

THE POSSESSIVE PASSIVE IN PORTUGUESE: A LEXICALIST APPROACH WITH A COMPUTATIONAL IMPLEMENTATION

A PASSIVA POSSESSIVA EM PORTUGUÊS: UMA ABORDAGEM LEXICALISTA COM UMA
IMPLEMENTAÇÃO COMPUTACIONAL

LA PASIVA POSESIVA EN PORTUGUÉS: UN ENFOQUE LEXICALISTA CON UNA
IMPLEMENTACIÓN COMPUTACIONAL

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ABSTRACT: The possessive passive is one of the most discussed grammatical phenomena of East Asian languages. In Portuguese, although common, it has apparently been discussed only by Lunguinho (2011, 2013, 2016) in a transformational approach with constructed examples. In this paper, we oppose this approach both theoretically and methodologically. On the one hand, we propose a purely lexicalist analysis based on the non-transformational LFG and LDG models. On the other, we resort to evidence extracted from authentic texts. This twofold strategy allows us to explain data that do not fit Lunguinho's proposal. We argue that the distinctive properties of this passive variety result from a lexical rule that extends the argument structure of the verb *ter* 'have', by incorporating a predicate variable into its semantic form. This variable is linked to a predicative argument, turning *ter* into an object control *equi* verb.

KEYWORDS: Possessive passive. Non-canonical passive. Lexical-Functional Grammar (LFG). Predicate decomposition. Computational linguistics.

RESUMO: A passiva possessiva constitui um dos fenômenos gramaticais mais discutidos das línguas do leste asiático. Em português, embora comum, foi discutida, segundo parece, unicamente por Lunguinho (2011; 2013; 2016), numa abordagem transformacional, utilizando exemplos construídos. No presente artigo, contrapomo-nos a essa abordagem tanto no plano teórico quanto no metodológico. Por um lado, propomos uma análise puramente lexicalista no quadro dos modelos não transformacionais LFG e LDG. Por outro, recorreremos a evidências extraídas de textos autênticos. Essa dupla estratégia permite explicar dados que não se

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encaixam na proposta de Lunguinho. Argumentamos que as propriedades distintivas dessa passiva resultam de uma regra lexical que estende a estrutura argumental de *ter* pela incorporação de uma variável de predicado à sua forma semântica. Essa variável é vinculada a um argumento predicativo, tornando *ter* um verbo de controle do objeto do tipo *equi*.

PALAVRAS-CHAVE: Passiva possessiva. Passiva não canônica. Gramática Léxico-Funcional (LFG). Decomposição de predicados; Linguística computacional.

RESUMEN: La pasiva posesiva es uno de los fenómenos gramaticales más discutidos en los idiomas de Asia oriental. En portugués, aunque es común, fue discutido, aparentemente, solo por Lunguinho (2011, 2013, 2016), en un enfoque transformacional utilizando ejemplos contruïdos. En este artículo, nos oponemos a este enfoque tanto teórica como metodológicamente. Por un lado, proponemos un análisis puramente lexicalista basado en los modelos no transformacionales LFG y LDG. Por otro lado, recurrimos a evidencias extraïdas de textos auténticos. Esta doble estrategia nos permite explicar datos que no se ajustan a la propuesta de Lunguinho. Argumentamos que las propiedades distintivas de esta variedad pasiva resultan de una regla léxica que extiende la estructura de argumento del verbo *ter* 'tener' al incorporar una variable predicativa a su forma semántica. Esta variable está vinculada a un argumento predicativo, convirtiendo *ter* en un verbo *equi* de control de objeto.

PALABRAS CLAVE: Pasiva posesiva. Pasiva no canónica. Gramática Léxico-Funcional (LFG). Descomposición de predicados. Lingüística computacional.

1 INTRODUCTION

In “Aurora”, Kim Stanley Robinson leads the reader through the perils of an intergalactic journey (ROBINSON, 2015). One of the most interesting aspects of this story is that, for the most part, it is narrated by the spacecraft’s artificial intelligence (AI), which helps its inhabitants solve the most varied problems, interacting with them in natural language. To do so, the system has available all human knowledge digitally stored in texts, whose zettabytes of information it is able to extract, organize, and apply to cognitive tasks as complex as elaborating a literary narrative.

It is uncertain whether someday an AI system could, by self-learning, achieve the mastery of a narrator like Robinson himself. However, question answering (Q&A) systems have for some time been aiding aircraft maintenance technicians, interacting with consumers of transport companies, providing real estate, tourist, and weather information, etc. (KOTSEV, 2010). One of the strategies underlying some of these systems is automatic information extraction (IE) from natural language texts, used by dozens of general or domain-specialized softwares, and indispensable in several fields, contributing to the analysis of large datasets (big data). Perhaps the most successful case of use of these two technologies is IBM’s Watson which, in 2011, defeated two former champions of *Jeopardy!*, a North American television quiz show (WATSON, 2017).

Q&A and IE belong to the natural language processing (NLP) sub-area called text understanding. IE consists of converting information that is only implicitly structured in texts into data structures (MEHLER; LOBIN, 2004, p.1). One of the components of the architecture of text understanding systems, such as Watson, is an automatic parser, whose analyses constitute input for building semantic representations of sentences (MCCORD; MURDOCK; BOGURAEV, 2012).

Consider the following fragments extracted from real texts:

(1) os torcedores tinham quebrado os vidros do quiosque (Google)
the fans have:IMPF;3PL break:PTCP the windows of the kiosk
‘The fans had broken the windows of the kiosk’

(2) Vidraças da sede do banco RBS foram quebradas por manifestantes (Google)
windowpanes:F;PL of the headquarters ... be:PRF;3PL break:PTCP;F;PL by protesters
‘Windowpanes of the RBS bank’s headquarters were broken by protesters’

(3) Bancos da região central tiveram vidraças quebradas pelos manifestantes. (Google)

banks ... have:PRF;3PL windowpanes:F;PL break:PTCP;F;PL by protesters

'Windowpanes of banks in the central region were broken by protesters.'

Intuitively, (1)-(3) express the same type of situation under different guises. This commonality is modeled in IE by means of a template, a data structure consisting of slots referring to the different semantic roles of a relation. These slots are automatically filled by entities extracted from texts in natural language, allowing unstructuredly encoded information to feed an ontology (KIRSTEIN-JOST, 2010), constitute answers for users of Q&A systems, etc. For example, we can schematize the semantic relations expressed by (1)-(3) through the DEPREDATION template, covering events such as *quebrar* 'break', *destruir* 'destroy', *depredar* 'depredate', etc., and including the roles PERP(etrator), TARGET, and POSS(esso)R (CHAMBERS; JURAFSKY, 2011). The application of this template to (1)-(3) reveals the underlying structure common to the different surface configurations:

(4) PERP: fans, TARGET: windows, POSSR: kiosk

(5) PERP: protesters, TARGET: windowpanes, POSSR: RBS bank

(6) PERP: protesters, TARGET: windowpanes, POSSR: banks in the central region

This example highlights the need for the architectures of IE and Q&A systems to take into account the different types of syntactic constructions. The IE system proposed by Chambers and Jurafsky (2011), for example, dispenses with the manual elaboration of templates, which are instead extracted from texts and automatically filled in. To do so, the system uses, among other resources, a parser, to label the grammatical functions of the occurrences of verbs that make up the templates, and to convert all of the passive sentences into the corresponding active ones. Thus, by taking this approach, the extraction of (5) from (2) would imply transforming this sentence into its corresponding active, in the form, therefore, of (1). Since (3) expresses the same type of relation as (2), it would also need to undergo an analogous transformation.

Sentence (3) exemplifies a construction of Portuguese that, although common in both the Brazilian and the European varieties, apparently has not yet been investigated, except for Lunguinho's approach (2011, 2013, 2016) within the framework of the Minimalist Program (MP). On the contrary, labeled possessive passive, its counterpart in East Asian languages, where it is pervasive, has been widely discussed (HUANG, 1999, p.51). In Korean and Japanese, which form the passive synthetically, the same derived verb form is used both in the direct passive (corresponding to (2)), and the possessive passive (corresponding to (3)) (OSHIMA, 2004). In both passive types, the participant realized as subject in the active is demoted to an oblique function. In the possessive passive, however, the direct object of the verb in the active is preserved, while a participant that does not belong to the source argument structure is promoted to subject. The term *possessive passive* arises from the constraint that some kind of possession relation must subsist between the referents of the subject and the direct object in this construction.

In this paper, we analyze the possessive passive of Portuguese, both in its grammatical and semantic dimensions, based on real data, extracted from recent texts of the most diverse genres and registers of the Brazilian variety. The model that underlies the first dimension of the analysis is Lexical-Functional Grammar (LFG), a non-transformational generative theory in which grammatical functions and the lexicon play a central role. The fundamental representation level of the model is functional structure, which constitutes input for the representation of sentence meaning. We deal with the semantic aspects of the possessive passive from the perspective of Lexical Decomposition Grammar (LDG), a lexicalist theory of argument linking and verb alternations, based on predicate decomposition (WUNDERLICH, 2000).

