

Plasticity of morphological paradigms

Alexandra Soares Rodrigues
ESE, Instituto Politécnico de Bragança
CELGA-ILTEC, Universidade de Coimbra
afsr@ipb.pt

Pedro João Rodrigues
ESTiG; CeDRI, Instituto Politécnico de
Bragança
pjsr@ipb.pt

1. Introduction

The aim of this work is to explain, in a paradigmatic framework, the occurrence of event nouns with the suffix *-ção* having an ‘intensive/iterative’ meaning in Brazilian Portuguese, which does not occur in European Portuguese (e.g., *viajeação* ‘intensive and iterated travel’, *passeação* ‘intensive and iterated walk’).

The paradigmatic approach to word formation has been recently reinforced against rule conceptions. Studies such as Štekauer 2014; Antoniová and Štekauer 2015; Blevins *et al.* 2019; Blevins 2016; Booij 2007; Baeskow 2015; Ortner and Ortner 2015; Spencer 2013; Fradin 2018 have emphasised the domain of word formation as a mental network of paradigms, against the vision that only inflection operates paradigmatically. The aim of this study is to bring experimental and empirical evidence to the plasticity of word-formation paradigms.

Paradigms are conceived of as dynamic patterns mentally organised in networks. The relationships between items that build a paradigm may be of different types, as highlighted by Pounder (2000), Štekauer (2014) or Van Marle (1985).

Following Rodrigues and Rodrigues (2018), we call the axis of the paradigm the feature that is responsible for the cohesion of the paradigm, i.e., for the relationship between the items belonging to the paradigm. We will focus on paradigms organised around different axes. The axis of one of the paradigms is the relationship between the syntactic and the semantic categories (which Bonami & Strnadová 2019 call content) of the involved members of the pairs of the paradigm, specifically event/result/state noun ↔ verbs (Table 1). We call this kind of paradigm a categorial macro-paradigm (built upon a macro-pattern). Micro-paradigms result from specialisations (Lindsay & Aronoff 2013, Aronoff & Lindsay 2014, 2015, Aronoff 2016, Rodrigues in press) and selectional restrictions inside the categorial macro-paradigm.

Table 1: Categorial macro-paradigm event/result/state nouns ↔ verbs

categorial macro-paradigm event/result/state nouns ↔ verbs
<i>concretização</i> ‘bringing about’ ↔ <i>concretizar</i> ‘to bring about’ <i>esclarecimento</i> ‘clarification’ ↔ <i>esclarecer</i> ‘to clarify’ <i>beliscão</i> ‘violent pinch’ ↔ <i>beliscar</i> ‘to pinch’ <i>olhadela</i> ‘light and quick look’ ↔ <i>olhar</i> ‘to look’ <i>vozearia</i> ‘intensive and iterated bawl’ ↔ <i>vozear</i> ‘to bawl, to voice’

We propose that, inside the categorial macro-paradigm, there are micro-paradigms (built upon micro-patterns), whose axes may be formal features (Table 2), such as affixal operators, and semantic features (Table 3), which are revealed in the semantics of the items of the paradigm.

A categorial macro-paradigm such as event/result/state nouns ↔ verbs has several internal micro-paradigms:

- (i) micro-paradigms based on the formal structure of the affixal operator and on the categorial and wide semantic relationship between the items of the pairs, which correspond to series (Table 2);

Table 2: Micro-paradigms whose axes are affixes and the wide semantic relationships between the items of the pairs

micro-paradigm <i>-ção</i>	micro-paradigm <i>-ment(o)</i>	micro-paradigm <i>-ão</i>
<i>avaliação</i> ‘evaluation’ ↔ <i>avaliar</i> ‘to evaluate’	<i>conhecimento</i> ‘knowledge, knowing’ ↔ <i>conhecer</i> ‘to know’	<i>beliscão</i> ‘violent pinch’ ↔ <i>beliscar</i> ‘to pinch’
<i>verificação</i> ‘verification’ ↔ <i>verificar</i> ‘to verify’	<i>esclarecimento</i> ‘clarification’ ↔ <i>esclarecer</i> ‘clarify’	<i>empurrão</i> ‘sudden and violent push’ ↔ <i>empurrar</i> ‘to push’

- (ii) micro-paradigms based on semantic features of the derivatives (Table 3).

Table 3: Micro-paradigm whose axis is a semantic feature

micro-paradigm ‘intensity’
<i>beliscão</i> ‘violent pinch’ ↔ <i>beliscar</i> ‘to pinch’
<i>vozearia</i> ‘intensive and iterated bawl’ ↔ <i>vozear</i> ‘to bawl; to voice’
<i>flirtanço</i> ‘intensive flirtation’ ↔ <i>flirtar</i> ‘to flirt’

In some cases, where an affix is characterised by a strong specialisation, the formal feature is associated with a fine-grained semantic feature. Hence, the micro-paradigm is linked by both types of axes. In this case, we have:

- (iii) micro-paradigms based on fine-grained semantic and formal features (Table 4).

