

The Elaboration of Human Anatomy Terminology for the Basque Language: the Contribution of Translators, Linguists and Experts¹

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El desenvolupament de la terminologia de l'anatomia humana en llengua basca: la contribució de traductors, lingüistes i experts

En aquest article comparem la traducció d'un atlas d'anatomia amb la revisió que es va encarregar a experts i lingüistes. L'objectiu és avaluar la mena de contribució que poden fer traductors, lingüistes i experts en l'elaboració de la terminologia de l'anatomia humana en basc. Analitzem les oracions que mostren discordances entre la traducció i la revisió respecte de les unitats lèxiques i les regles de formació usades. Hem observat que les correccions fetes pels experts i lingüistes tendeixen a substituir préstecs i calcs de regles de formació per unitats i estructures genuïnes. Arribem a la conclusió que les polítiques de planificació lingüística que pretenen proporcionar recursos terminològics propis en detriment de solucions dependents d'altres llengües no han estat assumides pels traductors per l'opacitat semàntica de la terminologia de l'anatomia i per la morfologia transparent del basc en comparació amb la del castellà.

PARAULES CLAU: terminologia anatòmica; traducció especialitzada; desenvolupament de llengües minoritzades

Abstract

In this paper we compare the translation of an atlas of anatomy with the review that was carried out by experts in human anatomy and linguists. The goal is to evaluate the type of contribution that translators, linguists and experts can make in the elaboration of the terminology of human anatomy in Basque. We analyzed the sequences that showed discordances between translation and review with respect to the lexical units and the term formation patterns used. We found that the corrections made by experts and linguists show a clear tendency to replace lexical loanwords and calqued term formation rules by genuine elements and structures. We conclude that the aims of language planning policies of gradually providing the language with terminological resources that are less dependent on other languages have not been met by translators due to the semantic opacity of anatomical terminology and the transparent morphology of Basque compared with Spanish.

KEYWORDS: anatomical terminology; specialized translation; elaboration of minoritized languages

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0 Introduction

The domain of education is of key importance for the development and elaboration of languages that are in a normalization process, and universities are one of the nerve centers for that development. In fact, students develop general discursive competences and attain the basis for specialized communication at primary and secondary education levels, but it is only at university level that they acquire the foundations of scientific and professional discourse that will qualify them for their professional development (Parodi, 2007). Specialized discourse is built on the basis of terminology, and its acquisition is essential for any graduate to become capable of successfully facing the challenges of academic and professional communication in any area of specialization. The use of a minoritized language as a vehicular language during time at university will condition the adequate knowledge and use of the terminology by future specialists, and undoubtedly it shows a clear commitment to extending the usage of the language to professional fields. In keeping with this idea, the University of the Basque Country UPV/EHU offers most majors either entirely or partially in Basque, and a large proportion of university students choose to study in Basque.²

Experts that are qualified to teach in Basque are necessary in order to meet this demand. Moreover, adequate academic materials are required that provide support to lectures and learning activities. In some cases, it is the faculty themselves, either individually or collectively, who produce teaching materials and reference textbooks. However, since there remains a shortage of academic materials and publications in Basque, the Vice-chancellorship of Basque and Multilingualism of the University of the Basque Country UPV/EHU has therefore been investing considerable efforts and resources over recent decades in translating reference textbooks in several fields. This work has typically been carried out by professional translators and thereafter reviewed by an expert in order to ensure scientific precision, and only those reviewed translations that receive the approval of the corresponding Language Service section (Euskara Zerbitzua) are accepted for publication. This policy is intended to compensate for the current shortage of academic materials in Basque. However, the incidence of linguistic control motivations cannot be ignored, which are based on the assumption that materials produced by professional translators are more correct and genuine than the ones created directly by experts. In fact, a well-established aim of language and terminology planning policies is to progressively provide the language with linguistic resources that are less dependent on other languages.

In this paper we will contend this premise on which the language planning and policy of the University

of the Basque Country UPV/EHU is largely based, at least insofar as terminology is concerned. It should be pointed out that our analysis has a sociolinguistic motivation and thus our work does not seek to evaluate the techniques and strategies used by translators. We carried out an empirical analysis based on a parallel corpus that contains the Spanish version of an atlas of anatomy,³ the Basque translation of this atlas, and the review that ten associate professors of Human Anatomy at the School of Medicine and Dentistry and the School of Pharmacy of the University of the Basque Country UPV/EHU⁴ conducted, with the support of three linguists. Apart from the data from the corpus, we also had access to the opinions and reflections of the experts that were given in forums and seminars which were designed to discuss the translation.

The translated atlas is composed of anatomical illustrations with captions and figure labels largely naming different structures, components and systems. Thus the linguistic part of the text is basically limited to explanatory terms and noun phrases, and the translators' task was therefore largely circumscribed to making decisions on term equivalences. Although the translation of an atlas is not representative of all translations of academic materials that are commissioned by this university, it is suitable for the goals that we have set in this empirical study.

The translators and the experts coincided in only 917 out of the 4810 linguistic sequences that were identified. We analyzed and classified the remaining 3893 mismatching sequences to gain insight into the reasons determining these discrepancies. We tried to establish the competences of each type of participant involved in this collaborative work (experts, linguists, and translators) with the aim of deciding on the type of contribution each can make to the development of anatomical terminology in Basque. We should point out that the ten professors that reviewed the translation are, along with university students that will soon become healthcare professionals, actually the main potential future users of this translated work. Thus we believe that their opinions should be taken into account when evaluating the adequacy of the translation.

In the first section, we will make some initial remarks regarding the difficulties inherent in medical terminology and, specifically, on the difficulties that anatomical terminology in foreign languages poses for experts, translators, and terminologists. In the second section, we will describe the specific ways in which such difficulties arise in Basque, and we will consider them in the context of translating and reviewing the atlas of anatomy. In the third section, we will analyze and classify those sequences in which the translators and the expert reviewers have diverged, and we will discuss the reasons for these discrepancies. Some conclusions are put forward in the final section.