One of the advantages of LFG in comparison to other generative approaches, such as the MP, is the complete formalization, facilitating computational simulation of specific grammatical phenomena or parser compilation. LFG has been used for text understanding, in IE systems (NOVICHKOVA; EGOROV; DARASELIA, 2003), Q&A (BOBROW et al., 2007), etc. An attraction of LFG for linguistics students and researchers is the Xerox Linguistic Environment (XLE), a free grammar development environment available for non-commercial purposes. A substantial part of the architecture of the model can be implemented in this system in smaller or larger grammars, without the need for in-depth computer skills. XLE allows one to compile parsers from these grammars and apply them to individual sentences or entire corpora, providing a number of features for evaluating results. Thus, a given proposal of analysis of a given grammar fragment can be automatically tested on a vast dataset. Analogously, alternative approaches to the same set of phenomena can be automatically compared for complexity. This evaluation methodology is not feasible in the case of proposals elaborated in theories that are not completely formalized and, therefore, not directly implementable, such as the MP.¹

The grammar analysis proposed herein was implemented in XLE within the framework of BrGram (ALENCAR, 2013), a grammar of medium syntactic coverage, capable of analyzing nontrivial examples such as (1)-(3), thus filling a gap in Santos' grammar (2014), which does not include the possessive passive.² In this way, BrGram can directly contribute to systems of text understanding.

In the next section, we present the theoretical framework that underlies the grammatical analysis and the computational implementation of the Portuguese possessive passive in section 4. This proposal offers a solution to several questions raised by previous studies on the phenomenon in Korean, Japanese, and Portuguese, summarized in section 3. The last section presents the conclusions and offers suggestions for future work.

2 LEXICAL-FUNCTIONAL GRAMMAR

LFG is a branch of generative grammar. However, it opposes the models proposed by Chomsky, like the MP, from which it diverges in relation to syntactic transformations. In LFG, only transformations in the lexicon are allowed, via lexical rules.

¹ According to Falk (2001, p.65), the MP is a *semi-formalized* theory.

² BrGram is available at this address: <https://github.com/LFG-PTBR/BrGram>.

"Os torcedores tinham quebrado os vidros do quiosque."

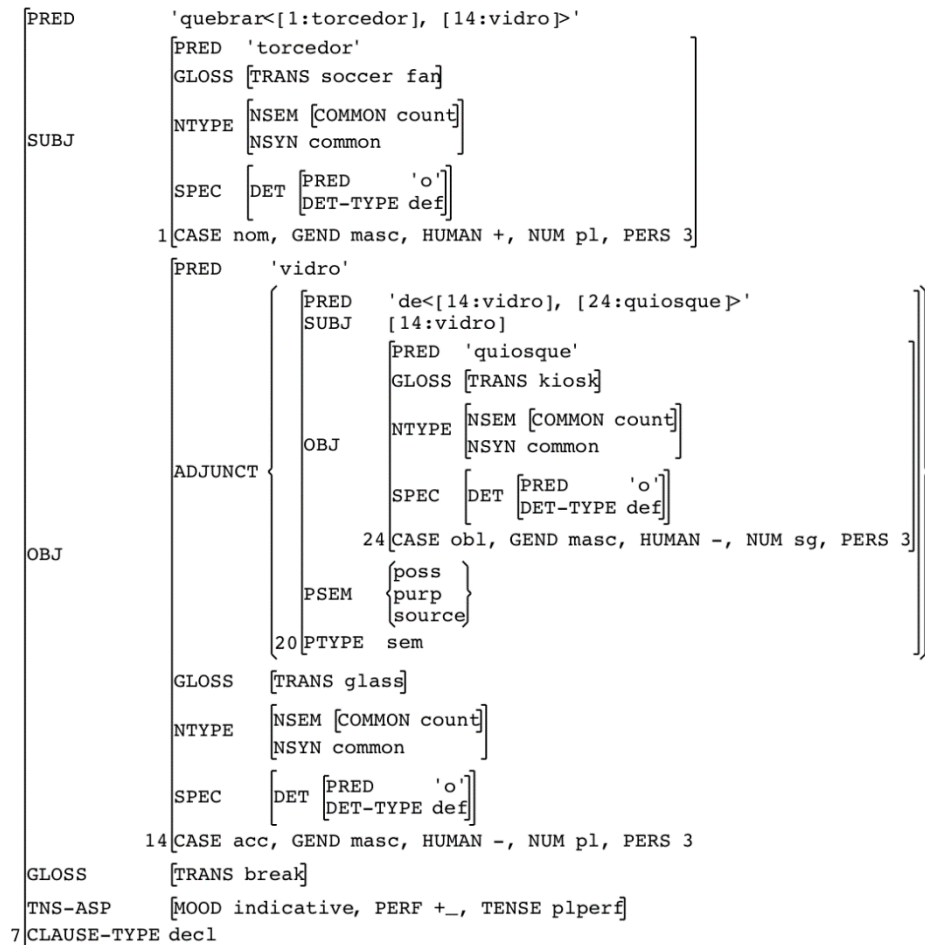


Figure 1: F-structure of example (1) generated by BrGram

Source: Own elaboration

Another difference from transformational approaches results from the Lexical Integrity Principle (henceforth LIP), according to which words are the atoms of syntax. Thus, processes of the syntactic component can not manipulate elements that do not constitute words, for example heads such as v^* , adopted by Lunguinho (2011, 2013, 2016) in his analysis of the possessive passive within the MP framework. In LFG, due to the LIP, the encoding of a wide range of phenomena analyzed by means of syntactic processes in transformational models is transferred to the lexical component. The lexicon, thus, takes on an enormous importance in this theory.

LFG postulates three fundamental projections to represent the grammatical properties of a sentence, of which only the first two are implemented in XLE and, therefore, in BrGram: (i) phrase or constituent structure (c-structure), (ii) functional structure (f-structure), and (iii) argument structure (a-structure). The first is represented by tree diagrams. The second encodes, among other properties, the grammatical functions. The third is a list of features that encode the syntactically relevant aspects of the semantic roles of a predicate. Other projections are provided in the model, such as phonological structure, semantic structure (s-structure), and information structure (FALK, 2001).

The most important projection, in the present context, is the f-structure, which constitutes input for the construction of the representation of sentence meaning. The main information represented in this structure consists of grammatical functions such as SUBJ (subject), OBJ (direct object), and so on. At this level, properties such as tense, mood, aspect, and voice are also encoded.

F-structure consists of an attribute-value matrix, where a given attribute can have an atomic value or another f-structure as a value, as in Figure 1, which follows the notation of King (2004), to whom we refer for the expansion of abbreviations used in the figures of

this article. We assign f_1, f_2, \dots, f_n to the f -structures of indices 1, 2, ..., n . In Figure 1, f_7 has the attributes PRED (predicate), SUBJ, and OBJ. The value of the first is the semantic form (7), where *quebrar* ‘break’ is a predicate of two arguments, saturated by f_1 and f_{14} , i.e. by the values of the attributes SUBJ and OBJ, whose semantic forms are the lemmas *torcedor* ‘fan’ and *vidro* ‘window’. Abstracting away from the mood-tense information, (7) translates to *quebrar*(t, v) in predicate logic, where t and v refer to the entities denoted by SUBJ and OBJ.

(7) 'quebrar <[1: torcedor], [14: vidro]>'

The other example of grammatical function of Figure 1 is ADJUNCT, which encompasses not only adnominal adjuncts, as in this case, but also adverbial adjuncts. Unlike SUBJ and OBJ, ADJUNCT is not subcategorized. The value of ADJUNCT is a set of f -structures, represented by braces. In the example at hand, this set has a single member, whose semantic form is the representation of the preposition *de* ‘of’ with its arguments in (8). This preposition expresses possession (*poss*), purpose (*purp*), or source (*source*) (KING, 2004).³ In a text understanding system, the disambiguation between these different meanings is taken care of by a later module in the processing pipeline.

(8) de <[14: vidro], [24: quiosque]>'

Formulas such as (7) and (8) can be used in an IE system to fill in templates such as DEPREDATION by simply linking the arguments of these formulas to the different slots: the PERP and the TARGET are the first and second arguments of (7), respectively, while POSSR is the second argument of (8).

Figure 1 exemplifies the treatment given in BrGram to the auxiliaries used in verbal periphrases like (1). These auxiliaries are analyzed as instances of the Inflection category (hereafter I), devoid of lexical meaning and, therefore, of a PRED attribute (FALK, 2001). Thus, they do not constitute a predicational and/or clausal domain by themselves, contributing to the structure F of the sentence only with features such as person, number, tense, mood, aspect, etc. In the example in question, there is a single sentence domain, consisting of the verb *quebrar* ‘break’. The auxiliary *ter* ‘have’, implemented as an I head, only contributes with the features MOOD=indicative and TENSE=plperf, specifying the mood and tense of the sentence as indicative and pluperfect.

In (9), we have an example of a lexical entry in the notational variant of the LFG formalism used in XLE, in this case for the word form *quebrado* ‘broken’ from example (1). In this entry, the first line expresses the lexical category (V=verb) followed by the predicate *quebrar* ‘break’, whose arguments must be realized by the SUBJ and OBJ functions. This formula, thus, also specifies the syntactic valence or subcategorization frame of the verb. In the second line of the entry, each of the two abbreviations preceded by “@” is a template call. Templates in XLE are analogous to subroutines or functions in programming languages such as C or Python. The @PSTPT and @ACT templates specify that this verb form is an active past participle.

(9) quebrado V * (^ PRED)=‘quebrar<(^ SUBJ)(^ OBJ)>’
@PSTPT @ACT.