Table 4: Micro-paradigms whose axes result from the association between fine-grained semantic and formal features

micro-paradigm <i>-del(a)</i> ‘light and quick event’	micro-paradigm <i>-ari(a)</i> ‘iterated event’	micro-paradigm <i>-ão</i> ‘sudden and violent culmination of event’
<i>olhadela</i> ‘light and quick look’ ↔ <i>olhar</i> ‘to look’	<i>vozearia</i> ‘intensive and iterated bawl’ ↔ <i>vozear</i> ‘to bawl; to voice’	<i>encontrão</i> ‘collision; violent and sudden push’ ↔ <i>encontrar</i> ‘to find; to strike on’
<i>batedela</i> ‘light and quick beating/mixing’ ↔ <i>bater</i> ‘to beat; to mix’	<i>gritaria</i> ‘intensive and iterated uproar’ ↔ <i>gritar</i> ‘to shout’	<i>puxão</i> ‘violent and sudden pull’ ↔ <i>puxar</i> ‘to pull’

It may be argued that the cohesion between pairs of paradigms whose axes belong to the content level is weak, such as those presented in Tables 1 and 3, due to the meaning variation among derivatives. We follow Bonami and Strnadová (2019: 179) who state that the stability of contrasts between the pairs of derivational paradigms, and even of inflectional paradigms, is not intended to be absolute. It is undeniable, however, that there is a category that abstracts from variation and that holds for a paradigm. Having in mind the fine-grained differences in meaning, we uphold that macro and micro-paradigms exist and are the root of different levels of categorisation of cohesion between pairs.

The patterns may be situated at different levels. For example, *puxão* and *gritaria* share a meaning of ‘intensity’, thus constituting a higher paradigm (Table 3) than those in Table 4 and

a lower paradigm than the categorial macro-paradigm (Table 1). However, those form/meaning correlations appear in other categorial macro-paradigms (Table 5) and, thus, the correlation between the meaning of ‘intensity’ and, e.g., the suffix *-ão* is simultaneously above and inside the categorial macro-paradigms. It is above, because the ‘intensive’ suffix *-ão* works in more than one categorial macro-paradigm. It is inside, because there are other meaning/affix correlations working in each one of the categorial macro-paradigms. We have called the interfaces between paradigms built by this kind of interpenetration cross-paradigms (Rodrigues & Rodrigues 2018) (cf. Table 5).

Table 5: Cross-paradigms

	categorial macro-paradigm event/result/state noun ↔ verb	categorial macro-paradigm agent noun ↔ verb	categorial macro-paradigm evaluative noun/adjective ↔ noun/adjective
semantic macro-paradigm ‘intensity’	<i>puxão</i> ‘sudden and violent pull’ ↔ <i>puxar</i> ‘to pull’	<i>saltão</i> ‘grasshopper’ ↔ <i>saltar</i> ‘to jump’	<i>passarão</i> ‘big bird’ ↔ <i>pássaro</i> ‘bird’ <i>amarelão</i> ‘intense yellow’ ↔ <i>amarelo</i> ‘yellow’

The present study focuses on the plasticity of these interpenetrations, by analysing the case of *-ção* derivatives that manifest an ‘intensive/iterative’ meaning in Brazilian Portuguese, but not in European Portuguese, as revealed by the analysis of corpora and Google searches. Our aim is to examine how Portuguese and Brazilian native speakers of Portuguese react to *-ção* nouns with an ‘intensive/iterative’ meaning.

We propose that the suffix *-ção* is becoming cross-paradigmatic in Brazilian Portuguese, but not in European Portuguese, because, in BP, it has built an interface with a semantic ‘intensive/iterative’ macro-paradigm, where a suffix such as *-ão* is already at work.

In section 2, we will present more empirical data on the macro-paradigm of event/result/state nouns ↔ verbs in Portuguese and on the ‘intensive/iterative’ paradigm. Section 3 will be dedicated to the explanation of the experiments. Section 4 is dedicated to a general discussion.

2. Data

Data concerning Portuguese deverbal nouns may be found in Rodrigues (2008). The first study analyses a corpus of 8414 deverbal nouns. Since then, the initial corpus has been updated and expanded to include other corpora, specifically the *Corpus do Português*, the *Corpus de Referência do Português Contemporâneo* and *Linguatca*, as well as oral and written texts.

