as well. The most important is that the RR model could explain the progressive development in morphological development of children who speak Portuguese. Although children in the E1 level did not show their sensitivity to morphology in the tests, I presented other kind of data that reveals this sensitivity – morphological variant forms. These data reveals that there is an explicit kind of knowledge that is a redescription of I-level representations. Children extract information from I-level representations, like the analysis of irregular paradigms to find a stem to regularizations, and this knowledge is redescripted in a new format – E1 representations. When the E1 representations is redescripted in a new format – E2 representations – children become able to have conscious acess to knowledge, which was demonstrated by the performance of off line tasks in the three morphological tests. However, only when children reached the E3 level could they elaborate responses that required explanations, as showed by Test 3.

## 4.3 CONSIDERATIONS ABOUT THE EMERGENCE OF LINGUISTIC AWARENESS, METHODOLOGICAL ISSUES AND FUTURE RESEARCH

As I had commented in the chapter 2, the question of the age of emergence, brought about by Pratt and Grieve (1984) and by Nesdale and Tunmer (1984), is a crucial point in the debate about linguistic awareness.

The results presented in the previous section point to the fact that younger children, around the age 2 to 5, are able to show sensitivity to morphological resources, according to the analysis of morphological variant forms, but the they could not deal with off-line tasks in the morphological tests. This could be evidence that indeed, as Tunmer and Herriman (1984) assert, the linguistic awareness emerges in the middle childhood. However, as I considered morphological variant forms as evidence of E1 representations, which consist in explicit representations, they may be accepted as a step toward to morphological awareness.

Chaney (1992) and Bialystok (1986) consider that solving metalinguistic problems requires two different abilities: (1) analyzed linguist knowledge, the ability to represent the structures of a language besides their meanings; and (2) cognitive control, the ability to select and keep information in memory and coordinating it in problem solving. In this sense, failure of younger children in some tasks may be due to lack of analyzed linguistic knowledge or, equally plausible, due to the amount of cognitive control demanded by the task. As far as children of age 2 to 5 are able to analyze morphological knowledge, verified in morphological variant forms, I deem that there is no lack of analyzed linguistic knowledge for those Kindergarten children. Thus the second reason of failure seems to be the more plausible to explain the tests' results.

As we could see in the chapter 2, several researchers show that young children are capable of demonstrating some evidence of linguistic awareness. To get these results, they limited or carefully controlled the complexity of the linguistic input, avoiding the use of metalinguistic terminology and providing demonstrations and practical questioning. They show that metalinguistic abilities do not emerge abruptly, but increase gradually during the language acquisition process.

Gleitman et al. (1982) show the basics of linguistic awareness appears at the age of 2. They also document the evolution of this ability in children in school age. The results of their

analysis reveal that every child showed, at least, a foggy ability to think about language. These authors got to the conclusion that the ability to think about language increases a lot with age. Fox and Routh (1975) with a feasible procedure showed that, in general, children do have linguistic awareness in younger ages than previous studies had thought. This result is due to the techniques used, which had less cognitive requirements. Bialystok's (1986) work gives evidence that children do answer systematically to a metalinguistic task even at the age of 5. This contradicts models in which metalinguistic awareness is described as a conceptual revolution that goes on sometimes around the age of 7.

All these researchers point to the fact that some rudiments of linguistic awareness do appears in a preschool age, before 6 or 7 years. The fact that this present work did not show the same outcome with the tests which are developed to reach a similar result is evidence that something did not work as planned.

At the time of the tests' elaboration, I could not find morphological tests to be applied to young children in Portuguese. So I decided to elaborate tests that could measure the ability of children on dealing with nonce words, applying to them morphological resources, on extracting a base from a derived word, and on judging incorrect words, providing an explanation of why they are considered wrong. These tests do not involve all kinds of morphological aspects, but they serve to the purposes of this thesis, that is to describe children morphological knowledge.

However, after studying with Professor Karmiloff-Smith at London University, some methodological issues were discovered. They may explain why the tests did not elicit adequate responses from the youngest groups. I realized that bringing knowledge from other areas, like Experimental Psychology, could help me a lot on elaborating more efficient tests.