In BrGram, different valence classes are encoded by means of templates, simplifying the elaboration of lexical entries. For divalent verbs of the type of (9), which govern an OBJ and are passivizable, the TRNS (transitive) template (10) is defined. This template takes the verbal lemma as a parameter, represented by the P variable. Invoking this template with the parameter *quebrar* ‘break’, the encoding of the semantic form of (9) can be simplified to (11).

(10) TRNS(P) = (^ PRED)=P<(^ SUBJ)(^ OBJ)>’.

(11) quebrado V * @(TRNS quebrar)

³ This list is far from exhausting the wide range of relations covered by the preposition *de*. New values will be included in future versions of BrGram.

Another subcategorized grammatical function that is relevant to our analysis of the possessive passive is the XCOMP predicative complement, characterized by the empty position of its subject in C-structure. This function is realized in f-structure by a nuclear grammatical function of the matrix verb, establishing a control relation between the two functions. In (12)-(14), the controlling function is the OBJ of the matrix verb. The head of an XCOMP can be any lexical category (N, V, A, etc.).

(12) O prefeito [...] convenceu os manifestantes a terminarem o protesto. (Google)
 the mayor persuaded the protesters to end:INF;3PL the protest
 'The mayor persuaded the protesters to end the protest.'

(13) A juíza [...] julgou improcedente a reclamação trabalhista. (Google)
 'The judge dismissed the labor claim as unfounded.'

(14) o sapateiro viu o bandido fugir em uma bicicleta (Google)
 'The cobbler saw the thug run off on a bicycle.'

"O prefeito convenceu os manifestantes a terminarem o protesto."

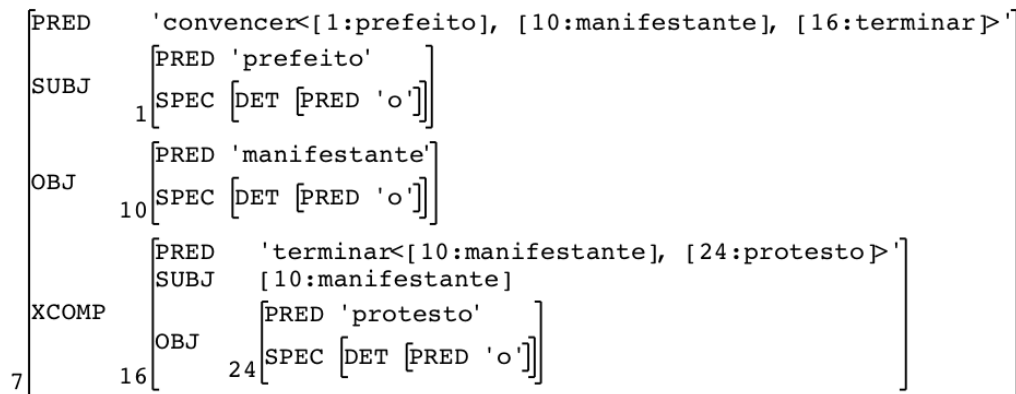


Figure 2: Simplified f-structure generated by BrGram for example (12)

Source: Own elaboration

Figure 2 exemplifies the control operation. In this example, the arguments of the predicate *convencer* 'persuade' are filled by f1, f10, and f16. These are the values of the SUBJ, OBJ, and XCOMP attributes, respectively. The semantic representation of f16 is the dyadic predicate *terminar* 'end', whose arguments are filled by f10 and f24, i.e., the values of the SUBJ and OBJ attributes. Thus, this example has a biclausal structure, formed by a matrix sentence headed by the verb *convencer* and an embedded sentence, argument of this verb, headed by the verb *terminar*. In contrast, the structure of Figure 1 is monoclausal. Since f-structure constitutes input for the projection of s-structure, the structure of Figure 2 projects a bipredicational s-structure, while the structure F of Figure 1 projects a monopredicational s-structure.

LFG models the relation between the controlling and the controlled functions by means of an equation in the lexical entries, as in the second line of (15). This equation concomitantly ensures agreement between these two grammatical functions, blocking examples like (16).

(15) convenceu V * (^ PRED)='convencer<(^ SUBJ)(^ OBJ)(^ XCOMP)>'
 (^ XCOMP SUBJ) = (^ OBJ)

(16) *O prefeito convenceu o manifestante a terminarem o protesto.
 the mayor persuaded the protester to end:INF;3PL the protest.

In BrGram, the encoding of control verbs is also simplified by means of templates, which allow for modeling properties common to different classes of verbs of this type. For example, in the elaboration of entries for object control verbs, the use of template (17) allows for condensing the information from the two lines of code of (15) into a single line, as exemplified in (18).

(17) O-CTRL (P) = (^ PRED) = 'P <(^ SUBJ) (^ OBJ)
 (^ XCOMP SUBJ) = (^ OBJ).

(18) convenceu V * @ (O-CTRL convencer)

Control verbs are classified into two classes, according to the relation of the controlling function to the matrix verb, namely equi type verbs and raising verbs. The verb of (15) falls into the first class, in which the controller realizes a semantic argument (i.e. a theta role) of the matrix verb. This is not the case with raising verbs, for example, aspectual verbs (*começar* 'to begin', *cessar* 'to cease', etc.), and causative verbs like *fazer* 'to make'. For example, in (19), it is not the matrix verb that imposes selection constraints on its OBJ, but the embedded verb. Subcategorized grammatical functions that do not realize a theta role are represented in LFG outside the angled brackets, as in (20).

(19) A iniciativa fez os ladrões fugirem. (Google)
 'The initiative made the robbers flee.'

(20) fez V * (^ PRED)='fazer<(^ SUBJ)(^ XCOMP)>(^ OBJ)
 (^ XCOMP SUBJ) = (^ OBJ)

Figure 3 exemplifies the raising verb analysis of passive *be*, defended by Morais (1988), Patejuk and Przepiórkowski (2014), etc.⁴ The most external predicate is *ser* 'be', which governs two functions: an XCOMP-PRED and a SUBJ, of which only the first one constitutes a semantic argument. In f23, we practically have the same formula (7) of the active counterpart of this sentence, the only difference being that the first argument slot in the passive structure is realized by the f-structure of the OBL-AG, the passive agent, while the second slot is filled by the f-structure of the SUBJ. The two formulas express the same semantic relation, resulting in the same filled in template of (4).

"Os vidros do quiosque tinham sido quebrados pelos torcedores."

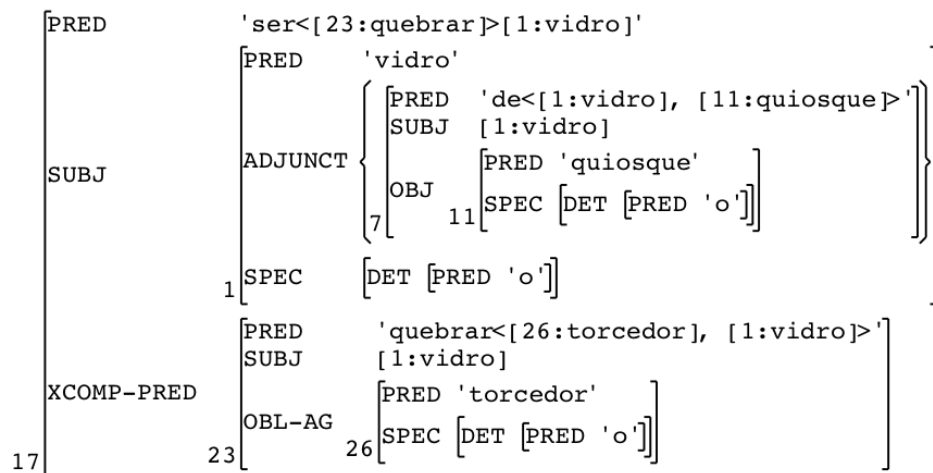


Figure 3: Simplified f-structure generated by BrGram for the passive counterpart of the example of Figure 1

Source: Own elaboration

⁴ This is a matter of controversy in LFG.. Bresnan (2001: 116), for example, classifies this element in English as I.