Portuguese presents fifteen suffixes that work in the event/result/state nouns ↔ verbs categorial macro-paradigm. The suffixes are *-ção*, *-ment(o)*, *-dur(a)*, *-agem*, *-nç(a)*, *-ão*, *-nç(o)*, *-id(o)*, *-ic(e)*, *-ari(a)*, *-d(a)*, *-nci(a)*, *-del(a)*, *-ç(o)* and *-ism(o)*.

Some of these affixes show specialisations (Rodrigues in press) in selectional restrictions (Rodrigues 2008, 2014) and in domains of knowledge (Rodrigues 2008), which makes them build micro-paradigms inside the macro-paradigm event/result/state nouns ↔ verbs, as shown in Tables 2, 3 and 4.

Among the suffixes that appear in the macro-paradigm of event/result/state noun ↔ verbs, the suffixes *-ão*, *-ari(a)*, *-nç(o)* and *-ism(o)* are semantically characterised by possessing an evaluative feature, specifically of ‘intensiveness/iterativeness’. The evaluative feature is observable in the derivatives that contain the suffixes and that contrast with derivatives

containing other suffixes correlated with the same verbs (e.g. *apagão* ‘blackout’ vs. *apagamento* ‘deletion’ ↔ *apagar* ‘to erase; to delete’).

These ‘intensive/iterative’ suffixes also appear in other categorial macro-paradigms:

- (i) *-ão* in the macro-paradigms of evaluative nouns/adjectives ↔ nouns/adjectives and of agent nouns ↔ verbs (*carrão* ‘big and expensive car’ ↔ *carro* ‘car’; *lindão* ‘very beautiful’ ↔ *lindo* ‘beautiful’; *saltão* ‘grasshopper’ ↔ *saltar* ‘to jump’);
- (ii) *-aria* in the macro-paradigm of quality nouns ↔ adjectives (*velharia* ‘old stuff’ ↔ *velho* ‘old’), in the macro-paradigm of locative nouns ↔ nouns (*livraria* ‘bookshop’ ↔ *livro* ‘book’) and in the macro-paradigm of quantity nouns ↔ nouns (*escadaria* ‘staircase’ ↔ *escada* ‘stair’);
- (iii) *-nç(a)* in the macro-paradigm of evaluative nouns ↔ nouns (*festança* ‘great party’ ↔ *festa* ‘party’);
- (iv) *-nç(o)* in the macro-paradigm of agent nouns ↔ verbs (*picanço* ‘shrike’ ↔ *picar* ‘to prick’), in the macro-paradigm of evaluative nouns ↔ nouns (*alfinetanço* ‘event of hurting someone with a pin’ ↔ *alfinete* ‘pin’) and
- (v) *-ism(o)* in the macro-paradigm of quality nouns ↔ adjectives (*fatalismo* ‘fatalism’ ↔ *fatal* ‘fatal’) and in the macro-paradigm of quantity nouns ↔ nouns (*sigilismo* ‘secrecy’ ↔ *sigilo* ‘secret; secrecy’).

In every categorial macro-paradigm where each mentioned suffix works, the derivatives of these suffixes display a semantic feature of ‘intensiveness/iterativeness’.

In Rodrigues (2008) we proposed that those suffixes operated in word formation on the basis of an interfaces model. In Rodrigues (2014), we developed the approach in terms of a paradigmatic model. The idea is that each one of the macro-paradigms where a suffix works crosses with the others by means of the suffix that works in them. In Rodrigues and Rodrigues (2018) the notion of cross-paradigm was developed and psycholinguistic data were used to highlight the mental existence of cross-paradigms.

Empirical data based on the analysis of Brazilian texts (Google and corpora) reveal that the derivatives of the suffix *-ção* present an ‘intensive/iterative’ meaning which is absent from European Portuguese texts.

Some of those occurrences are: *viajação* ‘intensive and iterated travel’, *passeação* ‘intensive and iterated walk’, *beijação* ‘intensive and iterated kissing’, *abração* ‘intensive and iterated hugging’, *chamação* ‘intensive and iterated call’, *abrição* ‘intensive and iterated yawning’, *chateação* ‘intensive and iterated boring’. The utterances present the following syntagmatic environment, in which the *-ção* noun:

- (i) is preceded by the determiner and predeterminer *toda* ‘all’ (e.g., *Não consegui dormir de tanta miação dos machos do lado de fora* ‘I couldn’t sleep with all that [intensive, iterated] meowing of the males outside’);
- (ii) is preceded by the determiners *aquela* ‘that’, *essa* ‘that’ or *esta* ‘this’ (e.g., *vamos continuar nesta viajação* ‘we will go on with this [intensive, iterated] travel’);
- (iii) occurs with both of the abovementioned items (e.g., *No meio dessa chateação toda, a gente merece umas risadinhas* ‘Among all that [intensive, iterated] boringness, we need laughter’);
- (iv) occurs with continuous aspect expressions such as *aos poucos* ‘little by little’ (*Nessa ouvição, aos poucos, a gente vai aprendendo o que é simples* ‘In that [intensive, iterated] listening, little by little, we go on learning what is simple’), *sempre* ‘always’, (*sempre tinha passeação daqui para lá* ‘there was always an [intensive, iterated] walk from one place to another’);