1 Problems that anatomical terminology raises for translators, experts, and terminologists

Many studies have described the problems that translators encounter when translating medical texts. As expected, most of the reported problems are related with choosing the right equivalent terms, especially in anatomical terminology, since it is generally assumed that terminological errors are precisely the ones that reduce precision in the target text (Echeverría & Jiménez, 2010). However, reported difficulties are not circumscribed to translation, since they also arise in specialized communication among experts.

Rouleau (2003) identifies two types of difficulties related to medical terminology in English to French translations, namely those concerning the structure of the language itself, and those related to the specialized nature of the discourse. Much the same as translators in any other field, medical translators must have a precise knowledge of the structure of the source and target languages, and must also be able to provide correct and adequate equivalents in the target language. Knowledge of the structure of a language is reflected not only in the syntax and the organization of the discourse but also in the adequate deconstruction of phrases that contain more than one term and polylexical terms in the source language, as well as in the correct restructuring of terms and phrases in the target language.

In reference to specialized discourse, Rouleau (2003) describes some difficulties regarding the knowledge of language usage among specialists, and more specifically of the frequent use of certain structures as compared to general language (for example, hypallage adjectives such as *infection opportuniste* or *rythme foetal*). Other difficulties are related to blocking the use of otherwise perfectly grammatical structures which are not used by specialists (*infarctus du myocarde* /# *myocardique* but *infarctus pulmonaire* /# *du poumon*). At the lexical level, it is well known that so-called ‘false friends’ are actually enemies to be taken into account by translators. In specialized texts, those units that coincide with lexical items of general language but contain a specialized meaning pose special difficulties (Estopà & Valero, 2002). For example, when referring to muscles in medicine, the translator needs to know that the French equivalent of the English term *tenderness* is not *tendresse*, but rather *sensibilité*. Finally, Rouleau (2003) points out certain suffixes and prefixes such as *-al*, *hypo-*, *multi-* and *-iasis* that may mislead the translator into using the wrong equivalents in French. For example, Rouleau identifies 14 possible French equivalent suffixes for the English suffix *-al*. Therefore, the translator must be aware that the French equivalents of *dental*, *germinal*, *carpal* and *palatal* are *dentaire*, *germinatif*, *carpien* and *palatin*, respectively.

Other challenges faced by medical translators are related to denominative and conceptual variation of terminology. Some difficulties involved in terminolog-

ical variation such as synonymy, eponymy, polysemy, and diachronic changes take on especial importance in the field of human anatomy. Terms are indeed subject to variation, much the same as any other element of natural language (Cabré, 1999). In addition, terms may change in meaning over time by effect both of the conceptual and denominative readjustment ongoing in any discipline and also the communicative context in which they are used. The substantial terminological variation occurring over time in anatomical terminology has been a matter of concern among experts because it has been perceived as potentially jeopardizing specialized communication. Such concern has prompted several attempts to standardize anatomical terminology that have yielded several reference works so far, recently including *Nomina Anatomica* (1956) and *Terminologia Anatomica* (1998). However, rather than reducing variation, these standardizing works seem to have added a number of new variants to the existing ones (Diaz Rojo, 2001). In addition, we should not forget that the boundaries between different fields of knowledge are often blurry, and that terms in different disciplines are used differently to approach concepts, as highlighted by the socioterminological approach to terminology over the last decade of the 20th century (Boulanger, 1991; Gaudin, 1993). Therefore, a given anatomical term may present with variations depending on whether it is used, for instance, by an anatomist, a surgeon or by a general practitioner (Gutierrez Rodilla, 1998). As pointed out by Rouleau (2003), the problem of terminology variation is noticeable in the case of translators because variation exists both in the source language and in the target language, but nevertheless not all variants in a language have analogous equivalents in usage in other languages. Finally, Rouleau (2003) mentions the difficulties derived from the limited reliability of specialized dictionaries for translators, mainly due to the heterogeneity of the gathered information. Reliability of dictionaries is also related to the denominative and conceptual variation of real use, as well as to the flexibility with which the authors of these dictionaries reflect such variation. However, translators often attribute other deficiencies to specialized bioscience dictionaries such as an insufficient number of entries, lack of systematicity, or the existence of terminological and conceptual errors (Echeverría & Jiménez, 2010).

Having superseded the reductionism of the General Theory of Terminology of Wüster (1979), it is nowadays accepted that the variability of terms derives, at least in part, from their use in different communicative contexts. Experts have the semantic-pragmatic knowledge of their area of specialization, built from linguistic experience in different communicative contexts of professional practice as well as from the use of the different textual genres that are specific to their specialized activity. They can, therefore, determine the most adequate term among the available variants within a

specific communicative context. Specialized translators will have to place themselves in the shoes of the experts to choose the right variants in each communicative context or genre (Montero & Faber, 2009; Montalt et al., 2008). The terminologist or linguist involved should keep in mind that in managing terminology variation it is important not to lose sight of the specific goal of each particular work (Cabr e, 1999). The goal of the anatomy atlas being examined here is to teach human anatomy in Basque to prospective healthcare professionals, as well as to develop anatomic terminology in this language.

In a context of term variability and lack of reliability of specialized lexicographic works, normalized term compilations gain importance, such as *Terminologia Anatomica* (TA) (1998) by the Federative Committee on Anatomical Terminology (FCAT), whose latest version was published in 2001. The TA consists of a list of anatomical terms in Latin and the corresponding English equivalents. It is now being completed in various vernacular languages, and it aims at replacing the previous reference work, i.e. *Nomina Anatomica* (1956). However, as pointed out by several authors (e.g. Rosse, 2001; Baud et al., 2005), the terms included in this list are often not very self-explanatory, and since no definition is included, the list may turn out to be obscure and cryptic for any user that does not belong to the community of experts. Yet anatomists make use of this tool whenever they wish to ensure precision when referring to anatomical structures.