Due to the LIP, LFG adopts a purely lexical analysis of verbal diatheses, such as passivization, possessor raising, etc., explaining them based on the argument structures of verbs. This level of representation is manipulated by lexical rules, processes that affect the phonological, syntactic, and/or semantic representations of lexical entries, generating new entries. They, therefore, make it possible to dispense with the individual encoding of lexical entries, simplifying lexicon development. In XLE, the modeling of lexical rules responsible for diatheses such as the passive resort to the LFG model of the early 1980s. In this model, the passive involves the manipulation of grammatical functions according to the transformations of (21), which can be implemented in XLE by means of a template (CROUCH et al., 2011). In the first transformation, the OBJ becomes the SUBJ. The second transformation involves two alternatives, connected by the logical disjunction "|": either the SUBJ is transformed into an OBL-AG, or suffers erasure (indicated by NULL).

$$(21) (^{A} \text{OBJ}) \rightarrow (^{A} \text{SUBJ}) \\ \{ (^{A} \text{SUBJ}) \rightarrow (^{A} \text{OBL-AG}) \mid (^{A} \text{SUBJ}) \rightarrow \text{NULL} \}$$

3 PREVIOUS ANALYSES

Given the typological proximity between Korean and Japanese (BUSSMANN, 2002, p.383), it is not surprising that these languages share the same superficial syntactic pattern in the possessive passive. However, according to Oshima (2004), there are many differences in this matter between the two languages. In the first place, the range of relations between subject and object referents is much broader in Japanese, which permits “any pragmatically significant relation” (p.16). Second, inanimate subjects are admitted in the Japanese construction, which is restricted in Korean to animated subjects. Third, the Japanese possessive passive (like the direct passive) does not imply that the subject is adversely affected, a characteristic of the indirect passive, a type that does not exist in Korean. On the contrary, the two Korean passives imply that the subject, when animated, is adversely affected. Fourth, only the Japanese passive suffix is productive, its counterpart in Korean being restricted to lexicalized forms. The fifth difference concerns the ambiguity of the passive suffixes. In Korean, this suffix also functions as a causativizer. In Japanese, instead, depending on the type of relation between the subject and the object, certain passive sentences can be interpreted as both possessive and indirect passives. The last difference refers to the amount of strata of the construction in each language. In Japanese, the possessive passive, like the other two types, constitutes a bistratal semantic structure, expressing a stative relation of somebody’s lack of control over someone else’s action, involving three participants: an actor, an undergoer, and an “effect”, of which the second participant functions as an actor (OSHIMA, 2003). This complexity of the Japanese passive at the semantic level, however, does not reflect itself on the syntactic level. A passivized verb stem functions syntactically as a single verb, with a valence frame that specifies a subject, a dative complement, and an accusative complement. In this way, the syntactic and semantic structures of passivized Japanese verbs are analogous to those of causativized verbs (OSHIMA, 2003). In Korean, both passive variants are syntactically and semantically monostratal. The additional argument of the possessive passive results, according to Oshima (2004), from possessor raising, which he considers a common process in this language.

In his thesis on auxiliary verbs, Lunguinho (2011) compares the two types of Portuguese passives, the “canonical” one with auxiliary *ser* ‘be’, and the “non-canonical” or “adversative” one with auxiliary *ter* ‘have’. Both are formed with the passive participle, which is restricted to verbs with an external argument and a direct internal argument. The passive participle agrees with the latter argument. Therefore, it differs from the perfect participle, which does not undergo this argument restriction nor exhibits agreement. Other common properties between the two passives are the demotion of the external argument, and the promotion of the direct internal argument. Based on constructed grammatical and ungrammatical examples, he presents the differences between the two types, for which he proposes an explanation in the MP framework. As this proposal was reformulated in later studies (LUNGUINHO, 2013, 2016), which we will deal with next, we limit ourselves to the aspects to which we are opposed in our proposal.

The first aspect refers to the position of the internal argument relative to the participle. For Lunguinho (2011), the latter must follow the former, as in (3), whereby (22) would be ungrammatical.

$$(22) *A \text{ porta teve concertada a maçoneta (pelo marceneiro). (p.43)}$$

the door have:PRF;3SG repair:PTCP;F;SG the doorknob:F;SG (by the carpenter)

The second aspect refers to the licensing of an empty category (*ec*) in the possessor position, as in (23). Lunguinho considers this *ec* a trace left by possessor raising, and it can also occur within an indirect internal or external argument, as in (24) and (25), respectively.

Linguinho states that “only canonical passives allow the possessor and the possessed to remain united as a constituent” (p.74). He admits that there is no explanation for the obligatoriness of the possessor movement to specifier of category T(ense), which prevents the derivation of sentences like (26).

(23) *ele_i teve conversas ec_i interceptadas pela PF* (Google)

he_i have:PRF;3SG conversations:F;PL ec_i intercept:PTCP;F;PL by the Federal Police
 ‘conversations of his were intercepted by the Federal Police.’

(24) *Byron_i teve cinco anos acrescentados à pena ec_i*.⁵

Byron have:PRF;3SG five years:M;PL add:PTCP;M;PL to the sentence
 ‘Five years were added to Byron’s sentence.’

(25) *[O Pedro]_i teve as contas ec_i pagas pelo pai ec_i*. (p.72)

Peter_i have:PRF;3SG the bills:F;PL ec_i pay_for:PTCP;F;PL by the father ec_i
 ‘Peter’s bills were paid for by his father.’

(26) **Nesse momento tem o suspeito a casa revistada pela polícia*. (p.76, n.27)

at this moment have:PRS;3SG the suspect the house:F;SG search:PTCP;F;SG by the police

Linguinho remarks that he uses *possessor* as a generic term to also cover cases in which the empty category does not necessarily correspond to the possessor of an alienable (v. 72) or inalienable possession relation (see (44)), but instead constitutes an argument of a relational noun (see 84) or of a whole-part relation (see (3)) or the theme of a deverbal noun (see (65)).

The third aspect concerns the realization of the possessor as a lexical pronoun, in which case Linguinho claims there is no difference in markedness with regard to its realization as an empty category:

(27) *Ele teve uma conversa dele grampeada e divulgada* (Google)

he have:PRF;3SG a conversation:F;SG of his bug:PTCP;F;SG and disclose:PTCP;F;SG
 ‘A conversation of his was bugged and disclosed.’

(28) *Ela teve uma conversa sua [...] impressa pelo diretor da escola* (Google)

she have:PRF;3SG a conversation:F;SG 3POSS:F;SG print:PTCP;F;SG by the principal of the school
 ‘A conversation of hers was printed by the school’s principal.’

The fourth aspect refers to the properties of the auxiliary *ter* ‘have’. According to Linguinho, this auxiliary assigns a thematic role to its subject and licenses accusative Case on the internal argument of the participle. The author admits that this behavior goes against his own definition of auxiliary as a category unable of selecting an argument and assigning a thematic role. However, he justifies this exceptionality by the incorporation of the auxiliary *ser* ‘be’ into *ter* ‘have’ (p.80). He does not, however, specify the thematic role assigned by *ter*, limiting himself to characterizing it as “compatible with the interpretation of affection” (p.77), generally associated, as he claims, with the argument in subject position.

⁵ Based on the following occurrence extracted from Google results, analogous to Linguinho’s (2011, p.72) example (63a): *Byron Moreno está preso e deve ter cinco anos acrescentados à pena*. (‘Byron Moreno is imprisoned and must have five years added to his sentence.’).

For Lunguinho (2013, p.2), (29) is ambiguous between readings (30a) and (30b), which correspond to questions (31a) and (31b), respectively:

- (29) O João tem dois artigos citados pelo Chomsky.
John have:PRS;3SG two articles:M;PL cite:PTCP;M;PL by Chomsky.
- (30) a. O João possui dois artigos citados pelo Chomsky.
'John possesses two articles cited by Chomsky.'
b. Dois artigos do João são citados pelo Chomsky.
two articles:M;PL of the John be:PRS;3PL cite:PTCP;M;PL by the Chomsky
'Two articles by John are cited by Chomsky.'
- (31) a. O que o João tem?
'What does John have?'
b. Por quem o João tem o trabalho citado?
by whom the John have:PRS;3SG the work:M;SG cite:PTCP;M;SG
'By whom was John's work cited?'

Linguinho (2013) calls the construction of (29), in reading (30a), possessive and, in reading (30b), non-canonical passive, as in his previous work. As evidenced by (31a) and (31b), different syntactic structures underlie the two readings. In the first interpretation, the verb *ter* (hereinafter *ter1*) expresses a relation of possession between its external and internal arguments, while the past participle constitutes a modifier of the latter.

In the second interpretation of (29), Linguinho points out, the referent of [John] does not function as possessor of [*two articles*], but as author. He claims that, in this case, *ter* functions as an auxiliary (hereafter *ter2*), analogously to *ser* 'be' in the canonical passive. He concludes from (32) that the non-canonical passive, besides exhibiting an additional argument, differs from the canonical passive by not allowing an expletive in the subject position.

- (32) São/*Têm citados pelo Chomsky dois artigos do João. (p.2)
be:PRS;3PL/have:PRS;3PL cite:PTCP;M;PL by Chomsky two articles:M;PL of John

To explain the common aspects and the differences between the two passives, Linguinho proposes an analysis within the MP that takes as its starting point the derivation of the canonical passive represented in (33), which, according to him, underlies reading (30b).

- (33) [_{vSER} [_{VoiceP} [_{PartP} [_{DP} [_{DP} o João] dois artigos] [_{Part} citados [_{VP...}]]] [_{Voice} por [_{vP} [_{DP} o Chomsky]] (p.2)
[_{vBE} [_{VoiceP} [_{PartP} [_{DP} [DP] John] two articles] [_{Part} cite:PTCP;M;PL [_{VP...}]]] [_{Voice} by [_{vP} [_{DP} Chomsky]

For Linguinho, the differences between the two passives result from a *v** head capable of introducing an argument, licensing possessor raising to subject position, and valuing Case on the internal argument of the participle. This head projects a structure that dominates the projection of the auxiliary *ser* 'be' represented in (33), from which *ter2* derives by the concatenation of *v** and *ser*.

Linguinho (2016) focuses on interpretation (30b), proposing, for both types of passives, the same analysis of Linguinho (2013). Three points of this latest work deserve to be highlighted. The first, refers to the types of relation that the extra argument of the non-canonical passive entertains with the internal argument of the participle. In the case of the theme of a deverbal noun, Linguinho (2016) calls the relation *complementation*. The relation expressed by a relational noun is no longer mentioned.