- (v) occurs with verbs in the gerundive form (*eu fui crescendo, ouvindo e escrevendo histórias. Nessa ouvição, aos poucos, a gente vai aprendendo o que é simples* ‘I have been growing up, listening and writing stories. In that [intensive, iterated] listening, little by little, we go on learning what is simple.’);
- (vi) occurs with aspectual verbs such as *continuar* ‘to go on’ (*vamos continuar nesta viagem* ‘we will go on with this [intensive, iterated] travel’);
- (vii) occurs with adjectives such as *indiscriminada* ‘indiscriminate’, *descontrolada* ‘uncontrolled’ (*Uma abração descontrolada e indiscriminada* ‘An uncontrolled and indiscriminate [intensive/iterated] hugging’), *desgovernada* ‘misruled’ (*a bebeção desgovernada* ‘a misruled [intensive/iterated] drinking’).

In order to evaluate whether the presence of these nouns in Brazilian texts and the absence in Portuguese ones have a correspondence in the mental lexicon of Brazilian and Portuguese speakers, we conducted two experiments that we describe next.

3. Experiments

3.1 Experiment 1: methodology

The first experiment consisted in a semantic decision task. The aim of the first experiment involving Brazilian Portuguese native speakers and European Portuguese native speakers was to evaluate their response time to strings of letters corresponding to Portuguese words, described in section 3.1.2, and their classification as ‘iterative/intensive’ or ‘non-iterative/intensive’.

3.1.1 Participants

The sample consisted of 40 participants. 20 (10 men and 10 women) were native speakers of European Portuguese. The other 20 participants (10 men and 10 women) were native speakers of Brazilian Portuguese. The 40 participants had normal to corrected-normal vision. The participants were undergraduate students at the Polytechnic Institute of Bragança (Portugal), without knowledge of linguistics, who participated voluntarily in the experiment. The ages of the groups ranged from 18 to 22. The Brazilian Portuguese native speakers participated in the experiment the first week after their arrival in Portugal.

3.1.2 Stimuli

The stimuli were comprised of 100 letter strings. These letter strings corresponded to 20 deverbal nouns with the iterative suffix *-ção*, found in Brazilian texts on Google, 20 non-constructed nouns functioning as fillers (here labelled *neutral words*), 20 event/result/state nouns bearing the same root as each one of the *-ção* derivatives, 20 deverbal nouns with the suffix *-ment(o)*, and 20 deverbal nouns with the suffix *-ão*. Of these 20 nouns with *-ão*, 10 were event deverbal nouns and the other 10 agent deverbal nouns (cf., Rodrigues 2008 for a distinction between the two). Fillers were used to avoid participants giving their answers from predictions built on the stimuli.

3.1.3 Procedure

The participants were presented with the stimuli at the centre of a PC screen, through a web platform using the client-server model. Stimuli were randomised. Before the real test, oral and written instructions (on the same platform) were given to the participants. The instructions

asked participants to press a specific key for words with an ‘intensive/iterative’ meaning (Y responses) and another key for words lacking that meaning (N responses) as quickly and precisely as possible. The keys were positioned at the same distance from the bottom of the keyboard.

Before the real experiment, a set of 10 words which did not contain the suffixes identified above were given to the participants, so that they could become familiar with the procedure.

The response time was measured from the onset of the stimulus and there was a time-out set to 5 seconds.

3.1.4 Predictions

Since we had only found in the corpora event/result/state nouns with the suffix *-ção* bearing an ‘intensive/iterative’ meaning in Brazilian Portuguese utterances and not in European ones, and having in mind the relationship between frequency and predictability in the speakers’ minds (Hawkins & Blakeslee 2004; Plag & Baayen 2009), we predicted that:

- (i) Since we had not identified *-ment(o)* words with an ‘intensive/iterative’ meaning in neither Brazilian or European Portuguese utterances in the corpora, both groups of participants would show a higher percentage of N responses than Y responses and the mean response time would be similar in both groups.
- (ii) Since event *-ção* words have an ‘intensive/iterative’ meaning in Brazilian and in European Portuguese, there would be a higher number of Y responses than N responses in both groups of participants and the mean response time would be similar in both groups.
- (iii) Since agent *-ção* words have an ‘intensive/iterative’ meaning in Brazilian and in European Portuguese, there would be a higher number of Y responses than N responses in both groups of participants and the mean response time would be similar in both groups.
- (iv) Since the chosen root words lack an ‘intensive/iterative’ meaning in Brazilian and in European Portuguese, both groups of participants would show a higher percentage of N responses than Y responses and the mean response time would be similar in both groups.
- (v) Since the chosen neutral words lack an ‘intensive/iterative’ meaning in Brazilian and in European Portuguese, both groups of participants would show a higher percentage of N responses than Y responses and the mean response time would be similar in both groups.
- (vi) Brazilian participants would have a higher rate of Y responses than Portuguese participants in *-ção* words and the mean response time to *-ção* words would be lower in Brazilian participants than in Portuguese ones.

