Methodological Challenges to Corpus Linguistics in Language Acquisition in Brazilian Portuguese

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Abstract: I will discuss the methodological challenges for the organization of three corpora belonging to a child aged 20 months and 21 days, aged 22 months and 20 days and aged 26 months and 8 days, when acquiring Brazilian Portuguese. The methodology was developed by R. Brown (1973), when he organized Adam, Eve and Sarah's classic corpora. I used the same measures, such as Mean Length Utterance, MLU and Maximum Upper Bound Limit calculation, whose rules I describe. The results are compared with the 19 reports listed by Brown (1973: 66) regarding different languages acquisition, including non-Indo-European ones. The criteria applied for selecting utterances, which will make up the corpora are also explained, for building up the emerging grammars. The child's total utterances number, in phonetic transcription, was 5530; that of adults, canonically transcribed, when addressed to the child, was 5664. All recordings, as well as phonetic transcripts, glosses, morphological analysis (mor line) and lexicons are available on the CHILDES Platform, the world's largest database on language acquisition.

I.   Introduction

I will discuss the methodological challenges for the organization of a child's three corpora, who was acquiring Brazilian Portuguese, henceforth BP, São Paulo sociolinguistic variety, practiced by university-educated parents, in three cross-sections: when the child was 20 months and 21 days old, at 22 months and 20 days and at 26 months and 8 days. The methodology was developed by [1] Roger Brown (1973:51-59), when he raised the classic corpora of Adam, Eve and Sarah.

The research was carried out in the apartment, with the presence, in addition to the researcher, of the mother, often the father and, exceptionally, the maid, during toy situations, watching video, feeding and hygiene, without the recorder being visible.

The first survey lasted five hours, when the child's 1319 utterances were recorded, phonetically transcribed, including intonation patterns. Here, we meet the first challenge: According to [2] Brown (1973: 531), "Anyone who plans to undertake a phonetic record needs to be warned that this is an immense work".

It should be added that the child's utterances contained sounds that were often far from those commonly used in BP phonemes, in addition to non-existent syllabic structures, such as [mbe], a fusion of the phrase *um beijo*(Eng., one kiss). You can have access to all recordings, as well as phonetic transcriptions, on the [3] CHILDES Platform, the world's largest database on language acquisition. In the first survey, 1313 more utterances by adults were recorded, when they addressed the child (Child Directed Speech, CDS) and as many as unnumbered, when they spoke to each other, transcribed canonically.

The second survey lasted six hours, during which the child's 2245 utterances were recorded and phonetically transcribed, another 2,475 utterances by adults, when they were addressed to the child, and many unnumbered statements when they spoke to each other, transcribed canonically. Finally, the third survey lasted six hours, during which the child's 1996 utterances and the adults' 1876 ones were recorded, when they addressed the child, and as many as they spoke to each other.

The child's total utterances number phonetically transcribed was, therefore, 5530. The number of adults, canonically transcribed, when addressed to the child was 5664.

The research, of a longitudinal nature, was carried out, as much as possible, in a natural situation. Parents were instructed to maintain a spontaneous behavior and not to force the child into stereotyped statements. During the recording, notes were taken on the environmental situation and a rough first transcription was made, especially considering that, in the recording, the final unstressed syllables, due to the absence of energy, become inaudible.

When it was impossible to take notes, a comment was recorded to be documented on the tape, with necessary clarifications and glosses provided by the child's mother about items that would escape the researcher's understanding. The recordings were made in a Sony stereo cassette-corder recorder, model TC-146A. The tapes used in Stage I contain the following specifications: Sony Auto-Sensor C-60 HP; those of Stage IIand III, Sony Auto-Sensor C-90 HP.

II. Transcription procedures

A first handwritten transcription was carried out and a second, typed by the author herself, with a careful review of the tapes and rechecking of the first transcript, carried out by two students from the Speech Therapy Course at the then *Escola Paulista de Medicina*(Eng., São Paulo Medicine School), today *UNIFESP* (Federal University of São Paulo).