The second point concerns the affection of the argument in the subject position of *ter2*. Linguinho (2016) is more categorical than Linguinho (2011), treating this property not as accidental, but essential. Finally, the third point refers to examples such as (34),

considered ungrammatical because of the absence of a semantic relation between the argument in the subject position of *ter* ‘have’ and the internal argument of the participle:

- (34) *O Paulo teve as contas da Maria pagas pela Ana. (LUNGUINHO, 2016, p.13)
 the Paul have:PRF;3SG the bills:F;PL of the Mary pay_for:PTCP;F;PL by the Hannah

4 LEXICAL-FUNCTIONAL AND DECOMPOSITIONAL ANALYSIS

In this section, we propose answers, based on LFG and LDG, for questions about the possessive passive in Portuguese raised by the approaches of the previous section. The lexical and syntactic aspects of the proposal are implemented in BrGram.

The first question concerns the ambiguity of (29) between (30a) and (30b), which, according to Lunguinho (2013), correlates with an opposition between two types of roles played by the referent of the subject in these structures. In the first, it functions as possessor; in the second, as author. In fact, this role differentiation is orthogonal to the structural ambiguity. It follows not from the syntactic structure of the sentence, but from the ambiguity of expressions that denote a possession relation in the broad sense, when the second argument of the relation (henceforth POSSM) is referred to by an expression headed by nouns such as *book*, *article*, *sculpture*, *video*, *film*, etc. For example, in all cases of (35), the first argument of the relation (henceforth POSSR) may function both as “author” and “possessor” of the POSSM. This ambiguity is less plausible in the same contexts with nouns such as *stone*, *dog*, *land*, etc.

- (35) a. O João tem dois artigos.
 ‘John has two articles.’
 b. os dois artigos do João
 the two articles of the John
 ‘the two articles of/by John’
 c. os dois artigos dele
 the two articles 3msPOSS
 ‘his two articles’
 d. os seus dois artigos
 the 3POSS;M;PL two articles:M;PL
 ‘his two articles’

According to Pustejovsky (1995), the semantic representation of nouns that designate artifacts like *book*, *article*, etc. contains the specification of an AGENT attribute whose value is the type of event responsible for the production of the entity. In the case of (35), this is a *write* event. In such structures, the POSSR can then be identified with the first argument of this predicator. On the contrary, in examples such as *sua pedra* ‘her stone’ or *o cachorro dela* ‘her dog’, the interpretation of POSSR as author does not emerge because these nouns, at least in their default specification, have no value for the AGENT attribute.

In this way, (30a) and (30b) are ambiguous between an interpretation in which the referent of [John] is “author”, and another in which it is “possessor”. Consequently, (29) has not only two readings, as proposed by Lunguinho (2013), but four, since both the *ter1* and the *ter2* structures express a relation between the referents of [*the John*] and [*two articles*] such that the former can be both “author” and “possessor” of the latter.

What is the semantic difference between the two readings of (29), given that it does not refer to the type of relation between the referents of the subject and the object? The first difference concerns the aspectual class of *ter1* and *ter2*. In reading (30a), the aspectual class of (29) is state, as evidenced by (36a). In this example, *possuir* ‘possess’ does not admit the progressive form marked by the gerund periphrasis, which, according to Cançado and Amaral (2016, 151), is a diagnostic criterion of state verbs. On the contrary, in reading (30b), the aspectual class of (29) is not state, as evidenced by the grammaticality of (36b). Consistent with this, the only reading of (36c) is (36b). Another test to identify state verbs, according to Cançado and Amaral (2016, p.152), is the inadequacy of

its use as a response to questions like (37a), as we see in (37b). Response (37c) is only permissible in reading (37d), corroborating the aspectual classification of *ter1* as stative and the non-inclusion of *ter2* in this class.

- (36) a. *O João está possuindo dois artigos citados pelo Chomsky.
the John is possessing two articles cited by the Chomsky
b. Dois artigos do João estão sendo citados pelo Chomsky.
two articles of the John are being cited by the Chomsky
c. O João está tendo dois artigos citados pelo Chomsky.
the John is having two articles cited by the Chomsky
'Two articles by John are being cited by Chomsky.'
- (37) a. O que aconteceu?
'What happened?'
b. #O João possuiu dois artigos citados pelo Chomsky.
'John possessed two articles cited by Chomsky.'
c. O João teve dois artigos citados pelo Chomsky.
the John have:PRF;3SG two articles:M;PL cite:PTCP;M;PL by the Chomsky
'Two articles by John were cited by Chomsky.'
d. Dois artigos do João foram citados pelo Chomsky.
two articles of the John were cited by the Chomsky
'Two articles by John were cited by Chomsky.'

We propose that *ter2* is not marked for aspect. The aspectual class of the possessive passive, analogously to what occurs in the common passive, is determined by the verb from which the participle derives, as evidenced by (38)-(41). The verb *usar* 'use' of (38) fits into the activities because it is dynamic and atelic, admitting the progressive form, while *pintar* 'paint', *decorar* 'decorate', and *limpar* 'clean' of (39)-(41) constitute accomplishments, since they are dynamic and telic, differing from (42), which constitutes an achievement because it does not have internal intervals (CANÇADO; AMARAL, 2016, p.153-167).

(38) O prefeito diz que soube que estava tendo o nome usado por golpistas em meados de março de 2015. (Google)
the mayor says he knew he was having the name used by scammers in mid-March 2015
'The mayor says he knew his name was being used by scammers in mid-March 2015.'

(39) O Home Office [...] teve as paredes pintadas de tinta látex preta fosca. (Google)
the Home Office had the walls painted with matte black latex paint
'The walls of the Home Office were painted with matte black latex paint.'

(40) A pequena casa de taipa [...] teve suas paredes decoradas com as ostras (Google)
the small mud house had its walls decorated with the oysters
'The walls of the small mud house were decorated with the oysters.'

(41) O site teve as "pichações" limpadadas pela tecnologia da empresa por volta das 9 horas. (Google)
the site had the graffiti cleaned_off by the company's technology at around 9 o'clock
'The graffiti were cleaned off from the site by the company's technology at around 9 o'clock.'

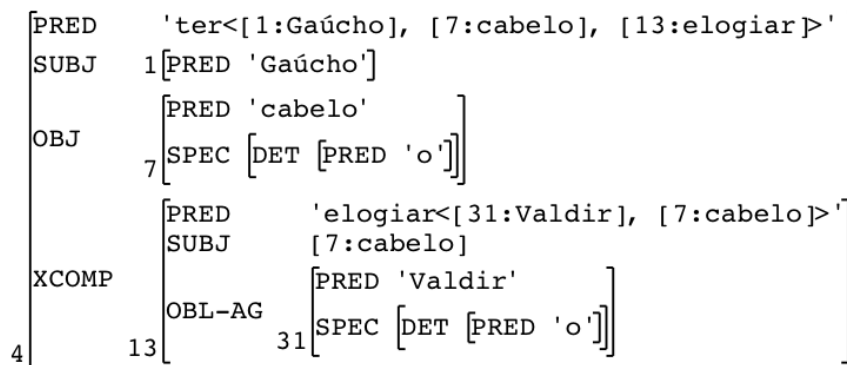
(42) A vítima conta que carregava a carteira embaixo do braço, quando a teve arrancada pelo infrator. (Google)
the victim reports that carry:IMPF;3SG the wallet:F;SG under the arm when have:PRF;3SG 3SG:F;ACC rip_off:PTCP;F;SG
by the offender
'The victim reports that s/he was carrying the wallet under her/his arm when s/he had it ripped off by the offender.'

The second question refers to the syntactic category of *ter2*. Linguinho (2011) analyzes it in the MP as an atypical auxiliary, which differs from the other members of this category by selecting an argument, the external one, assigning it a theta role and valuing Case, namely the accusative on the internal argument of the participle, as manifested in the clitic pronoun of (42). This corresponds, in LFG, to the behavior of a raising-to-object verb, which semantically selects its SUBJ, but only syntactically licenses its OBJ. On the other hand, the passive *ser* 'be' has been analyzed as a raising-to-subject verb within LFG. In this scenario, two alternatives for categorizing *ter2* within LFG present themselves: (i) auxiliary, or (ii) raising verb. According to (i), the construction would be monostratal, as in Korean, while (ii) would imply a biestratal structure, such as the semantic structure of the Japanese equivalent construction. We did not opt for either of these two categorizations, classifying *ter2* instead as an *equi* object control verb, such as *convencer* 'persuade' in (15) and (18), projecting a biestratal f-structure, as exemplified in Figure 4, structurally analogous to Figure 2.

In BrGram, template (43) encodes the properties of *ter1* and *ter2* by means of the disjunction of two template invocations. The two disjunctively invoked templates are defined in (10) and (17), respectively. The control relation identifies the OBJ of *ter2* with the SUBJ of the XCOMP, ensuring participle agreement. Figure 5 displays the f-structure of (44) in the *ter1* reading, implausible in the context at hand.

(43) VERB-TER = {"ter1" (TRNS ter) | "ter2" (O-CTRL ter)}.

"Gaúcho teve o cabelo elogiado pelo Valdir."