3.1.5 Results

Both in Brazilian and in Portuguese participants, the classification of *-ment(o)* words with a N response was very high (99,8% Portuguese and 95,3% Brazilian participants) (Table 6). The remaining percentages in both groups were in time-out situations (2,8% in Brazilian participants and 0,3% in Portuguese ones). Only Brazilian participants gave Y answers in relation to *-ment(o)* stimuli, which occurred in a low percentage (2,0%). Concerning neutral words, Brazilian participants gave 98,3% N answers and Portuguese participants 96,3%. Neutral words were classified with the Y answer by 1,8% of the Brazilian participants and by 3,8% of the Portuguese. Root words were classified as ‘non-intensive/iterative’ by 80,0% of the Portuguese participants and by 75,5% of the Brazilian participants.

Negligible percentages of Y answers and time-out situations appeared in Brazilian participants (time-out: 0,0% for neutral words and 3,3% for root words; Y answers: 1,8% for neutral words). In Portuguese participants, time-out situations occurred for *-ment(o)* words in a total of 0,3%.

In what concerns ‘intensive/iterative’ words in Brazilian and in European Portuguese, specifically event *-ãõ* nouns and agent *-ãõ* nouns, both classes obtained a high percentage of Y answers both from Brazilian participants (agent *-ãõ* nouns 96%; event *-ãõ* nouns 97,5%) and Portuguese participants (agent *-ãõ* nouns with 97%; event *-ãõ* nouns with 99,5%). The percentage of N answers for those classes of stimuli for both Brazilian and Portuguese participants was negligible (both agent *-ãõ* and event *-ãõ* with 0,5% each in Brazilian participants; agent *-ãõ* with 1% and event *-ãõ* with 0,5% in Portuguese participants). The Portuguese participants presented 2% time-out results in relation to agent *-ãõ* nouns and none in event *-ãõ*. The Brazilian participants showed time-out situations concerning agent *-ãõ* nouns (2%) and agent *-ãõ* nouns (3,5%).

Interesting results were obtained with regard to *-çãõ* words. In Portuguese participants, 70% of the responses were N answers and 2,5% Y answers. Time-out occurred in 27,5% of the answers, which is the highest percentage of time-outs, comparing all the classes of stimuli in both groups of participants. In Brazilian participants, 93,8% of the answers were Y answers. N answers were residual (0,5%). Time-out occurred in 5,8% of the answers.

Mean response time showed interesting results in relation to *-çãõ* words. Portuguese participants presented a mean response time of 3503 ms in classifying *-çãõ* words as ‘non-intensive/iterative’ and 2546 ms in classifying them as ‘intensive/iterative’. These mean response times have no relation with the length of the letter strings of *-çãõ* words, which was 7.9, whilst the average length of *-ment(o)* words was 11,9 and the mean response time of N answers to *-ment(o)* stimuli was 1781 ms. The percentage of time-out situations involving *-çãõ* words in the Portuguese group is also worth noting (27,5%). In Brazilian participants, the percentages of Y and N answers to *-çãõ* words contrast with those from Portuguese participants. The mean response time for Y answers was 2658 ms. Time-out occurred in 5,8% of the participations.

Table 6: Results of experiment 1

Words-Brazilian participants					Words-Portuguese participants				
Answer	Class	Count	Perc	Time (ms)	Answer	Class	Count	Perc	Time (ms)
N	<i>-ment(o)</i>	381	95.3%	1965	N	<i>-ment(o)</i>	399	99.8%	1781
	neutral	393	98.3%	1227		neutral	385	96.3%	979
	root	314	78.5%	1377		root	320	80.0%	1159
	<i>-ãõ</i> agent	1	0.5%	1066		<i>-ãõ</i> agent	2	1.0%	2688
	<i>-ãõ</i> event	1	0.5%	1802		<i>-ãõ</i> event	1	0.5%	1449
	<i>-çãõ</i>	2	0.5%	2658		<i>-çãõ</i>	280	70.0%	3503
Time-out	<i>-ment(o)</i>	11	2.8%	5000	Time-out	<i>-ment(o)</i>	1	0.3%	5000
	neutral	0	0.0%	5000		neutral	0	0.0%	5000
	root	13	3.3%	5000		root	0	0.0%	5000
	<i>-ãõ</i> agent	7	3.5%	5000		<i>-ãõ</i> agent	4	2.0%	5000
	<i>-ãõ</i> event	4	2.0%	5000		<i>-ãõ</i> event	0	0.0%	5000
	<i>-çãõ</i>	23	5.8%	5000		<i>-çãõ</i>	110	27.5%	5000
Y	<i>-ment(o)</i>	8	2.0%	2227	Y	<i>-ment(o)</i>	0	0.0%	0
	neutral	7	1.8%	1768		neutral	15	3.8%	1317
	root	73	18.3%	1725		root	80	20.0%	1162