The IPA symbols were used for the statement broad transcription. For the intonation patterns, [4] J. Matluck's (1965)system was employed. Under each phonetic transcription there is a gloss with interpretation in canonical transcription. The numbering on the left of the page indicates the tachometer points, 50 out of 50, for tape control and quick location of any utterance. The names of adults were indicated by the initial, to keep them anonymous. Then, with the respective number, the statement, when it was addressed to the child, in canonical transcription.

Adult utterances when they talked to each other were included, without numbers. This inclusion was made for possible confrontation research, to contrast with the register, when it addressed to the child and possible influences on the latter, in the acquisition of his lexicon. The child's statements were written on the page right side, preceded by the numbering. On the far right, there is the number of items per utterance, to calculate the MLU, that is, Mean Length Utterance.

In the text, we used the name of Pa, when referring to the child. As it is a nickname, it was chosen, without the danger of further identification. The child's parents, he, a linguist, she, a psychologist, carried out a confrontation between the typed transcript and the tapes, and, finally, the author performed a new recheck.

Then, each statementsegmentation and the lexiconorganization were processed, according to [5] Chomsky's (1964)Generative Transformational Grammarmodel and [6]Fillmore's (1968: 1-18) Case Grammar and, for that purpose, for calculating the Mean Length Utterance(MLU) and the Maximum Upper Bound Limit, [7] Brown (1973: 54) criteriawere followed, adapting them to BP.

III. Rules for Calculating the Mean Length Utterance (MLU) andthe Maximumupper Bound Limit

a) Start with the transcript second page, unless it includes a recitative. In this case, start with the first part that doesn't include it. Count the first 100 utterances that meet the following conditions:

b) Only fully transcribed utterances should be used and none with blank spaces. Excerpts in parentheses are used, as they indicate a dubious transcription.

c) Include all exact utterance repetitions (marked with the + sign in the transcripts). Mark the hesitations as single word repeated efforts: Count as a single occurrence the form produced more completely. In the few cases where a word is pronounced more emphatically (no, no, no), compute each occurrence.

d) Do not compute full pauses like 'mm', 'ɘ' (adaptation to BP of the last example), but rather 'não', 'é', 'hi' (adaptation to BP of the last three examples).

e) All compound words (of two, or three free morphemes), proper names and ritualized reduplications must be computed as a single word. For example: mbé (Eng. a kiss); pique-pique-pique (needle pricks imitative onomatopoeia). The reason for this criterion is that there is no evidence that the constitutive morphemes work as such for the monitored children.

f) Count as a single morpheme all irregular verbs past tenses, like '*fez*' (Eng., (he) did). The justification is that there is no evidence that the child relates them to the present tense forms.

g) Count the diminutives as a single morpheme (in BP, augmentatives also occur, as in the examples '*Paião*', '*grandão*' (Eng., very big), because, at least, children surveyed do not seem to use suffixes in a productive way. Diminutives (and augmentatives) are the basic forms they use.

h) Count as separate morphemes all the auxiliaries 'é' (*is*), 'tá' (*is*), 'qué' (*want*), 'vai' (*is* + ing), 'pode' (*want*),likewise, the catenatives, such as 'é-pra' (*is-for*), 'tem-de' (*have-to*). The latter must be counted as a single morpheme, because there is evidence that they do so for the child. Count as separate morphemes all

inflections, for example, the plural -s; the BP tense-aspect-person morpheme -w of the perfect indicative past tense, or gender -u ~ -o (masc.), -a (fem.).

FIGURE 1 –Pá's*corpus***, 20 months and 21 days old, first page.**

Source: [8] Scliar-Cabral (1976b).