First, in the test's application, I did not provide demonstrations and practical questioning. This could be crucial to the youngest children understand what it was required in each question and to me perceive if the child understand what the question required. Second, there were few opportunities in the tests format to provide responses to each kind of question. For example, there is just one question about agentive for each nonce word in the Test 1. In this way, I cannot surely affirm that the child was not able to apply a suffix to the base. He or she provided another response, but this does not mean that he or she is not able to give another kind of response, an expected response, because there are not many opportunities for him or her to do that.

Another point is that the order of the questions was always the same. Experiments in general divided the subjects in groups and each group answer a test with a different questions order. For example, one child answer a test with questions A, B, C and another child answer a test with questions C, B, A. In this way I could verify the reason why children got a better performance in one question or in another without interference of the order of the questions. Finally, a bigger amount of subjects of each grade could provide more trustable results. In this sense, I ponder that the outcomes of my tests are suggestive of E1, E2 and E3 representations. A future research which takes into account these methodological issues may confirm these hypotheses.

What I intend to do in the future is approximate even more Linguistics and Cognitive Psychology. One of my ideas is to develop other ways to elicit data that consist on evidence of linguistic awareness, which do not demand a high level of cognitive control. In addition to this idea, I intend to study neuroconstructivism in deep to fundament my researchers.

5 CONCLUSION

Pursuing the aim of this work, which was to describe the morphological knowledge presented by a group of children who speaks Brazilian Portuguese, with ages between 2 and 11 years, from sensitivity to awareness, and to relate this knowledge to the mental representation levels postulated by the Representational Redescription model by Karmiloff-Smith (1992), I analyzed some data from spontaneous speech and from morphological tests. The results presented a developmental trajectory of mental changes that are expressed through an improvement in the performance on morphological test, as well as in morphological variant forms that precede morphological awareness. All levels of representations, from implicit to the three different levels of explicit representations, were contemplated by the data.

The children showed sensitivity to morphological structures, analyzable in morphological variant forms, which I considered suggestive of the E1 representations level, and also showed morphological awareness in different levels — E2, which means conscious access, but without the ability of verbal report —, and E3, in which verbal report is available.

Answering the guiding questions I can say that, according to the results presented, 1) Are the tests efficient on showing children's capability to apply morphological resources to nonce words? Except for the youngest ones, children were capable of applying morphological resources to nonce words; 2) Do young children show morphological awareness with these tests? My tests do not offer adequate conditions to the youngest children to show at least the emergence of morphological awareness due to the high level of cognitive demand of the test, besides the fact that I did not provide a demonstration before the real test application; 3) Does the children's performance improve across ages? The children's performance did improve across ages, but did also show that children of almost all ages (from Kindergarten III to the 4th grade) seem to reach E3 representations because they were able to provide adequate verbal report to Test 3 questions. This confirms what Karmiloff-Smith (1992) states that there is no such a thing as an E3 phase child and that levels of representation are not age-related. 4) What are the most frequent suffixes used in Test 1? 5) Do children show the same preferences of adults in the suffixes choice? The most frequent suffixes were surveyed and they reveal that in some cases, like in questions B, C, D and F, the preferences of children are the same of adults; 6) Are children capable of extracting the base from derived nonce words and of inflecting nonce verbs? Children show some difficulties on extracting the base from nonce words and this may be due to the fact that many of them took to account the supposed content of the derived word instead of providing a base (maybe a different format in the questioning could

provide better results); moreover, children of all ages showed a great performance on the inflection questions; 7) Are children capable of judging as incorrect verbal forms that do not belong to adult grammar, but that are produced during language acquisition? Older children were capable of judging morphological variant forms as incorrect, but younger children did not; 8) Are children capable of providing adequate explanations about why these forms are incorrect? Less children were able of providing an adequate explanation to why these forms are incorrect, especially the youngest ones. The explanation suggested is that this performance is due to the fact that only children that reached the E3 representations level of redescription are able to provide such kind of verbal report.