	-ão agent	192	96.0%	1545		-ão agent	194	97.0%	1278
	-ão event	195	97.5%	1426		-ão event	199	99.5%	1265
	-ção	375	93.8%	1692		-ção	10	2.5%	2546

3.2 Experiment 2: methodology

Since context influences decisions on lexeme meaning, the second experiment evaluates the response of participants regarding the ‘intensive/iterative’ meaning or not of the same words that constituted the stimuli of Experiment 1 provided in utterances.

Experiment 2 considers the principle of John Rupert Firth (1957: 11) formulated as follows: “You shall know a word by the company it keeps”, as remembered by Bonami and Paperno (2018: 178) (“properties of a word, including semantic properties that are otherwise notoriously hard if not impossible to characterize systematically, are reflected in and can be inferred from the distribution of the word in texts.”) and by Fradin (2018: 167) (“[...] the association of new meanings with morphological patterns can be deemed to be a discourse routed process.”).

3.2.1 Participants

The same participants of experiment 1.

3.2.2 Stimuli

The stimuli of experiment 2 comprised utterances that contained the words with the suffix *-ção* and the suffix *-ment(o)* presented as stimuli in experiment 1. Every utterance was found on Google or in *Corpus do Português*. For each of the words, one utterance was presented.

Regarding the syntagmatic co-occurrences of the nouns bearing the suffix *-ção* with the ‘intensive/iterative’ meaning, stimuli that comprised those words presented the event/result/state noun in utterances displaying the contexts focused on in section 2.

Stimuli with the suffix *-ment(o)* were presented without the environment described for *-ção* words.

3.2.3 Procedure

Stimuli were presented randomly at the centre of a PC screen, through a web platform using the client-server model. In each of the utterances, the target word (the words that constituted the stimuli of experiment 1) was highlighted in bold. Participants were given oral and written instructions (on the same platform) before the experiment began. The instructions asked participants to press a specific key for utterances where the word in bold had an ‘intensive/iterative’ meaning (Y responses) and another key for utterances where the word in bold lacked that meaning (N responses) as quickly and precisely as possible. The keys were positioned at the same distance from the bottom of the keyboard.

Before the real experiment, a set of 10 utterances which did not present the words identified above were given to the participants, so that they could become familiar with the procedure.

The response time was measured from the onset of the stimulus and there was a time-out set to a space of time dependent on the length in letters of each of the utterances.

3.2.4 Predictions

For experiment 2 we predicted that:

- (i) since we had not identified *-ment(o)* words with an ‘intensive/iterative’ meaning in neither Brazilian or European Portuguese utterances in corpora and that the utterances chosen as stimuli lack an ‘intensive/iterative’ semantic syntagmatic environment, both groups of participants would show a higher percentage of N responses than Y responses and the mean response time would be similar in both groups;
- (ii) since utterances containing *-çãõ* words presented an ‘intensive/iterative’ semantic syntagmatic environment, Portuguese participants would show a higher percentage of Y answers than N answers and time-out situations and the mean response time concerning these stimuli would be higher in Portuguese participants than in Brazilian ones, bearing in mind that *-çãõ* words with an ‘intensive/iterative’ meaning were only found in Brazilian occurrences.

3.2.5 Results

In Brazilian participants, *-ment(o)* words got 97,3% N answers, whereas the Portuguese participants gave 96,5%. Time-out situations were negligible (Table 7).

When introduced in utterances, *-çãõ* words showed a slight increase in Y answers among the Portuguese participants (5,8%) in comparison to the Y answers obtained in Experiment 1 (2,5%). The Y answers also increased among the Brazilian participants (99,5% in Experiment 2; 93,8% in Experiment 1). Time-out situations in the Brazilian participants regarding *-çãõ* stimuli were negligible (0,3%). The percentage of N answers from the Portuguese participants concerning *-çãõ* stimuli decreased from Experiment 1 (70%) to Experiment 2 (41%). The gain in Y answers was, however, very low (Experiment 1: 2,5%; Experiment 2: 5,6%). Time-out situations increased from 27,5% to 53,3%.