In conclusion, the substantial variation existing in anatomical terminology seems to pose difficulties for specialists, translators, and terminologists. Much of the variation is related to usage by different specialists (anatomists, surgeons, general practitioners) and in different communicative contexts or in different text genres. The reference works with standardization purposes (*Nomina Anatomica* and *Terminologia Anatomica*) do not seem to have fully achieved their ultimate goal, and furthermore they have sometimes contributed to increasing variation by suggesting new variants. These reference works are quite inaccessible and cryptic for those who do not belong to the community of experts in anatomy, including but not limited to translators and terminologists. However, they do provide great help to anatomists when they want to ensure high precision in specialized communication. The specialized dictionaries that translators could use in order to compensate for the lack of transparency in TA do not seem to be entirely reliable in many cases, and therefore they must be used with care. One of the biggest difficulties for translators lies in knowledge of the specific uses of lexical units that have specialized values but are also employed in common language. An additional challenge for translators is adequate knowledge of the fixation of certain words and phrase formation rules that are used by anatomists more often than other available grammatical structures.

2 Specific problems of the Basque language and its contextualization in this paper

The above section has highlighted the difficulties that variation in human anatomical terminology poses to experts, translators, and terminologists. It is apparent that such difficulties are more pronounced when a language such as Basque is still within a normalization process, since some dispersion is added to the natural variation occurring in any language derived from diverse sociolinguistic factors (Elordui & Zabala, 2005). To this dispersion we should add the existence of some insecurity concerning the use of terminology, which stems from the lack of fluid networks among experts that would otherwise contribute to collective awareness and thus to progressively fix reference terms. In addition to the aforementioned factors, agents external to the experts' community, such as proofreaders, standardization institutions, or translator's practices, exert an influence in the development and use of specific terms. Finally, we should stress that certain lexicographic and terminographic works often collect terminological proposals whose actual implementation and use among experts have not been adequately attested.

Just by analyzing the anatomical terminology of Basque in corpora and in lexicographic works, we encounter many variants resulting from the different possibilities that the system of the language offers. Other variants are loanwords and calques taken from other linguistic systems (Zabala et al., 2012). The source languages already show great variation, as discussed above. If we place ourselves in the position of the translator that has to translate an anatomy atlas that will be used as a textbook in university studies in biomedical sciences, the translator will probably doubt whether to choose the terms appearing in dictionaries and terminological databases or the variants that experts presumably use most often. To this problem has to be added the difficulties encountered by the translator in finding out the actual terminology used by specialists, since in most cases the use of real terminology is confined to university classrooms and is therefore not collected and reflected in corpora that are accessible for translators.⁵ Finally, we should point out that anatomical terms are often complex noun phrases. With regard to the lexemes that are part of such phrases, translators tend to choose the variants that are backed by lexicographic works, but they will hardly find complex terms in such works and they will have to form them either by adapting the structures of other source languages or by using formation rules of the linguistic system of Basque.

Anatomical terms in Romance languages and in English often contain different types of referential modifiers that are adjectives or prepositional phrases. Referential adjectives abound in specialized texts in Basque because Basque has borrowed and calqued

many terms. However, nominal compounds and postpositional phrases are considered to be more genuine, since Basque largely lacks referential adjectives, except for certain patronymic adjectives. Translators are expected to contribute in the development and diffusion of the genuine structures of the language, and thus they will try to choose such structures. However, the typological characteristics of Basque itself often make this task difficult. Indeed, the morphological transparency that derives from its agglutinative nature forces translators to study the meaning of denominations in depth so as to decide on the correct equivalent of the morphemes of the source language, which may be polysemic. Some of the difficulties derived from the nature of the structure of the source and target languages are the following:

- The translator will have to decide whether the Spanish preposition *de* reflects a locative or possessive relation so as to choose between the locative genitive *-ko* or the possessive genitive *-(r)en* in Basque.
- Referential adjectives that so much abound in anatomical terminology in Romance languages and English are often more opaque than a prepositional modifier, since adjectives may denote many different types of semantic relations (whole-part relationship, location, direction, source, etc.) (Zabala et al., 2012). The translator will have to decide on whether to directly adapt the relational adjective or whether to search for a more genuine equivalent in Basque, namely a compound noun or a postpositional modifier. A requisite for this purpose is to adequately decode or figure out the precise semantic content of the adjective.
- In anatomical terminology we often find that different types of adjectives combine to denote complex semantic relations (Zabala et al., 2012). Difficulties are even greater in the case of complex adjectives. In such instances, apart from the difficulty of deciding on the semantic relations between the components of complex adjectives or between the noun and the complex adjective that functions as a modifier, the translator will have to decide on an adequate and genuine equivalent in Basque for the complex adjective. It is this difficulty that has often been used to argue that loanwords and calques that contain referential adjectives should be massively admitted in the language.
- Finally, certain structures that involve adjectives that tend to nominalize in discourse (e.g. *músculo recto / el recto*) pose problems to the translator. In Spanish, both adjectives and appositional nouns are placed to the right of the noun they modify, and it is hard to determine whether the overall structure of the term is an apposition [nN] or a phrase of the [N+Adj.] type. It is crucial to analyze this structure correctly in order to decide on the Basque equivalent, since the appositional noun in Basque is placed to the left of the noun and the adjective to the right. English does not help in this respect, because in both structures the modifier must be placed to the left of the noun.