The count follows the rules above, but always calculated for the total number of transcripts and not just the initial 100 utterances. The reason we chose Brown's criteria for calculating MLU lies in several factors. First, there is a desire on the part of the researcher to compare the results obtained in the acquisition of BP, with those of research in other languages, in which the same criteria were used. Thus, the results can be compared with the nineteen reports listed by [9] Brown (1973: 66).

The more similar the characteristics found in the acquisition of languages belonging to very different language families, the more correct the hypothesis about some linguistic universals in it.

Second, although MLU has some failures that we will discuss, it has been shown to be a more adequate external measure than chronological data. There is a much greater correlation between the MLU and the aspects that characterize linguistic maturation, called the law of increasing complexity by Brown, than the one verified between the chronological age and the aspects mentioned above.

Thirdly, such a measure makes it possible to compare the results among children, who are acquiring the same language. However, this measure still has many failures, including the fact that many criteria have been established *ad hoc* for English, lacking generalization.

Due to the fact that in Stage I, beginning, the child's grammar presents itself with a pivotal appearance, with the use of operators to which he/she attaches open items, it is necessary to be very careful not to discard items that, apparently, may look like crutches, that is, a mere articulatory resource of performance, but that actually work productively in the child's grammar. The criteria for segmenting or not statements, as explained in Brown's rules, sometimes take on an impressionistic tone, lacking objectivity, that is, Brown does not specify, what he considers to be evidence that certain morphemes, as the past tenses, in the verbs, do not work as such for the child.

In the case of the child, who is acquiring BP, we use the following criteria to segment:

1st - The item must have appeared isolated and/or in combination with more than one morpheme, presenting, therefore, a distribution that evidences its existence as a unit;

2nd - the meaning must be properlyused in linguistic and situational contexts;

3rd - items that have the same recurrent meaning, while the same grammatical distribution, are considered variants of the same form.

IV.   Utterance choice criteria and sampling extension for grammar building

The following criteria were applied to select the statements that make up the corpora, in addition to those already mentioned in Brown's provisions:

For each Stage, 713 statements were selected for the grammarsunderstanding, according to what has been traditionally followed, based on the Harvard teamdecision [10] (Brown, 1973: 56).

For the grammarsunderstanding, only utterances with more than one word were used, discarding those that only presented one occurrence regarding the stereotypes and imitationsconstructiontype.

TABLE 1[a] -Data that can be ordered evolutionarily.

CHILD	SEX	MLU	CHILD'S AGE	SURVEYCHARACTERISTICS	RESEARCHER	LANGUAGE
Eric I	M	1.10	1; 7	4 hours recorded	Bloom	American English
Kendall I	F	1.10	-	Full 2 days, transcription*in loco*	Bowerman	American English
Gia I	F	1.12	1; 7	7 hours recorded	Bloom	American English
Eric II	M	1.19	1; 9	6 hours recorded	Bloom	American English
Gregory	M	-	1; 7.5-1;11.5	Cumulative inventory	Braine	American

						English
Andrew	M	-	1; 7.5-1;11.5	Cumulative inventory	Braine	American English
Steven	M	-	1; 11.5-2;0.5	12 toy sessions, recorded	Braine	American English
Christy	F	-	2; 0-2;3	Weekly recording sessions, 45 min.	Miller, Ervin	American English
Susan	F	-	1; 8-2;0	Weekly recording sessions, 45 min.	Miller, Ervin	American English
Kathryn I	F	1.32	1; 9	7½hours recorded	Bloom	American English
Gia II	F	1.34	1; 9	7 ½hours recorded	Bloom	American English
Eric III	M	1.42	1; 10	8½hours recorded	Bloom	American English
Seppo I	M	1.42	1; 11	2 hours recorded for 1 month	Bowerman	Finish
Pá I	M	1.45	1; 8	5 hours, recorded in 1 day	Scliar-Cabral	BrazilianPortuguese
Kendall II	F	1.48	1; 11	2 hours recorded for 1½hour	Bowerman	American English
Viveka	F	1.50	1; 11	4 ½ hours, recorded in 1 month	Rydin	Swedish
Sipili	M	1.52	2; 6	6 ½ hours, recorded for 1 week	Kernan	Samoan
Tofi	M	1.60	2; 2	2 hours, recorded for 1 week	Kernan	Samoan
Eve I	F	1.68	1; 6	3 ½ hours, recorded for 6 weeks	Fraser, Brown	American English
Sarah I	F	1.73	2; 3	3 hours, recorded for 6 weeks	Cazden, Brown	American English
Seppo II	M	1.81	2 ; 2	2 hours, recorded for 1 week	Bowerman	Finish
Rina I	F	1.83	2; 1	2 hours, recorded for 1 week	Bowerman	Finish
Pepe	M	1.85	2; 6	4 hours, recorded on 2 consecutive days	Tolbert	Mexican Spanish
Kathryn II	F	1.92	1 ; 11	9 hours recorded	Bloom	American English
Adam I	M	2.06	2 ; 3	2 hours, recorded for 1 month	Bellugi, Brow	American English