Table 7: Result of experiment 2

Utterances-Brazilian participants					Utterances-Portuguese participants				
Answer	Class	Count	Perc	Time (ms)	Answer	Class	Count	Perc	Time (ms)
N	<i>-ment(o)</i>	389	97.3%	4039	N	<i>-ment(o)</i>	386	96.5%	3666
	<i>-çãõ</i>	1	0.3%	3824		<i>-çãõ</i>	164	41.0%	7068
Time-out	<i>-ment(o)</i>	2	0.5%	8691	Time-out	<i>-ment(o)</i>	4	1.0%	10075
	<i>-çãõ</i>	1	0.3%	13080		<i>-çãõ</i>	213	53.3%	13084
Y	<i>-ment(o)</i>	9	2.3%	3545	Y	<i>-ment(o)</i>	10	2.5%	3642
	<i>-çãõ</i>	398	99.5%	5244		<i>-çãõ</i>	23	5.8%	6354

Except for the mean response time to the *-çãõ* stimuli, which was lower in Brazilian participants than in Portuguese ones, the predictions regarding the reaction of Portuguese participants to *-çãõ* words failed. Although we expected a higher percentage of Y answers to *-çãõ* words from Portuguese participants, the experiment revealed an increase in time-out situations.

4. General discussion

Experiment 1 revealed that our predictions were correct. When isolated from an utterance, *-çãõ* words were not labelled by Portuguese participants as having an ‘intensive/iterative’ meaning at a considerable rate. The low percentage of Y answers (2,5%), the majority of N answers (70%) and, very importantly, the percentage of time-out responses (27,5%, contrasting with 5,8% in Brazilian participants) may be interpreted as a sign of the lack of correlation between event nouns with the suffix *-çãõ* and an ‘intensive/iterative’ meaning in European Portuguese. The percentage of time-out responses (27,5%, contrasting with 5,8% in Brazilian participants) may show, however, an effect which is more salient on Experiment 2: the conflict between the

consistency of the *-ção* morphological series and the opacity of the particular *-ção* words which European participants were faced with. According to Dal Maso and Giraudo (2019: 298-301), consistent series, which are frequent, productive, morpho-semantically and morphotactically transparent and functionally and perceptually salient, show a stronger morphological effect than non-consistent ones, which may be seen in lower response times. In our experiments, the conflict may be observed in time-out situations, which have increased in European participants in Experiment 2 (53,3%) when compared with Experiment 1 (27,5%) and have decreased in Brazilian participants (Experiment 1: 5,8%; Experiment 2: 0,3%), and higher response times in European participants (in Experiment 1, European participants: 3503 ms in N answers and 2546 ms in Y answers vs. Brazilian participants: 2658 in N answers and 1692 in Y answers; in Experiment 2, European participants: 7068 ms in N answers and 6354 ms in N answers vs. Brazilian participants: 3824 ms in N answers and 5244 in Y answers).

The low mean frequency (0,024/million) of the particular words that constituted the stimuli seems to have no effective weight on the results, since: (a) the particular words had a low frequency in Brazilian texts, and did not behave as a factor in constraining Y answers (93,8%) in Brazilian participants, and (b) if the particular words had a low frequency, the morphological series frequency (cf. Dal Maso & Giraudo 2019 for the effect of morphological series in morphological processing) of event/result/state nouns with the suffix *-ção* was higher (6,717/million, according to the *Corpus do Português*). Moreover, results obtained from other stimuli with a low mean frequency, vis-à-vis event *-ão* words (0,988/million) and agent *-ão* words (0,437/million), which were mainly labelled as ‘intensive/iterative’ by Brazilian (respectively 97,5% and 96%) and Portuguese (respectively, 99,5% and 97%) participants, suggest that the answers had no correlation with the low frequency of each of the particular words, but rather with the fact that the ‘iterative/intensive’ meaning is absent from European Portuguese.

Not all the predictions concerning Experiment 2 were corroborated. Stimuli containing *-ment(o)* words were mainly classified as ‘non-intensive/iterative’, which was in accordance with our prediction. When introduced in utterances which contain a semantic syntagmatic ‘intensive/iterative’ meaning, contrarily to what we expected, *-ção* words did not show a higher rate of Y answers than N answers among Portuguese participants in Experiment 2, in comparison to Experiment 1. The semantic environment revealed insufficient to promote a shift in the mean interpretation of those words by Portuguese participants. The high percentage of time-out situations in Portuguese participants may reveal an unsolved conflict between the lack of a lexical association between *-ção* words and an ‘intensive/iterative’ meaning and the semantic syntagmatic environment that could promote it. The consistency morphological effect of the *-ção* morphological series is in conflict with the syntagmatic-semantic ‘intensive/iterative’ environment, among European participants, when faced with ‘intensive/iterative’ *-ção* words inserted in utterances that promote the ‘intensive/iterative’ interpretation’. Being *-ção* words highly consistent in European Portuguese (which may be evidenced by the high percentage of N answers obtained in Experiment 1), European participants seems to be confronted with features that emerge from the schema of *-ção* series (non-intensive/non-iterative) and with features that emerge from the syntagmatic semantic context.