As will be shown by the empirical analysis, the translators often chose the strategies that are most dependent on the source language. We believe that this choice may easily be due to the semantic and morphosyntactic difficulties described above. Nevertheless, there has been room for choosing more genuine resources in the review that the experts carried out with the aid of the linguists, precisely because there has been a synergic combination of the semantic-pragmatic control of the specialized field that the group of experts have and the linguists' capacity for linguistic analysis and their deep knowledge of morphosyntactic rules in Basque.

3 Analysis of the coincidences and mismatches between translators and experts

As has already been mentioned, we counted 4810 linguistic sequences in the translations, out of which only 917 showed coincidence between the translators and the experts that reviewed the translation (19.06 %). Therefore, 3893 instances (80.94 %) showed some kind of divergence between translators and experts. As expected, the longer the linguistic sequences, the larger the divergences. The amount of coincidences is near 1 % in sequences that contain five or six elements, and there is no coincidence in sequences of more than six elements.

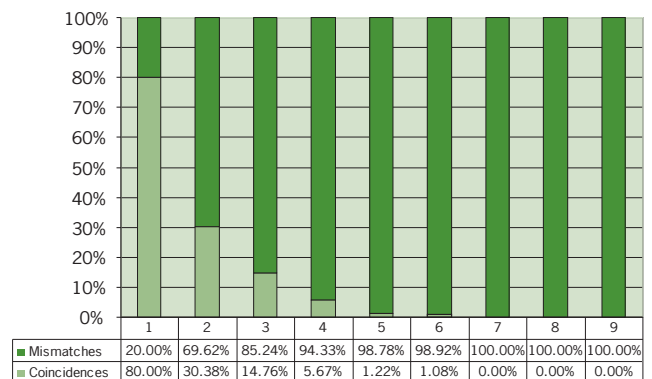


FIGURE 1. Percentage of coincidences and mismatches depending on the number of elements of the linguistic sequences

3.1 Analysis of the matching sequences

Most of the 917 matching sequences contain just one term or one explanatory phrase. However, some of these sequences include several terms or explanatory sequences in them, such as appositional elements or in parentheses, elements conjoined with the conjunction *eta* 'and' or with the conjunction *edo* 'or'. In all these the translators literally translated the sequence of the source language. In some cases the sequence appears divided (*bihotza (ezkerreko bentrikulua)* 'corazón (ventrículo izquierdo)') for the sake of simplification. In other instances, they refer to two different struc-

tures (*goiko goputz-adarra eta toraxa* ‘miembro superior y torax’). Finally, the conjunction *edo* ‘or’ was used to join synonyms (*guruin pineala (edo epifisia)* ‘glándula pineal (o epifisis)’). In all these the different components were considered separately so as to count the cases more accurately. Most of the matching sequences contain two elements (43.40%), 28.79% of the matching sequences contain one element, and 22.90% contain three elements. Finally, the number of matching sequences of four, five and six elements is very low, 4.36%, 0.44% and 0.11%, respectively. We analyzed the heads of the matching sequences and the morphosyntactic rules of term formation with respect to their origin (genuine/borrowed). As for the heads of the sequences, borrowed heads (46.5%) and Basque lexical elements (53.67%) show a similar proportion. Finally, there are only two sequences with a Latin head (0.31%).

There are only 382 different lemmas among the 954 heads that we analyzed, out of which 147 are Basque lexical units (38.48%), 233 are loanwords (60.99%), and 2 are Latin terms (0.52%). Thus by leaving aside the repeated lemmas, proportions are reversed. Anyway, even though there are fewer Basque lexical units, they are more productive in the terminology of the anatomical atlas that we analyzed.

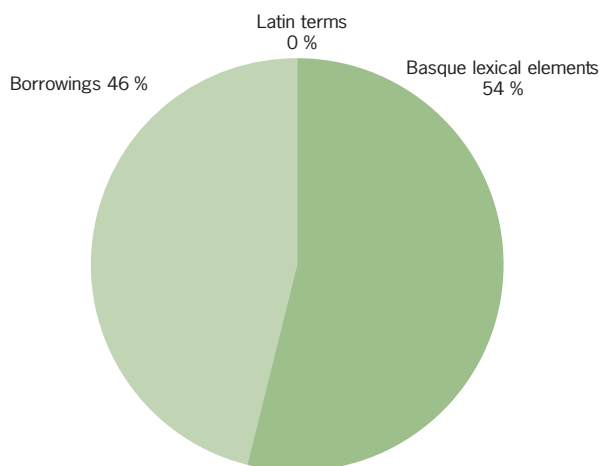


FIGURE 2. Nature of heads of sequences: Basque lexical units, adapted borrowings, and Latin terms

As for the word formation rules of the different sequences, we detected 53 different patterns. Out of all these patterns, we only identified 7 that may be considered as syntactic calques, more specifically sequences that contain simple or complex referential adjectives (*sagital*, *parazentral*, *urogenital*, etc.). The rest of the patterns contain elements that are considered as exclusively genuine: root compounds (*aho-arteria* ‘arteria bucal’), genitive postpositional modifiers (*goiko lobulua* ‘lóbulo superior’, *sudurraren bestibulua* ‘vestíbulo nasal’), qualifying adjectives (*ahosabai biguna* ‘paladar blando’), or ordinals (*hirugarren bentrikulua* ‘tercer ventrículo’). Table 1 shows the total number of patterns and the number

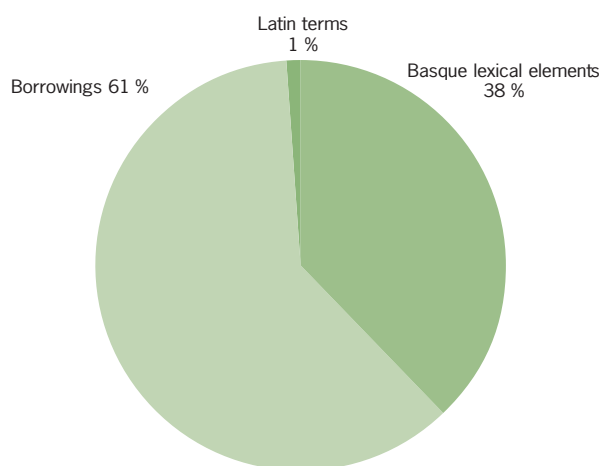


FIGURE 3. Nature of distinct lemmas of sequences: Basque lexical units, adapted borrowings, and Latin terms

of syntactic calques in relation to the number of elements of the sequence. As can be observed, most of the sequences in which the translators and experts matched follow genuine formation rules.