According to (43), *ter*₂ is a full verb, of which not only the SUBJ, but also the OBJ realizes a semantic argument, also governing an XCOMP, realized by the passive participle, whose SUBJ is controlled by the OBJ. Since the controlling function is a semantic argument of the matrix verb, it is an *equi* verb. In Figure 4, we have a bipredicational (and, therefore, biclausal) structure. The first predication level consists of the three-place predicate *ter*, whose arguments are realized by the f-structures of the SUBJ, the OBJ, and the XCOMP, respectively. The second predication level consists of the PRED attribute value of XCOMP, which is the dyadic predicate *elogiar* ‘praise’, whose arguments are saturated, respectively, by the f-structures of the OBL-AG and the SUBJ of the XCOMP, the same as the OBJ of *ter*.

The third question refers to the semantic representation of *ter*₂. For this, we propose, based on LDG, a representation of the semantic form (SF) of the sentence of Figure 4, paraphrased in (45). In LDG, the SF of a verb is restricted to aspects of meaning that are relevant for argument linking. The temporal relations between subevents are specified only at the level of conceptual structure (CS). Thus, in SF, instead of operators of temporal relations (PUSTEJOVSKY, 1995, p.69-70), LDG uses the logical conjunction &.

(44) Gaúcho [...] teve o cabelo elogiado pelo Valdir (Google)
 Gaúcho have:PRF;3SG the hair:M;SG praise:PTCP;M;SG by the Valdir
 ‘Gaúcho’s hair was praised by Valdir.’

(45) O Valdir elogiou o cabelo de Gaúcho.
 ‘Valdir praised Gaúcho’s hair.’

Since these two sentences are logically equivalent, they share the same SF. Following Wunderlich (2000), among others, we translate *elogiar* ‘praise’ as $\lambda y \lambda x$ [ELOGIAR(x,y)], and we use POSS to represent the preposition *de* ‘of’. Abstracting away from the tense/mood inflection, we propose (46) as SF of (44) and (45).

(46) POSS(gaúcho,o.cabelo)&ELOGIAR(valdir,o.cabelo)

(47) i. λQ λy λx [POSS(x,y) & Q(y)]
 | | |
 ii. XCOMP OBJ SUBJ

From (46), by lambda abstraction, we obtain the SF of *ter*₂ in (47i) with the argument linking in (47ii). The first argument of (47i) is a variable of type $\langle e, t \rangle$, i.e., a function that receives an entity and returns a truth value, the other two are entities. Since the variable Q predicates on the internal POSS argument, realized as OBJ, it is this function that constitutes the controlling function of the SUBJ of the XCOMP.

In (48)-(52), we show how the meaning of (45) derives from the composition of *ter* ‘have’ in (47) with its arguments by means of functional application and lambda reduction (WITT, 1998, p.47). We assume $\lambda v \lambda u$ [ELOGIAR(v, u)] as SF of the passive participle. This is identical to the SF of the verb in the active form, except for the inversion of the lambda abstractors (STERNEFELD, 2006, p.673). Thus, by representing the meaning of an expression *x* as $[[x]]$, $[[\textit{elogiado}]]$ is first composed with OBL-AG to form $[[\textit{elogiado pelo Valdir}]]$ in (48), with which $[[\textit{ter}]]$ is composed in (49), resulting in $[[\textit{ter elogiado pelo Valdir}]]$ in (50). This, in turn, is applied to $[[\textit{o cabelo}]]$ in (51). The result is $[[\textit{ter o cabelo elogiado pelo Valdir}]]$ in (52), which, applied to $[[\textit{Gaúcho}]]$, results in $[[\textit{Gaúcho ter o cabelo elogiado pelo Valdir}]]$ in (53). In an IE system, the meaning of (3) can be computed by the same procedure used to derive (53), resulting in formula (54), by means of which the DEPREDACTION template can easily be filled in, resulting in (6). An analogous procedure applies to (1) and (2).

(48) $\lambda v \lambda u$ [ELOGIAR(v,u)](valdir)

(49) $\lambda Q \lambda y \lambda x$ [POSS(x,y) & Q(y)](λu [ELOGIAR(valdir,u)])

- (50) $\lambda y \lambda x [\text{POSS}(x,y) \& \lambda u [\text{ELOGIAR}(\text{valdir}, u)](y)]$
- (51) $\lambda y \lambda x [\text{POSS}(x,y) \& \text{ELOGIAR}(\text{valdir}, y)](\text{o.cabelo})$
- (52) $\lambda x [\text{POSS}(x, \text{o.cabelo}) \& \text{ELOGIAR}(\text{valdir}, \text{o.cabelo})](\text{gaúcho})$
- (53) $\text{POSS}(\text{gaúcho}, \text{o.cabelo}) \& \text{ELOGIAR}(\text{valdir}, \text{o.cabelo})$
- (54) $\text{POSS}(\text{bancos...}, \text{vidraças}) \& \text{QUEBRAR}(\text{manifestantes}, \text{vidraças})$

Let us now see what arguments, from an LFG perspective, favor our proposal, compared to Lunguinho's approach. First, the latter violates the LIP, because it involves manipulating, in the syntax, categories such as the head v^* , which do not constitute words. Second, in analyzing possessive passive as a succession of movements, involving the extraction of the possessor from within an argument of the participle and its raising to the position of SUBJ of *ter* 'have', it is incompatible with the non-transformational nature of syntax in LFG. Third, an auxiliary, in LFG, has no semantic representation in the form of a PRED attribute. Thus, it can not have a thematic grid or subcategorization frame. If *ter*₂ is analyzed as an I head, it can not assign a thematic role nor govern a grammatical function. The POSSR and POSSM roles must be selected, in this case, by the participle, which must govern the grammatical functions that realize them, i.e. the SUBJ and the OBJ.

An inconvenience of this analysis is that it is not covered by (21), which generates the subcategorization frames of the canonical passive participles. In order to analyze the possessive passive within this proposal, this rule needs to be reformulated to include an alternative in which the OBJ is preserved, and a new argument (the POSSR), to be realized as SUBJ, is introduced into the frame. With this reformulation, the complexity of the lexicon increases proportionally to the number of passive participles, because each element of this group has two representations, one for the canonical passive, and another for the possessive. Our proposal is, therefore, computationally less complex, since it uses, in the possessive passive, the same participles as the canonical passive. The only complexity it introduces in the lexicon is the inclusion of *ter*₂ in (43).

The analysis of *ter*₂ as an I head presents a syntactic problem as well. In (55) and (56), we present the structures of I' and V' of (1) and (3) generated by BrGram. In (57), we reformulate (56) in terms of the analysis of *ter*₂ as an I head. Note that, in (57), contrary to (55), the DP complement of V is realized to the left of this head, contrary to the canonical order of heads and complements in Portuguese, a head-initial language. The implementation of this analysis is disadvantageous because it needs to introduce, in the apparatus of phrase-structure rules, a rule that generates a head-final VP. Our proposal in (56) does not suffer from this type of problem, since it strictly obeys the head-initial parameter: both the V and the Part(icipale) heads precede their respective complements.

- (55) os torcedores [_I tinham] [_{VP} [_V quebrado] [_{DP} os vidros do quiosque]]]
 the fans [_I have:IMPF;3PL] [_{VP} [_V break:PTCP] [_{DP} the windows of the kiosk]]]
- (56) bancos... [_V tiveram] [_{DP} vidraças] [_{PartP} [_{Part'} [_{Part} quebradas] [_{PP} pelos...]]]]]
 banks ... [_V have:PRF;3PL] [_{DP} windowpanes:F;PL] [_{PartP} [_{Part'} [break:PTCP;F;PL] [_{PP} by ...]]]]]
- (57) bancos... [_I tiveram] [_{VP} [_{DP} vidraças] [_V quebradas] [_{PP} pelos...]]]
 banks ... [_I have:PRF;3PL] [_{VP} [_V [_{DP} windowpanes:F;PL] [_V break:PTCP;F;PL] [_{PP} by ...]]]]]

There is also an argument of a semantic nature in favor of our analysis, to the detriment of the analysis of *ter*₂ as an I head or as a raising verb. Let us consider the examples of (58) and their respective paraphrases in (59).

- (58) a. O livro teve uma página rasgada pelo vândalo.
 the book have:PRF;3SG a page:F;SG torn:F;SG by the vandal
 ‘A page of the book was torn by the vandal.’
 b. Uma página do livro foi rasgada pelo vândalo.
 ‘A page of the book was torn by the vandal.’
- (59) a. #O lago teve uma página rasgada pelo vândalo.
 the lake have:PRF;3SG a page:F;SG torn:F;SG by the vandal
 ‘A page of the lake was torn by the vandal.’
 b. #Uma página do lago foi rasgada pelo vândalo.
 ‘A page of the lake was torn by the vandal.’

Sentence (58a) is perfectly normal, corresponding to paraphrase (58b). Example (59a) differs from (58a) only in the type of entity referred to by the SUBJ. However, it is semantically anomalous, as its paraphrase in (59b). What underlies this contrast? Our proposal offers a natural explanation for the normality of (58), on the one hand, and the anomaly of (59), on the other. According to (43) and (47), *ter2* semantically selects both the SUBJ and the OBJ, which realize the two arguments of the POSS predicate. The anomaly of the second group of examples naturally stems from the difficulty of conceiving a relation of possession between a lake and a page, as POSSR and POSSM, respectively, of this relation, unlike what occurs with the first group.