The fact that there are some *-ção* words with an ‘intensive/iterative’ meaning in Brazilian texts and that Brazilian participants mainly label those words as having an ‘intensive/iterative’ meaning, whereas Portuguese participants do not, shows that, in Brazilian Portuguese, *-ção* is being used with an ‘intensive/iterative’ meaning, which does not occur in European Portuguese. How can we account for this change in BP and for this divergence between BP and EP?

The concept of cross-paradigms may provide an explanation. If cross-paradigms predict that affixal operators may put different paradigms into interface, and if there are micro-paradigms within the categorial macro-paradigm of event/result/state nouns ↔ verbs in Portuguese whose

semantic component has an ‘intensive/iterative’ meaning, we propose that, in Brazilian Portuguese, but not in European Portuguese, the micro-paradigm of *-çã* words has built an interface with *-ã* paradigms or other paradigms (*-nç(o)*, *-ari(a)*) that involve an ‘intensive/iterative’ feature in their semantics. The micro-paradigm of *-çã* words is, thus, involved in building a cross-paradigm.

Paradigms are not rigid structures. Instead, they are characterised by inter- and intra-plasticity. Inter-plasticity in the sense that paradigms may build new cross-paradigms, since *-çã* is building new associations with other paradigms. Intra-plasticity in the sense that the non-rigidity of paradigms reveals itself, not only in potential words, but also in (potential) new meanings that result from the interface with other paradigms.

This account would not be possible in a framework based on rules, since it does not permit this kind of plasticity in the construction of networks in word formation. Traditionally, as pointed out by Hathout and Namer (2019: 156), “word formation rules are binary and oriented”. The emergence of iterative *-çã* words would be explained in a rule-based approach by stipulating homonymous *-çã* suffixes, so that one of them could account for the ‘iterative’ meaning of the derivatives under focus. Such approach would leave aside the categorial macro-paradigm character of the ‘iterative’ *-çã* words within the non-iterative *-çã* words. Another rule-based strategy would consist on the specification of lexicalisation processes of semantic specialisation. However, there seems to be enough generalisation to leave those occurrences to idiosyncrasy. Following Hathout and Namer (2019: 159), a paradigmatic approach “aims to maximize the consistency of the paradigms that structure the lexicon”. Conceiving the plasticity of cross-paradigms is one way to design that consistency. Otherwise, a rule-based approach would leave one branch of *-çã* words idiosyncratic and non-integrated in the dynamic relationships built in the lexicon.

5. Conclusions

In this study we have presented empirical and experimental data on the consistency of paradigmatic derivational morphology. The occurrence of event nouns with the suffix *-çã* bearing an ‘intensive/iterative’ meaning in Brazilian Portuguese, but not in European Portuguese, led us to conduct two experiments with native speakers of both varieties of Portuguese. Experiment 1 revealed that European Portuguese speakers do not label the words selected in this study as having an ‘intensive/iterative’ meaning, contrarily to Brazilian Portuguese speakers. Experiment 2 revealed that, even when those words are provided in utterances containing a semantic syntagmatic environment which promotes the ‘intensive/iterative’ interpretation, European Portuguese speakers do not identify that meaning. Instead, there seems to be a conflict between their non-intensive/non-iterative expectations towards *-çã* words and the environment, which led to an increase of time-out situations and of response time in Experiment 2.

In a paradigmatic approach to word formation, these data may be interpreted as follows: In Brazilian Portuguese, but not in European Portuguese, the paradigm of *-çã* nouns is acquiring a cross-paradigmatic character in the sense it is showing a meaning which is not systematic in that paradigm, but which is systematic in other micro-paradigms that exist within the categorial macro-paradigm event/result/state nouns ↔ verbs. Paradigms reveal intra-plasticity and inter-plasticity in their relationships with other paradigms. Hence, a paradigmatic approach to word formation means we are able to better understand the dynamic, multidimensional and structured form that characterises the organisation and construction of the lexicon (Štekauer 2014; Antoniová & Štekauer 2015; Blevins 2016; Rodrigues & Rodrigues 2018). A paradigmatic framework is in accordance with psycholinguistic approaches to the mental lexicon (e.g., Elman

2011 and Libben 2014, 2015), which conceive it as “[...] a dynamic cognitive system that allows for lexical activity” (Libben 2015: 209).

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