TABLE 1. Number of patterns containing genuine formation rules and morphosyntactic calques

Number of elements in the sequence	Genuine formation rules	Morphosyntactic calques	Total number of different patterns
2	9	2	11
3	21	4	25
4	19	1	20
5 / 6	4	0	4

3.2 Analysis of the mismatching sequences

As for the mismatches, we analyzed the different ways in which the translators and experts diverged: number or order of elements, lexical divergences, and morphosyntactic patterns or rules. Some of the sequences are only different in one of the variables, and other sequences combine several variation types.

As can be seen in Figure 4, most mismatches reflect different term formation rules (80.25%). Only 18% of the mismatches are due to differences in lexical selection. However, it should be pointed out that a great number of such lexical divergences are triggered by specific lexical elements that are part of many terms (*artikulazio/giltzadura* ‘articulación’, *muskulu/gihar* ‘músculo’, *gongoil linfatiko/nodo* ‘ganglio linfático/nodo’). 38% of divergent sequences differ only in the formation rule, 18% differ only in the lexical selection of one or several of the components (head or modifier) and 19% of the sequences combine a lexical difference and a morphosyntactic divergence. 15% are the mismatches that diverge in the number or order of the components and in the term formation rule: these two variables are

related, since different morphosyntactic rules result in different number and order of the components. In fact, the number of sequences that diverge only in the number or order of components is very low (1 %).

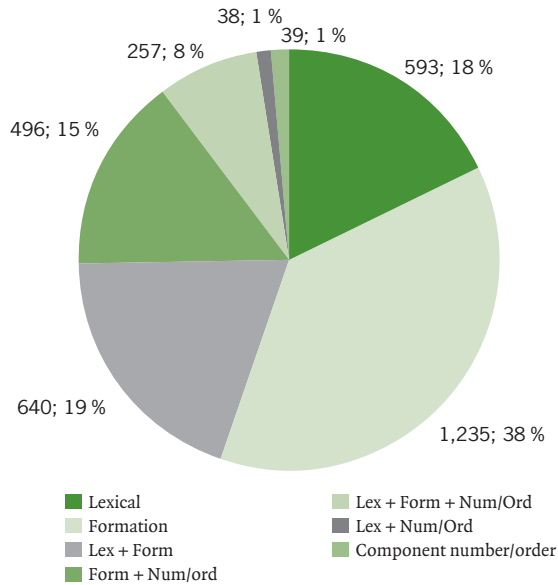


FIGURE 4. Percentage of the different kinds of (simple and complex) mismatches

Since the main goal of this paper is to evaluate the contribution that translators and experts make in the elaboration of terminology for Basque, we analyzed the variation types both in the heads and in the modifiers that appear in the sequences in relation to their genuine or borrowed nature (see table 2).

TABLE 2. Variation in the choice of borrowed or Basque lexical elements by translators and experts by the heads and the modifiers of the sequences analyzed

	Heads	Modifiers	Head (%)	Modifiers (%)
Borrowings (translators)	585	473	62.23 %	61.51 %
Basque units (experts)	128	16	13.62 %	2.08 %
Borrowings (experts)	17	21	1.81 %	2.73 %
Borrowings (translators & experts)	210	259	22.34 %	33.68 %

As can be seen in Figure 5, in 63 % of the cases the experts used Basque lexical elements in the sequences where the translators resorted to loanwords, and, on the contrary, in 8 % of the cases the experts used loanwords when the translators resorted to Basque units. In the seminars and forums carried out among experts and linguists, we found that overall the experts pre-

ferred to use Basque lexical units and that the choices where they preferred loanwords were motivated by precision. In fact, they employed both the genuine variant as well as the loanword in order to avoid polysemy. For example, like the translators the experts suggested *gongoil* to refer to ganglia of the nervous system, but employed the loanword *nodo* when referring to lymph glands (or lymph nodes): *gongoil sinpatikoak* vs *nodo (linfatikoak)*. In 27 % of the cases the lexical divergences occurred between the genuine forms and only in 2 % of the cases between loanwords.

If we count the lexical variants only once (Figure 6), we see that the percentage of the variation patterns goes down, which shows that the Basque lexical elements that experts prefer over borrowed forms are very productive in the terminology we are analyzing. It should also be pointed out that 47 % of the lexical variation occurs among genuine elements.