The last and the most important questions take into account the role of the tests and of the RR model (9) Are the data (morphological variant forms and test responses) evidence of representational redescription? 10) Does the Representational Redescription model explain the data?). I ponder that, apart the methodological issues verified after the appliance of the tests and the analysis of the results, the data suggest a developmental change over time, which is verified by redescription of representations of the same knowledge in a determined domain or subdomain, in this case, morphological knowledge. Moreover, the Test 3 results could show a clear difference between the E2 and E3 levels of representation. The analysis of morphological variant forms and the tests confirm the fact that there are not just two levels of knowledge — implicit and explicit — as some authors consider. The spontaneous speech data analyzed revealed that there is sensitivity to morphological resources, which implies that children are not focused on the input/output relationship anymore, but that they are extracting information about that knowledge that was in an implicit format and that was redescribed to a new format — the E1 representations. Off-line tasks as those required by the three morphological tests, in which children were asked to keep information in the mind, work on it and then produce a response, suggested evidence of E1, E2 and E3 representations levels. Children who were not able of dealing with the tasks are probably in level E1, in which there is no conscious access yet; children who were capable of dealing with the tests, but could not provide an adequate explanation to Test 3 questions are probably in level E2; and those children who were able to provide adequate responses to all questions in the three test probably reached the E3 representations level. The RR model explained the data and showed the importance of a developmental approach.

With respect to the age of emergence of linguistic awareness, I do believe that at least some rudiments of awareness emerge early in the children development. Some sensitivity to morphological resources was demonstrated with morphological variant forms; however, the

tests could not show linguistic awareness in the youngest groups. I believe that future researches can invest on other ways to elicit data that reveal linguistic awareness from young children without high levels of cognitive demand.

I also acknowledge that other possibilities of study emerge from my data, such as a deeper study on productivity, checking the sort of suffix that is used in relation to the category of the base; the use of the female gender and plural suffixes; other kinds of derivational processes, like verbal formation or formation of compounds and a deeper analysis of the relation between morphology and phonology and between morphology and semantics. I hope to cover these studies in the future. I also highlight that I went to London to study with Professor Karmiloff-Smith in the final year of my PhD, so I do not had the time to reaply the tests without the methodological issues that I mentioned. I really hope to do this in the future.

Finally, I remark that this is just the beginning of my journey. After seven years, since Graduation to this moment, studying children's morphological knowledge, I understand how huge is the task of a researcher and how much I have to do in the searching for a real understanding of children's language development. The proposal of bringing together Linguistic and Cognitive Psychology will certainly guide my future researches because studying language acquisition means studying Cognitive Psychology. I hope that this work may contribute to the studies developed in the area with data, ideas, and, especially, with the gaps that this work could not fill, with the opportunities left for future researches.

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ANNEX 1 – WINKI (FOR TEST 2)

ANNEX 2 – DOLL (FOR TEST 3)

Annex 3 — Documento de Consentimento Autorizado

**INSTITUTO DE EDUCAÇÃO CENECISTA ANGELO ANTONELLO**
Mantido pela Campanha Nacional de Escolas da Comunidade
Farroupilha/RS

**Senhores Pais!**

Nossa ex-professora Aline Lorandi faz doutorado na PUCRS em Porto Alegre e vem desenvolvendo uma pesquisa sobre como as crianças lidam com palavras inventadas e como elas expressam o conhecimento sobre a Língua Portuguesa na idade em que estão. A doutoranda Aline escolheu a nossa escola para aprimorar sua pesquisa e, por esse motivo com consentimento dos Senhores, ela fará uma entrevista com 10 alunos que serão sorteados entre os autorizados. Pedimos a autorização para que seu/sua filho (a) participe da pesquisa, que constará de uma brincadeira de inventar palavras. Asseguramos que a identidade da criança será preservada.

Podendo contar com sua colaboração, favor assinar autorização abaixo.

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Autorizo meu/minha Filho (a) _Bermardo Lodi_ a participar da pesquisa "Produtividade de Sufixos do Português Brasileiro", conduzida pela doutoranda Aline Lorandi. Os dados produzidos pelo (a) informante serão usados para fins de pesquisa acadêmica. A identidade de cada informante será preservada.

Assinatura do responsável