[a]The Roman numerals after children's names were stipulated by the researchers and refer to eachof their analyses ordering; all children are in stage one, by definition.
(Confronting [11] Brown's table (1973: 66).

Source: [12] Scliar-Cabral(1976a: 34).

Such decisions were taken, the first of them, because it was considered that constructions that only present one occurrence lack productivity, revealing, almost always, incipient grammarstages. This hypothesis was confirmed because, in general, sporadic occurrences tend to become productive in subsequentStages.

The second decision, that of discarding stereotypes, was justified by the fact that they do not reveal the child's linguistic competence. This is the case, for example, of the catenative auxiliary '*é-pra*' (Eng., is-to); (nº 99, 100, 444), which always occurs in the same context. That is, followed by the verb*pô(r)*(Eng. Put), showingroutinecharacteristics.

The third decision, that of discarding imitations, requires a definition of what is meant by imitation. According to [13] Bowerman (1973:21), direct imitation is considered to be the complete or reduced reproduction, in the same order, of another person's utterance, which occurred up to three previous utterances.

Note, however, that, confronting children compared by Bowerman (see Table 2 below), Pa's number of imitations is quite small. We attribute this difference to the fact that we have taken into account the intonation. So, if the adult asked a yes/no question, with ascending intonation, such as"*Vocêquer*?" (Eng.:Do you want it?) and the child answered adequately with the descending intonation "qué", such utterance was not discarded, as we stopped considering it as imitation.

V. Brown's measurement calculations

5.1 Utterance type*s*

An utterancetype is defined as one that is said with isolated words, or in combination, not constituting imitation. Pá presented, in the MLU 1.45 Stage, 274 utterancetypes, between Seppo and Sarah (see Table 2).

5.2 Utterance tokens

The utterance tokensis defined as all statements in the sample, whether repeated or not, that is, 713.

5.3 Type-token ratio

The type-token ratio is defined as the quotient resulting from dividing types by occurrences. In theMLUStage1.45, the type-token ratio was 0.38 (see Table 2).

5.4 Upper bound

It should be understood that the emergence of children's grammars presents a dynamic rather than static aspect: at a given stage, there is a predominant grammar (the one described), but some rules and categories of the preceding grammar persist, as well asthe subsequent grammarrules and categories are already announced. It is precisely in the latter that the maximum number of items per statement is included.

In general, researchers have been faced at different solutions to the limits imposed on grammars, in terms of their generative capacity to trigger more extensive and complex chains. Since these last two aspects are exactly the ones that configure a given linguistic maturational stage, grammars cannot be formulated with recursive rules, or with rules that would generate strings that the child hardly produces. Two solutions are mentioned in the literature, [14] Bloom's (1970) reduction transformation and [15] Bowerman's (1973: 90 et seq.)optional verb deletion.

TABLE 2 –Subjects' speech samplesquantitative characteristics, who are acquiring Finnish, Brazilian Portuguese and English.