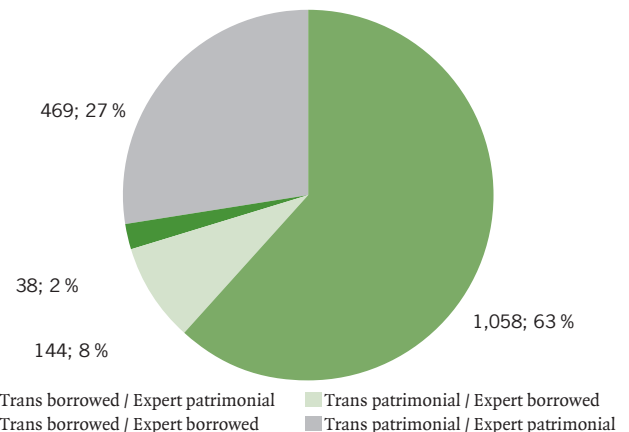


FIGURE 5. Lexical variation between experts and translators with respect to the patrimonial/borrowed nature of lexical elements

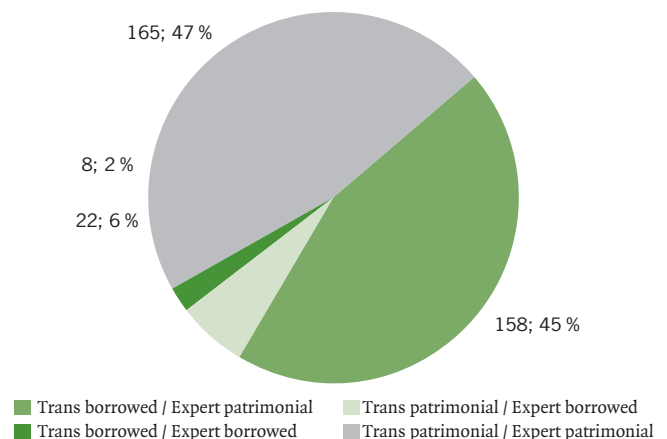


FIGURE 6. Lexical variation between experts and translators taking into account only different elements: the patrimonial/borrowed nature of lexical elements

As for morphosyntactic variation patterns, we detected 746 different ones among the 3247 sequences analyzed. As would be expected, the number of morphosyntactic variation patterns grows as the number of

components of the sequences grows, reaching a 0.67 ratio for sequences of more than 5 elements.

TABLE 3. Number and ratio of variation patterns with respect to the number of components

Number of elements in the sequence	Number of variation patterns	Sequence number	Variation ratio
2	32	909	0.04
3	184	1213	0.15
4	272	665	0.41
5	166	323	0.51
>5	92	137	0.67
TOTAL	746	3247	0.23

The variation patterns that repeat most in the sequences of two elements are to a large extent the ones that appear combined in the different segments of the larger sequences. The following table illustrates some of the most frequent variation patterns found:

TABLE 4. Most frequent variation patterns and number of occurrences

SPANISH	BASQUE		Patterns		Number of occurrences
	Translators	Experts	Translators	Experts	
lordosis cervical	lordosi zerbikala	idun-lordosia	N + Rel.Adj.	[N-N]	307
aorta abdominal	abdomeneko aorta	abdomen-aorta	PP _{GEN LOC} + N	[N-N]	103
intercarpiana	interkarpianoa	karpo artekoa	Rel.Adj. _{PREF}	N + Loc.N _{GEN LOC}	65
lumbosacra	lunbosakroa	gerri-errainetako	Rel.Adj. _{COMP}	[N-N] _{GEN LOC}	57
tróclea astragalina	astragaloko troklea	astragaloaren troklea	N _{GEN LOC} + N	N _{GEN POS} + N	44
visión palmar	ahurraren ikuspegia	ahur-ikuspegia	N _{GEN POS} + N	[N-N]	42
asta lateral	lakio laterala	alboko adarra	N + Rel.Adj.	Loc.N _{GEN LOC} + N	32
capa adventicia	geruza adbentizioa	adbentizia geruza	N + Rel.Adj.	[Nn]	28
cavidad abdominal	barrunbe abdominala	abdomenaren barrunbea	N + Rel.Adj.	N _{GEN POS} + N	13
cabeza del páncreas	pankrea-burua	arearen burua	[N-N]	N _{GEN POS} + N	12
región digital posterior	atzeko eskualde digitala	atzeko atzamar-eskualdea	Loc.N _{GEN LOC} + N + Rel.Adj.	Loc.N _{GEN LOC} [N-N]	150
músculo palatofaríngeo	muskulu palatofaringeo	ahosabai-eztarri giharra	N + Rel.Adj. _{COMP}	[N-N] N	101
surco palatino mayor	ildo palatino handia	ahosabai-ildo nagusia	N + Rel.Adj. + Qual.Adj.	[N-N] + Qual.Adj.	31
ganglios aórticos laterales	gongoil aortiko lateralak	alboko aorta-nodoak	N + Rel.Adj. + Rel.Adj.	Loc.N _{GEN LOC} [N-N]	23
tubérculo lateral del astrágalo	astragaloaren tuberkulu laterala	astragaloaren alboko tuberkulua	N _{GEN POS} + N + Rel.Adj.	N _{GEN POS} + Loc.N _{GEN LOC} + N	20
músculo cricoaritenideo lateral	alboko muskulu kriko-aritenideoa	alboko krikoide-giharra	Loc.N _{GEN LOC} + N + [Rel.Adj.-Rel.Adj.]	Loc.N _{GEN LOC} + [N-N] + N	18
ganglio linfático del ligamento arterioso	arteria-lotailuaren gongoil linfatikoa	arteria-lotailuaren linfa-nodoa	[N-N] _{GEN POS} + N + Rel.Adj.	[N-N] _{GEN POS} + N + [N-N]	10
músculo recto lateral de la cabeza proximal del músculo redondo mayor	buruko aurreko muskulu zuzena muskulu biribil handiaren proximala	buruaren aurreko gihar zuzena gihar bilibil nagusiaren hurbileko lotunea	N _{GEN LOC} + Loc.N _{GEN LOC} + N + Qual.Adj. N + Qual.Adj. + Qual.Adj. _{GEN POS} + Rel.Adj.	N _{GEN POS} + Loc.N _{GEN LOC} + N + Qual.Adj. N + Qual.Adj. + Qual.Adj. _{GEN POS} + Qual.Adj. _{GEN LOC} + N	10 10
rama esofágica de la arteria tiroidea inferior	beheko arteria tiroidearen adar esofagikoa	beheko tiroide-arteriaren hestegorri-adarra	N _{GEN LOC} + N + Rel.Adj. _{GEN POS} + N + Rel.Adj.	N _{GEN LOC} + [N-N] _{GEN POS} + [N-N]	7
proximal del músculo braquiorradial	muskulu brakio-erradialaren proximala	beso-erradio giharraren hurbileko lotunea	N + [Rel.Adj. + Rel.Adj.] _{GEN POS} + Rel.Adj.	[N-N] N _{GEN POS} + Qual.Adj. _{GEN LOC} + N	6
distal del músculo extensor largo de los dedos	behatzetako muskulu hedatzaile luzearen distala	behatzen gihar hedatzaile luzearen urruneko lotunea	N _{GEN LOC} + N + Qual.Adj. + Qual.Adj. _{GEN POS} + Rel.Adj.	N _{GEN LOC} + N + Qual.Adj. + Qual.Adj. _{GEN POS} + Qual.Adj. _{GEN LOC}	7

