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Compiling and Using a Specialized Corpus: The Use of *Since* in Medical English Language

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ABSTRACT

Most of the studies dealing with the academic language and the research article have focused on the structure of these. However, this paper presents an overview of the usage and frequency of the particle *since* in a specialized corpus dealing with Research Articles about spine deformities. It aims to depict the process and selection criteria followed to compile that corpus, to study the usage and frequency of *since* in this, and to compare these results to the results found in two reference corpora (COCA and BNC). *Since* can have three different functions (preposition, adverb and conjunction), which will be analyzed separately in each corpus.

Keywords: *Since,* POS, corpus, specialized corpus.

RESUMEN

La mayoría de las investigaciones dedicadas al estudio de lenguaje académico y, más concretamente, en el artículo de investigación se centran en el estudio de la estructura de los mismos. Sin embargo este estudio presenta una perspectiva diferente centrándose en el uso y frecuencia de la partícula *since* en un corpus especializado sobre artículos de investigación de las deformaciones de columna. Este trabajo explica en primer lugar el proceso y los criterios de selección que fueron seguidos para la compilación del corpus. Después estudiaremos el uso y la frecuencia de *since* en el corpus y compararemos los resultados con dos corpus de referencia (COCA y BNC). *Since* puede tener tres funciones diferentes (preposición, adverbio y conjunción), las cuales serán estudiadas por separado en cada uno de los tres corpus.

Palabras clave: *Since,* parte del discurso, corpus, corpus especializado.

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List of Acronyms

BNC: British National Corpus

COCA: Corpus of Contemporary American English

CSD: Corpus of Spine Deformities

ESP: English for Specialized Purposes

LGP: Language for General purposes

LSP: Language for Specialized purposes

POS: Part of Speech

RA: Research Article

TEC: Translational English corpus

1. Introduction

Many studies have been carried out in the academic language, (Biber and Conrad, Swales, etc), however, most of them have focused their attention on the structure of the Research Articles. Nevertheless, the present paper has a different aim, to compile corpus of spine deformities and to study the use and frequency of the particle *since* in this and to compare it with two reference corpora (COCA and BNC).

I decided to study this specific particle due to its complexity as it can have three different functions: preposition and adverb denoting time, and conjunction expressing the reasons for something. Considering as no study regarding the use of *since,* in the general or specialized language, was found, it was felt that a corpus research may provide a clear, less intuitive insight into the use of *since.* Corpora can offer high benefits compared to other type of resources related to the study of the language such as dictionaries, grammars or natives speaker's intuition, since corpora are based in real language. The use of corpora can compliment other resources dealing with the study of language. One of the most common criticisms of dictionaries is that they provide little contextual or usage information. However, nowadays examples of use based on corpora are increasingly being included in language resources such as online grammars and dictionaries, in which size is not a problem.

As in most dictionaries and grammars the use of *since* can only be found in the general language, the current paper aims to (1) compile a specialized corpus dealing with two of the most common spine deformities, and (2) to provide a different perspective of the use of *since* regarding its use in the specialized language. More concretely the use of *since* will be analyzed in academic research articles in the medical discipline and compare this to some reference corpora, (BNC or COCA) and their specialized sub-corpora. This is a corpus driven study because a corpus will be compiled and the use and frequencies of the different functions *since* can have will be studied and compared this to the British National Corpus (BNC) and the Corpus of Contemporary American English (COCA).

Texts were collected from five of the most important and well known journals regarding this topic. Research was made with the help of AntConc 3.2.4 (Laurence Anthony) to find all the occurrences and concordances of *since* in the texts.

This paper is structured as follows: Section 2 provides an overview of related studies and collects information about *since* in different dictionaries as well as grammars. After this, in Section 3 the corpus compilation process will be depicted, as well as the criteria followed for this, and the methodology of analysis. The following section will show the results found in the corpus and compare them with some reference corpora such as the BNC and COCA. Finally, in the last section the results found in the previous section will be analyzed and it will be tried to explain why frequencies found in the corpus I compiled and those found in COCA and BNC are not similar in some sections.

2. Theoretical background

Many studies have been carried out in the academic language (Biber and Conrad; Swales). The research article (RA) is one of the most studied subgenres comprised of the academic language. This is not very surprising since it is highly used in many disciplines. "The research article or paper (henceforth often RA) is taken to be a written text (although often containing non-verbal elements), usually limited to a few thousand words, that reports on some investigations carried out by its author or authors." (Swales 93). According to Swales, the research article is an immense genre (93). It is the central communicative mechanism of most sciences. However, most of the studies dealing with the study of the RA focus on the study of its structure, for instance Swales, focuses his study in the RA introductions. However, this study is not concerned with the structure of the RA, but with the usage and frequency of the particle *since* in RAs dealing with spine deformities. There are not corpus-based or corpus driven studies dealing with the specific particle *since,* although there are there are many studies regarding other particles, mainly prepositions.

As it has already been anticipated in the introduction, according to most dictionaries and grammars consulted *since* can have three different functions in a sentence, preposition and adverb denoting time, and conjunction expressing the reasons for something. Prepositions, adverbs and conjunctions are function words, which are closed classes of words which include determiners, conjunctions, prepositions, pronouns, etc. In contrast to content words, function words do not have full meaning, but they are defined by their function. These are also known as grammatical words and they are highly used in every language. "Function words account for less than one-tenth

of 1 percent of your vocabulary but make up almost 60 percent of the words you use." (Pennebaker 11).