In the proposals that analyze *ter2* as an I or an object-raising verb, POSSM is not a semantic argument of this head, which, therefore, does not express the relation of possession inherent to the construction. In Lunguinho’s approach, this relation is housed within an argument of the participle, from which the possessor is extracted. However, this operation is incompatible with LFG. In this theory, to maintain the analysis of *ter2* as a functional I head or a raising verb, it is necessary to encode, in some way, the POSS relation in the passive participle. As this category does not express this relation in the canonical passive, it is necessary to stipulate a semantic extension to include it. As this process must apply to every passive participle, it is clear that this solution incurs the same complexity problem noted above. Another issue that the two alternative approaches face is the licensing of the additional argument in the role of POSSR. If *ter2* is considered an I head, it is the passive participle that must license this argument. In the analysis of *ter2* as a raising verb, POSSR can be licensed by that verb. In this case, however, there is an asymmetry in the treatment of the two participants in the POSS relation that seems unjustifiable, since POSSM is licensed by the participle. One way to overcome this difficulty would be to encode POSS in the participle, as in the approach that treats *ter2* as an I, and to stipulate, in the wake of Lunguinho’s approach, a new semantic role for the argument in the subject position of *ter2*, co-referent with POSSR. We will see later, however, that this argument plays no affected role.

Our proposal, on the contrary, dispenses with all these stipulations. The participle of the possessive passive is the same as the common passive participle. The possession relation that distinguishes the first from the second type of passive stems from *ter2*, which, as *ter1*, encodes POSS, responsible for the semantic roles POSSR and POSSM of the SUBJ and OBJ. Thus, our proposal naturally correlates the semantic difference between the two passives (i.e. presence of the POSS predicate) with the syntactic difference between them (i.e. presence of *ter* ‘have’). From this perspective, the possessive passive constitutes a mere diathesis of *ter* ‘have’, which, in our opinion, derives from a general process of valence increase that Wunderlich (2000) models through the semantic extension rule ARG. This rule is responsible for resultative constructions like *Ela cortou os cabelos curtos* ‘She cut the hair short’ and, it seems to us, underlies analogous diatheses of several other *equi* verbs, such as *convencer* ‘persuade’, *julgar* ‘judge’, *ver* ‘see’, and so on (see (12)-(14)).

The fourth question focuses on the ordering of constituents. For Lunguinho (2011), examples such as (22b) are ungrammatical, contrary to the evidence of (60)-(62).

- (60) o brasileiro “Aquarius” [...] teve elogiada a atuação de Sonia Braga pelo crítico. (Google)

Brazilian *Aquarius* have:PRF;3SG praise:PTCP;F;SG the performance:F;SG of Sonia Braga by the critic
 ‘Sonia Braga’s performance in Brazilian *Aquarius* was praised by the critic.’

(61) o Prefeito de Canela teve vetado pela Câmara de Vereadores o seu pedido de autorização para viajar à Itália (Google)
 the mayor of Canela have:PRF;3SG veto:PTCP;M;SG by the City Council his application:M;SG for authorization to travel to Italy

‘The mayor of Canela’s application for authorization to travel to Italy was vetoed by the City Council.’

(62) o Bitfinex teve roubado por hackers 65 milhões de dólares. (Google)
 Bitfinex have:PRF;3SG steal:PTCP;M;SG by hackers 65 million dollars:M;PL
 ‘Bitfinex had 65 million dollars stolen by hackers.’

Examples (13), (63), and (64) show that, in object control verbs, XCOMP can precede OBJ. As in our analysis these two grammatical functions are governed by *ter*₂, and Portuguese generally does not establish a rigid order among verbal complements, examples such as (60)-(62) with the order XCOMP OBJ are expected, along with examples with the reverse order OBJ XCOMP, as in (3), (38), and (39). In Lunguinho’s (2011) analysis, however, examples of the first type are not licensed.

(63) A categoria quer resolvida na mesa de negociação a cláusula de compensação dos dias parados (Google)
 the category wants resolve:PTCP;F;SG at the negotiating table the clause:F;SG of compensation of the days stopped
 ‘The category wants the compensation clause for non-worked days resolved.’

(64) a pernambucana viu chegarem às lojas só um LP, “A Rainha da Ciranda” (1977), e um CD (Google)
 the Pernambuco saw arrive:INF;3PL at the shops only one LP, *The Queen of Ciranda* (1977), and a CD
 ‘The woman from Pernambuco saw only one LP, *The Queen of Ciranda* (1977), and a CD come to the shops.’

Contrary to Lunguinho’s (2013) analysis of (32), (65) evidences that the passive possessive licenses a final SUBJ. As evidenced by (66), the ungrammaticality of that example stems from the non-realization of OBJ.

(65) Além de João Vaccari, tiveram as condenações confirmadas pelo tribunal o marqueteiro João Santana [...], a mulher dele, Mônica Moura, e o lobista Zwi Skornicki. (Google)

In addition to João Vaccari, had:PRF;3PL the convictions:F;PL confirm:PTCP;F;PL by the court marketer João Santana, his wife, Mônica Moura, and lobbyist Zwi Skornicki.

‘In addition to João Vaccari, the conviction of marketer João Santana, his wife, Mônica Moura, and lobbyist Zwi Skornicki was confirmed by the court.’

(66) Têm trechos citados pelo Chomsky dois artigos do João.
 have:PRS;3PL excerpts:M;PL quote:PTCP;M;PL by the Chomsky two articles by the John
 ‘Excerpts from two articles by John were quoted by Chomsky.’

Another divergence of our proposal in relation to Lunguinho’s (2011) refers to (26), considered ungrammatical by him. Although without evidence from real texts, we consider this example grammatical, given occurrences such as (67), which show that subject inversion is licensed in equi-type verbs.

(67) Por despacho proferido no dia 19 de Dezembro de 2001, julgou o juiz a arguição da executada improcedente (Google)
 by order delivered in the day 19 of December of 2001, judge:PRF;3SG the judge the complaint:F;SG of the defendant unfounded:F;SG
 ‘By order delivered on December 19, 2001, the judge dismissed the defendant’s complaint as unfounded.’

The fifth question concerns the types of possession relation. We have seen that the Korean possessive passive is restricted to inalienable possession, whereas Japanese admits a wide range of relations. For Portuguese, Lunguinho (2011) proposes a range of five types. Our analysis in (47) predicts a spectrum of relations coincident with that of other elements with the POSS predicate in its composition, such as *ter* and the possessives. This prediction is corroborated by the fact that both the synthetic and the analytical possessives can explicit this relation, as in (27), (28), (40), and (61). Thus, in the case of deverbal nouns, POSSM is not limited to the theme role, as Lunguinho proposes, but can also play other roles, such as agent (see (23), (27), and (61)), container (see (68)), etc., as in the case of possessives.

- (68) Os setores de imprensa dos Ministérios tiveram ampliadas as suas atribuições (Google)
 the press departments of the Ministries have:PRF;3PL extend:PTCP;F;PL their powers:F;PL
 ‘The powers of the press departments of the Ministries were extended.’

The sixth question concerns the realization of POSSM, which, in Korean and Japanese, according to the examples of Oshima (2003, 2004), is restricted to OBJ, a restriction that we incorporate in our analysis in (47). However, example (24) from Lunguinho (2011), supported by (69)-(71), evidences that the POSSM can be realized by an indirect internal argument of the participle.

- (69) No comprimento, o novo Palio teve adicionados mais 28 mm (Google)
 in length, the new Palio have:PRF;3SG add:PTCP;M;PL more 28 mm:M;PL
 ‘More 28 mm in length were added to the new Palio.’
- (70) a comissão teve acrescentadas em seu nome [...] as palavras “Direitos Humanos”. (Google)
 the commission have:PRF;3SG add:PTCP;F;PL in its name the words:F;PL *Human Rights*.
 ‘The words *Human Rights* were added to the commission’s name.’
- (71) O piloto [...] teve adicionados 10s ao seu tempo final de prova (Google)
 the racing_driver have:PRF;3SG add:PTCP;M;PL 10s:M;PL to his final race time
 ‘10s were added to the driver’s final race time.’

Occurrences (72)-(74) show that POSSM can also be realized as an ADJ(UNCT) of OBJ. Indeed, in (74), for example, it was not the width of the car that was enlarged, but that of its front grille.

- (72) Carmem teve o carro dela e [o [ADJ do filho]] arrastados pela correnteza. (Google)
 Carmen have:PRF;3SG the car:M;SG 3fsPOSS and [the [ADJ of the son]] drag:PTCP;M;SG by the flood
 ‘Carmen’s car and her son’s were dragged by the flood.’
- (73) o Luverdense [...] teve quebrados [os vidros [ADJ do ônibus que o levou ao Estádio]] (Google)
 the Luverdense [...] have:PRF;3SG break:PTCP;M;PL [the glasses:M;PL [ADJ of the bus that took it to the Stadium]]
 ‘The glasses of the bus that took the Luverdense team to the Stadium were broken.’
- (74) o novo [Audi] TT teve [a largura [ADJ da grade]] ampliada (Google)
 the new TT have:PRF;3SG [the width:F;SG] [ADJ of the grid]] extend:PTCP;F;SG
 ‘The width of the grid of the new [Audi] TT was extended.’