As can be observed, in some variation patterns only Basque genuine morphosyntactic formation rules intervene, but nevertheless other patterns also contain exogenous elements, such as referential adjectives of different kinds. We analyzed the tendencies that the translators and experts had in choosing genuine or Spanish calqued formation rules. As can be observed in Figure 7, only in 1 % of all the cases did the experts and translators choose syntactic calques. Among the variation patterns, the cases in which the experts chose genuine rules and the translators used syntactic calques amount to 66 %.

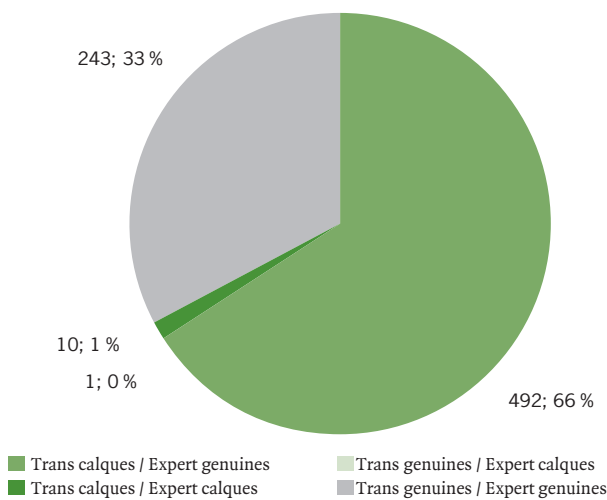


FIGURE 7. Patterns of morphosyntactic variation between experts and translators by their genuine/calqued nature

In our view, there are several factors that explain the great number of the cases where the translators calqued the Spanish formation rules. Firstly, translators consider the Greco-Latin forms as a distinguishing mark of anatomical terminology, and the Basque terminology collected in dictionaries and terminological data-bases reinforces this idea. However, the tendency to use syntactic calques also seems to be conditioned by the difficulty that translators have in finding a precise and adequate Basque equivalent for some simple referential adjectives, and especially for some prefixed and compound adjectives. Thus in the case of some locative adjectives such as *anterior* or *posterior*, the translators employed the Basque formation rule that consists of a locative noun and the genitive locative suffix *-ko* (*aurreko* ‘anterior’, *atzeko* ‘posterior’). Yet in the case of adjectives such as *medial* and *central*, the translators sometimes used the loanword (*aurpegi mediala* ‘cara medial’), and at other times the Basque formation rule (*erdiko ebakortza* ‘incisivo central’). The experts, in contrast, used the genuine rule in all instances (*erdialdeko aurpegia* ‘cara medial’, *erdialdeko ebakortza* ‘incisivo central’).

With regard to adjectives that refer to anatomical objects, the translators tended to use borrowed referential adjectives (*muskulu tibiala* ‘músculo tibial’, *faszia*

krurala ‘fascia crural’), whereas the experts systematically used root compounds (*tibia-giharra* ‘músculo tibial’) or postpositional phrases (*zangoaren faszia* ‘fascia crural’). Similarly, the translators calqued the sequences that contain adjectives with prefixes (*poltsa subakromiala* ‘bolsa subacromial’) or compound adjectives (*lotailu akromioklavikularra* ‘ligamento acromioclavicular’, *tolestura aritenopiglotikoa* ‘pliegue ariepiglótico’), whereas the experts employed genuine formation rules (*akromio azpiko poltsa* ‘bolsa subacromial’, *akromio-lepauztai lotailua* ‘ligamento acromioclavicular’, *aritnoide-epiglotietako tolesa* ‘pliegue ariepiglótico’). It should be pointed out that by using genuine formation rules, the experts reached greater precision in terminology: when complex adjectives denote anatomical objects that relate two structures or organs, the experts employed compounds of the tandem type with the doubled element (*akromio-lepauztai*) and the appositional head (*lotailua*), but when the compound adjective denotes the group of two elements, the experts used the dvandva type of composition, with the plural genitive locative *-etako* linking the two elements (*aritnoide-epiglotietako*). The translators also sometimes employed (although not invariably) composition in cases of locative compound adjectives (*aurre-beheko segmentua* ‘segmento anteroinferior’) but the experts used this composition rule invariably.

A type of variation among genuine formation rules that frequently appears is related to the use of the locative genitive (*-ko*) or the possessive genitive (*-ren*). The choice of the suffix is directly linked to the conceptualization of how the different anatomical structures relate to each other. Thus when providing the equivalent term for *tróclea astragalina*, the translators opted for the locative suffix (*astragaloko troklea*), whereas the experts decided that the underlying semantic relation is that of inalienable possession and therefore chose the possessive suffix (*astragaloaren troklea*). In only a few cases did the translators choose the possessive genitive suffix (*oin-zolaren ikuspegia* ‘visión plantar’) where the experts chose the locative genitive (*oinazpiko ikuspegia* ‘visión plantar’).