	Seppo	Pá		Seppo	Rina	Adam	Eve	Sarah
MLU	1.42	1.45		1.81	1.83	2.06	1.68	1.73
Age (months)	23	20; 21		26	25	27	18-19	27-28
Utterancetypes	297	274		437	338	505	309	265
Utterance tokens	713	713		713	713	713	713	713
Type-token ratio	0.42	0.38		0.61	0.47	0.71	0.43	0.37
Upper bound	5	5		5	5	7	4.25	4
Numberof imitations	173	12		79	112	37	88	136
Percentage of imitations	24	1.68		12	15	4	12	18
Lexicon size	112	145		226	136	201	169	193
Number of nouns	57	56		103	74	103	103	142
Number ofverbs	31	30		65	32	37	36	21
Number ofadjectives	3	9*		8	5	15	6	13
Number oflocatives	3	6		14	9	7	3	7
Number ofpronouns	2	2**		9	8	7	5	?
Requiredfunctors	32	146***		98	168	127	91	81
Presentfunctors	1	46		8	16	7	14	15
Presentfunctorspecentage	3.1	31.5		8.2	9.5	6	13	16
			Other classes not mentioned by Bowerman Stage I, beginning (1.45):					

	Copulas		2
	Auxiliaries		3
	Possessive pronoun		1
	Particles		3
	Operators ****		6
	Demonstratives		2
	Interrogatives		2
	Confirmative		1
	Tag		1
	Interjections		8
	Onomatopoeias		13
	Stereotypes		1
	Nouns with objective function (possessor) and so-called isolated epithets are included. **Personal ***Taking into account my adopted criteria, the required functors are 231 and those present, 48. **** *ó; não, mais; oto, esse, m*.(Eng., O, no, more; other, this, one, ə).		

Fonte: [16] Scliar-Cabral(1976ª: 38).

The solution we adopted was formulating a condition rule that prevented the grammar from generating longer strings. Anyway, the items per statementmaximum limit (upper bound) is a very revealing measure, as can be seen in Table 2:Pá'supper boundwas 5.

5.5 Lexiconsize

The lexicon sizeis obtained from the wordssum, with their respective repetitions. Although the total number obtained by me is not very different from the other samples, analyzing item by item, there will be some differences, for example, regarding the nounsnumber. This fact is that we have made some discriminations, such as including isolated nouns in the adverbial classes (locative, instrumental and company). In addition, given its relevance, items such as the interrogative particle m? with ascending pattern, which presents the highest number of occurrences in the sample (123), were included in the statements. Interjections and onomatopoeias, with well-defined articulation and used with semantic adequacy, were also included.

The m? particle inclusiondeserves comments, as it unequivocally proves the interrogative modalityexistence, according to [17] Menyuk's (1971) opinionand contrary to [18] Bowerman (1973: 118) and [19] Bloom (1973: 19).

However, it should be noted that the data, as in other researches, prove the higher incidence of nouns, followed by verbs and the almost total absence of adjectives:The latter, when they appear, are most often in isolated form, as epithets, *feio*(Eng., ugly) and *sem-vergonha*(Eng, shameless). This last fact supports the hypothesis that the primary cause of certain syntactic constructionsand classesnon-occurrence, is their linguistic complexity. Indeed, adjectives, although they are contentives, with semantic load relative to objectsworld and not to the inner grammar, and also having perceptual salience (all adjectives have a more stressed syllable), they act as noun modifiers, therefore, they are not autonomous.

This explains the greater occurrence of only one type of nounmodification, in Pá'sStage I, the possessive one: Construction N + N, is explained, as corresponding to an already well-established cognitive category. It should be noted that this adjectival construction is also consigned by other observers: There is only one difference regarding the owner and the object possessedplacementorder. There is also a similarity regarding the possessor having the [+animated] feature and the possessed object, the [-animated] one, being also alienable.