To handle the realization of POSSM by functions other than OBJ, we propose the notion of mediate possession (MPOSS), which we define in (75) in the Prolog programming language, analogously to the definition of descendant by Blackburn, Bos, and Striegnitz (2006, p.52).⁶ Paraphrasing (75) informally, translating POSS as *have*, *x* mediately has *y* (i) if *x* has *y*, or (ii) if *z* has *y* and *x* mediately

⁶ In Prolog, “:-” corresponds to conditional *if*.

has z. We, thus, reformulate the SF of *ter2* in (47) as (76), which covers all cases of (72)-(74), for example, in (73), from *POSS(bus,glasses)* and *POSS(luverdense,bus)* follows *MPOSS(luverdense,glasses)*. The application of (76) to (34) in (77) shows that this sentence, contrary to Linguinho's (2016) opinion, is actually grammatical, since it is acceptable in a situation where *POSS(paul,maria)* holds true, as in (78).

(75) $mposs(X,Y) :- poss(X,Y).$

$mposs(X,Y) :- poss(Z,Y), mposs(X,Z).$

(76) $\lambda Q\lambda y\lambda x[MPOSS(x,y)\&Q(y)]$

(77) $MPOSS(paul,bills)\&PAY_FOR(ana,bills)\&POSS(maria,bills)$

(78) As contas da Maria do Paulo foram pagas pela Ana.

the bills of the Maria of the Paul were paid_for by Ana

'Paul's Maria's bills were paid for by Ana.'

Representation (76) also covers cases like (24) and (69)-(71). Applying it to the composition of the meaning of (24), we obtain (79), where we abbreviate the names of the arguments and decompose ADD. As we have seen, representations of the form $c1\&c2$ do not explicit the precedence (<) between the eventualities denoted by each proposition. In (46), we have $c1<c2$. In (79), on the contrary, we have $c2<c1$, because, given that the condition *POSS(byron,the.sentence)* is satisfied, *MPOSS(byron,5.years)* is only fulfilled when *POSS(the.sentence,5.years)* obtains.

(79) $\exists x[MPOSS(byron,5.years) \& CAUSE(x,BECOME(the.sentence,5.years))]$

Our proposal also includes occurrences such as (80)-(82), which are not capable of being derived by means of possessor raising. In fact, in these examples there is no $[_{DP} [_{DP} possessor] possessed]$ configuration from which the possessor could be extracted as in (33). However, according to Linguinho (2013), such a configuration underlies all possessive passive constructions. The SUBJ in this constructional variant is not a possessor co-referent with an *ec*, as in (69), which can be replaced by a possessive, as in (70) or (71). The representation of (82) in (83) shows the analogy with (24). In both cases, $c2<c1$ subsists. The only difference is that *MPOSS(d3048,p)* denotes immediate possession, resulting from *POSS(d3048,p)*, according to the first rule of (75).

(80) o Hino [...] teve adicionados os versos de Ovídio Saraiva (Google)

the Hymn have:PRF;3SG add:PTCP;M;PL the verses:M;PL of Ovídio Saraiva

'The verses of Ovídio Saraiva were added to the Hymn.'

(81) LISP [...] teve adicionados recursos de linguagens imperativas (Google)

LISP have:PRF;3SG add:PTCP;M;PL resources:M;PL from imperative languages

'Resources from imperative languages were added to LISP.'

(82) O Decreto nº 3.048 [...] teve um parágrafo acrescentado pelo Decreto nº 5.545 (Google)

Decree No. 3,048 have:PRF;3SG one paragraph:M;SG add:PTCP;M;SG by Decree No. 5.545

'One paragraph was added to Decree No. 3,048 by Decree No. 5.545.'

(83) $MPOSS(d3048,p)\&CAUSE(d5545,BECOME(POSS(d3048,p)))$

The seventh question concerns the alleged affection of the SUBJ referent of *ter*₂. While the equivalent Korean construction implies that the subject is adversely affected, in Japanese this only occurs in the indirect passive, which excludes a possession relation between the referents of the SUBJ and the OBJ. The semantic representation that we propose in (47) predicts, contrary to Lunguinho (2016), that there is not necessarily this type of implication, which is confirmed by (84) and (85). Whether there is affection or not, it depends on the participle, in interaction with pragmatic-discursive factors. This characteristic is shared with the canonical passive, which does not necessarily express affection of the patient or subject (CANÇADO; AMARAL, 2016).

(84) Cada dente teve a largura mensurada por três vezes (Google)
 each tooth have:PRF;3SG the width:F;SG measure:PTCP;F;SG for three times
 ‘The width of each tooth was measured three times.’

(85) A ex-primeira-dama Marisa Letícia teve o nome excluído da ação após a sua morte (Google)
 the former First Lady Marisa Letícia have:PRF;3SG the name:M;SG exclude:PTCP;M;SG from the lawsuit after the her death
 ‘Former First Lady Marisa Letícia’s name was excluded from the lawsuit after her death.’

The last question concerns the realization of POSSR as a possessive, alternating with its non-realization, compare (23), (39), and (69) with (27), (28), (40), and (71), which seems to contradict Lunguinho’s (2011, 2013) analysis. In fact, if possessor raising is obligatory in the non-canonical passive, how to explain that the possessor, in form of a possessive, concomitantly makes up a constituent with the POSSM, since this configuration is restricted to the canonical passive? In our proposal, which dispenses with the movement of constituents, this problem does not exist. Verb *ter*₂ encodes an MPOSS relation between the SUBJ and the OBJ, while the possessive encodes a POSS relation between these two arguments or between the SUBJ and another grammatical function.

5 CONCLUSION

The possessive passive is one of the most discussed phenomena of East Asian languages. In Korean and Japanese, for example, which form the passive morphologically, this diathesis is distinguished by the additional argument functioning as SUBJ, the preservation of the OBJ, and the relation of possession between them. This paper put forward an approach to this construction in Portuguese, which, apart from the periphrastic passive formation, shares these characteristics.

To investigate the grammatical and semantic properties of the Portuguese possessive passive, we formulated eight questions based on the characteristics of the Korean and Japanese counterparts, according to Oshima (2003, 2004), and on Lunguinho’s proposal (2011, 2013, 2016), apparently the only one about the phenomenon in Portuguese. From the perspective of two formal lexicalist theories, LFG and LDG, we proposed solutions anchored in occurrences from authentic texts. While the first theory lays foundation for the description of the grammatical aspects, the second lays foundation for the description of the syntax-semantics interface by means of predicate decomposition.

We argued, from an LFG perspective, that there are at least two variants of *ter* ‘have’ in Portuguese: biargumental *ter*₁, and possessive passive *ter*₂. The latter is analyzed by Lunguinho as an atypical auxiliary, resulting from the concatenation of *v*^{*} and *ser* ‘be’. According to him, head *v*^{*} is responsible for the external argument of *ter*₂, which plays an affected role, and the accusative on the internal argument of the participle. On the contrary, we argued that *ter*₂ is an equi-type object control verb, whose XCOMP is realized by the passive participle, analogously to the analysis of common passive *ser* ‘be’ as a subject raising verb. Our proposal is consistent with occurrences in which the subject of *ter*₂ is not affected, impossible for Lunguinho, who also excludes examples in which the XCOMP precedes the OBJ, among other positional variants attested in authentic texts. In our proposal, these two complements of *ter*₂ are permutable, as in the case of other equi-type verbs.

Based on LDG, we proposed that *ter2* results from the application of the ARG operation on *ter1*. This operation, which underlies several verbal diatheses, appends an additional predicate to the input predicate. Assuming $\lambda y\lambda x[\text{POSS}(x,y)]$ as semantic representation of *ter1*, we initially proposed $\lambda Q\lambda y\lambda x[\text{POSS}(x,y)\&Q(y)]$ as a representation of *ter2*, from which the subcategorization frame and the object control equation characterizing this lexeme are derived. This also results in the assignment of the POSSR and POSSM roles to the SUBJ and the OBJ, respectively, so the SUBJ is not necessarily affected. Because of POSS, the range of semantic relations between the SUBJ and the OBJ is the same as in *ter1* and other possessive elements. Thus, the distinctive grammatical and semantic properties of the possessive passive in relation to the common passive do not derive from elements that are not words, which would violate the LIP, but from the integration of the passive participle into a bipredicational structure with *ter* 'have' instead of *ser* 'be'.

Our proposal states that the possessive passive and the common passive share the same participle, being, therefore, computationally more economical than the alternatives that encode the distinctive properties of this construction within the participle, since this requires the duplication of passive participles for each passivizable verb. To also handle cases where the POSSM is realized by a function other than the OBJ of *ter2*, we replaced POSS in the representation of this verb by MPOSS, which expresses mediate possession. This solution also covers cases in which there is no possessor-possessed configuration from where the possessor can be extracted and which, therefore, are not derivable by Lunguinho's approach. It also provides an explanation for the concomitant realization of POSSR as a possessive, which, in our view, represents a problem for Lunguinho's approach.

Given the fully formalized character of LFG, the grammatical analysis was implemented within BrGram (ALENCAR, 2013). This will allow, on the one hand, testing the analysis automatically on a large volume of data, as we intend to do so in an upcoming study. On the other hand, it represents a potential contribution to NLP applications aimed at text understanding, such as IE and Q&A.

This paper focused on the grammatical and semantic aspects of the possessive passive. Therefore, several questions had to be left out, such as the discursive functions of this diathesis, which, by promoting to SUBJ the possessor of an argument of a verb of which it is not a participant, represents a strategy to assign it topic status. Other interesting questions concern the conceptual, historical, dialectal, typological, and translational aspects.

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