The variation in the number of elements of the sequences proposed by the translators and by the experts is sometimes related to precision. Thus in some cases the translators only used the name of a given structure (*etnoidea*, *pulbinarra*, *trapezioa*, *muskulu ankoneoaren proximala* ‘proximal del músculo ancóneo’), whereas the experts, less literally, employed the hypernym in apposition (*hezur* ‘hueso’, *nukleo* ‘núcleo’, *gihar* ‘músculo’, *lotune* ‘inserción’), which gives as a result a self-explanatory term (*etnoide hezurra*, *pulbinar nukleoa*, *trapezio giharra*, *ankoneo giharraren hurbileko lotunea*).

The order in which the elements are organized within a term is sometimes related to precision and on others to the degree in which the experts considered such orders as appropriate for the specialized registers. For example, different semantic features

are activated depending on whether the qualifying adjective *sakon* ‘profundo’ is chosen, which must be placed to the right of the noun, or the postpositional modifier *sakoneko*, which is always placed to the left of the noun. The translators invariably used the adjective *sakon* for all the terms that contain the adjective *profundo* (*plano sakona* ‘plano profundo’, *besoko arteria sakona* ‘arteria braquial profunda’). In contrast, the experts suggested the modifier *sakoneko* (*sakoneko plano* ‘plano profundo’, *besoaren sakoneko arteria* ‘arteria braquial profunda’).

The order of elements that the experts considered as inadequate for specialized registers includes the structures that contain modifiers with a postposed locative genitive. Thus for terms such as *fisura media anterior* and *nervio peroneo superficial*, the translators proposed *aurreko fisura erdiko* and *perone-nerbio azalekoa*, respectively, and the experts systematically corrected these types of sequences by placing all postpositional modifiers to the left of the noun: *aurreko erdiguneko arteka* and *azaleko fibula-nerbioa*.

Lastly, we can mention instances where the lack of semantic control led the translators to make mistakes in providing the equivalents of sequences that involve the adjectives *medio*, *mediano* or *medial*, which acquire different meanings depending on the context. In Basque, the adjective *ertain* can only mean medium (size) and may be misleading when a locative relation is intended. Thus the experts corrected sequences where the translators used this adjective incorrectly. For a string such as *músculo cutáneo medio*, the translators suggested *ipurmasaileko erdiko muskulua* (locative), whereas the experts corrected it and proposed *ipurmasailaren gihar ertaina* (size). On the contrary, for the sequence *núcleos medianos* the translators proposed *núcleo ertainak* (size) and the experts corrected it into *talamoaren erdiguneko nukleoak* (locative). Finally, in some instances the translators made conceptual errors because they literally translated a sequence that was not correct. For example, in the sequence *núcleo de la célula muscular lisa* the adjective *lisa* modifies the noun *célula* incorrectly, because it should modify the noun *músculo*. Thus the experts corrected the translation (*muskulu-zelula lisoaren nukleoa*) into *gihar leuneko zelularen nukleoa* ‘núcleo de la célula del músculo liso’.

To conclude this section, we found that the experts that reviewed the anatomy atlas that has been analyzed in this paper made corrections in 80.85% of the sequences. The data that we have presented contradict the idea that experts have a greater tendency than specialized translators to use loanwords and calques. Among the items corrected by the experts, we find that 45% are replacements of borrowings by genuine forms. In fact, only in 6% of the cases do we find the reverse case, where the experts proposed loanwords rather than genuine forms. As for morphosyntactic variation patterns, 66% of such patterns are proposals to replace syntactic calques with genuine word formation rules. We find no instances where the experts proposed the reverse. Experts have a greater conceptual control of anatomical terminology and have shown a tendency and wish to develop anatomical terminology for Basque by using genuine resources. In some cases, linguists’ help has been required in order to decide on the most correct and adequate rule of term formation that fulfills the semantic-pragmatic motivation of the experts.

4 Conclusions

It is indisputable that translation has played a key role in the expansion and development of science. In the case of Basque, the contribution of translators is essential to compensate for the lack of teaching materials and reference books for universities. The agents in charge of language planning typically assume that experts have a greater tendency than specialized translators to use loanwords and calques. In this paper we have shown that this assumption is incorrect, at least in the case of anatomical terminology. In this collaborative research we have found that the semantic and morphosyntactic difficulties that the translators have faced have often led them to choose equivalents that are strongly dependent on the source language. In contrast, these difficulties have been overcome mostly by the synergic use of the semantic-pragmatic control of terminology by the experts together with the linguists’ capacity for linguistic analysis and more profound knowledge of morphosyntactic formation rules in Basque. ✨

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Notes

1. This research was funded by the research grant GARATERM-2 (US10/01) from the University of the Basque Country UPV/EHU and the Elhuyar Foundation.
2. Currently 60.8 % of students taking their university entrance exams do so in Basque. Moreover, 46.72 % of students study for their degrees completely or partially in Basque, 78 % of compulsory credits are offered in Basque, and 45.10 % of the professors are bilingual.
3. «Master» *Atlas de Anatomía* (2010). Marbán.
4. Angel Bidaurrezaga, Arkaitz Bengoetxea, Gontzal Garcia del Caño, Izaskun Elezgarai, Jon Jatsu Azkue, Juan Luis Mendizabal, Inma Gerrikagoitia, Amale Caballero, Rafa Sarria, and Sonia Gómez.
5. In 2008 the University of the Basque Country UPV/EHU started an initiative called *Terminologia Sareak Ehunduz* (Weaving Terminology Networks) in order to publicize the real terminology that university professors use in their classes. This is being done by collecting the texts that professors use in teaching, extracting the terminology contained in them, and making it available for online search (Zabala et al., 2011).