This last comment supports Brown's concernabout reformulating the telegraphic styleconcept. This is what I will examine in commenting on the following measure.

VI.   Required functors

Functors (morphemes for [20]Martinet (1964) and gramemes for [21]Pottier (1968) are grammatical classes characterized by constituting a limited and closed element types, by presenting a high tokens frequency and by referring, semantically, to the inner languagemeanings (grammar). In Portuguese, functors are articles, prepositions, conjunctions, pronouns, adverbs, particles (all these free forms) andbound forms affixes (inflections, prefixes and suffixes).

One of the characteristics of the child's language, in the acquisitionearly stages, is functors absence, a fact that led to the telegraphic styledesignation, given its similarity to the language used when writing telegrams.

According to [22]Brown's analysis (1973: 74-90), however, the functorsabsence in Stage Iof language acquisition cannot be categorically affirmed, but rather we must examine, which of the variables influence some functors and not others. These variables are as follows: high frequency versus low frequency; having syllabic independence or not; playing a semantic role or just modulating the meaning of another item; having informational load or being redundant; being phonologically conditioned or not; being grammatically conditioned or not.

Joining these variables together, [23]Brown (1973: 88)comes to a conclusion as to why some functors emerge earlier than others: "If functor x has some minimal frequency, high perceptual salience, is unconditioned by verbal context, and expresses a basic semantic role rather than a modulation, then it will be fully controlled in Stage I (used freely and correctly)."

The opposite extreme of the variables mentioned above constitutes a condition for the non-occurrence of functors. Brown's statements are justified in the data analysis in Table 2.

As can be seen, in Stage I, the child does not have functors control, except for those that meet the variables indicated by Brown, with the exception of the 1st (showing minimal frequency). Thus, the prolocatives*aqui*(Eng., here) and*aí*(Eng., there)are allomorphs in free variation and, contrary to most research, the two copulas *é*, *tá*(Eng., is)do not fulfill all the stipulated variables, since, as noted above, they present a very high frequency. It is also worth noting the occurrence of some functors as operators, due to thegrammar pivotal appearance in the initial Stage.

Another observation to be made is that the authors, when calculating the required functors, have followed [24] Cazden's (1973)criterion, by which only gaps in occurrences of more than one word are computed. Now, as can be seen from a careful analysis of the single item statements, many of them clearly accuse the absence of functors; the same occurs with [25] Bower man's decision (1973: 24-25) not to consider functors necessary when such necessity depends more upon the semantic interpretation attributed to the utterance than upon the linguistic construction itself. Therefore, we recommend taking into account the criteria, applying the norm of which functors are required in the usual speech, considering the context.

For example, in the excerpt that comprises Stage Istatements 55 and 517, with words said in isolation, there is undoubtedly the absence of the functor*na*(Eng., in); equally, in the isolated utterance 68, Stage I, the absence of the 1st person functor, and, in general, in all verb utterances said alone that refer to the 1st person, because it is precisely this gap that allows us affirming that the child, in the initial phase, lacks both bound and free morphemes signaling thespeech 1st person, as can be seen in the below examples:

55. (na) mão(Eng., (in the) hand)
317. (na) rua(Eng., (in the) street)
68. que (ro)(Eng., (I) want)

VII.   Final remarks

Although technological advances have eased the challenges to Corpus Linguistics applied to language acquisition, they still remain immense. I consider the risk of the adult's grammarprojection towards the child's cognition as a major deadlockto such research: the child still does not have the phonological system of the variety he/sheis acquiring completely consolidated, nor does he/she segment the word limits of whathe/she is beginning to internalize in his/her mental lexicon, but not in the same way as the adult.

However, I believe I have contributed to the area when, in 1974, a year after the publication of Roger Brown's *A First Language*, I started collecting data from Pá, then, I made the phonetic transcription, with the intonation patterns of the child's 5530 utterances, organizing the corpora, with their lexicons and, finally, making them available to the world scientific community on the CHILDES Platform.

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