A preposition is an independent word that does not have full meaning itself but it provides meaning to the rest of the sentence. They have a function rather than a meaning. According to Sinclair there are more than 100 prepositions in English, which is a very small number if it is compared with the number of nouns, adjectives and verbs in existence in English ("Prepositions" vi). However, most sentences contain at least one preposition ("Prepositions" vi). One of the most common errors that people learning English make is to use the wrong preposition. A conjunction is a word that joins two different sentences, clauses or just two words. There are several kinds of conjunctions: coordinating, subordinating, and correlative. *Since* is a subordinating conjunction as it makes one clause dependent upon the other. An adverb is a word that modifies a verb but it can also modify an adjective or even other adverbs.

Before any study of *since* can be carried out, the uses of *since* should first be consulted in some grammars and dictionaries in order to be able to describe the use of *since* in the general language and to compare it latter to what was found in the Corpus of Spine Deformities (CSD).

2.1. *Since* in different dictionaries

After consulting several dictionaries and confirming that all of them agreed on the functions, meanings, and uses of *since*, we selected three of the most representative and well known dictionaries and included the most relevant information found in them.

Oxford Dictionary: according to this, *since* is in the top 1000 frequently used words. These are the uses of *since* presented in the Oxford Dictionary:

- Preposition: in the intervening period between (the time mentioned) and the time under consideration, typically the present. *She has suffered from depression since she was sixteen.*

- Conjunction: For the reason that, because. *Delegates were delighted, since better protection of rhino reserves will help protect other rare species.*

- Adverb: Ago. H*e settlement had vanished long since.*

Cambridge Dictionary: The uses of *since* registered in this dictionary are the same that in the previous one.

- Preposition: at a time between (something in the past) and the present time. *I've changed my address since last year.*
- Conjunction: because. *Since you are going, I will go too.*
- Adverb: at a later time. *We have since become friends.*

Collins Dictionary: the last dictionary that was consulted was the Collins dictionary in which we found similar results to the previous ones.

- Preposition: during or throughout the period of time after. S*ince May it has only rained once.*
- Conjunction: seeing that, because. *Since you have no money, you can't come.*
- Adverb: *since* that time. *He left yesterday and I haven't seen him since.*

2.2. *Since* in different grammars

In most grammars I have consulted, *since* is studied in a similar way. I include a summary of the information found in two of those grammars which provide a very different perspective of the use of *since.* Quirk et al. provide in the *Longman Grammar* a more professional overview of since divided according to the word class (56, 74, 86, 125, 838-849). On the other hand, Ronald in the *Cambridge Grammar* (137-140) is a more practical one. It is addressed to learners of English as a second language and, thus, the usage of *since* is described in a different way. There is a whole section dedicated to this particle and many different uses are defined in it, without specifying the part of the speech (POS) of *since* in any of them.

According to the *Longman Grammar* (Quirk et al 56, 74, 86, 125, 838-849) when it is a preposition or an adverb, it denotes time and can be followed by a temporal noun phrase, a subjectless –ing clause: *since leaving school*; or a noun phrase interpreted as equivalent to a clause: *since electricity ['since electricity was invented'*]. It denotes duration from some preceding point of time. Those adverbs co-occur with

perfect aspect and are normally positioned finally: *His studies haven't been improving since*.

As conjunction, it can introduce clauses of time or clauses of reason or cause. *Since* is a simple subordinator for finite adverbial clauses of time. It can be followed by *–ing* clauses but not by *–ed* clauses or verbless clauses, *Since moving here, I have felt more relaxed.* Clauses of reason or cause are commonly introduced by the conjunctions *because, as* or *since: As*/*Since Jane was the eldest, she looked after the others.*

When *since* is used in a temporal sense, the perfect is used in the superordinate clause, also sometimes in the subordinate clause, in referring to a stretch of time up to the present: *She has been drinking Martinis ever since the party started*. The same applies to *since* as preposition and as prepositional adverb: *Scholars have been writing English grammars since the sixteenth century.*

In the *Cambridge Grammar,* Ronald splits the meaning of s*ince* in two different sections, referring to time and referring to reasons (137-140). When *since* refers to time it indicates that something occurs from a point in time until now and when *since* is referring to reason, it is used when the reason for something is presumed to be already known to the listener. It is used with present perfect or past perfect in the main clause. However, present simple and past simple are often used instead of present perfect and past perfect with the construction it + be + time period + *since: It was years since I'd seen him.* It is used with the past tense in the *since*-clause when *since* refers to a point in time and with the present perfect when it refers to an event leading up to now or still relevant.

Since referring to time may be followed by the –ing form of a verb where the subject is the same in both the main and subordinate clause: *She'd only had a couple of hours' sleep since arriving in Oxford the previous day.* This does not occur when *since* refers to reasons: *Since I didn't have medical insurance, I would have to pay for everything out of my pocket.*

Since can be used with several particles: *Since then* (referring to time), e*ver since* (more emphatic form in its references to time), *long since* ('a long time ago, a long time before that').

It is also studied in opposition to *from. From* is sometimes used instead of *since*, especially with reference to distant historical times. However, *from* also refers to the starting point of completed periods of time, whereas *since* refers to periods of time continuing up to the point of speaking or writing.

After consulting the meanings, functions and usages of *since* in the dictionaries and grammars that were previously described in this section, it can be deduced that it has three different functions: preposition, adverb, and conjunction which will be studied in terms of frequency in the Corpus of Spine Deformities in Section 4.

3. Methodology

Data for this analysis come from a corpus that was manually compiled collecting texts from five of the most important journals dealing with the main spine deformities (kyphosis, lordosis and scoliosis): *Orthopaedics and Related Research, American Journal of Physical Medicine & Rehabilitation, Seminars in Spine Surgery, Spine Deformity and The Spine Journal.*

This section depicts the compilation process of the corpus and the specific criteria followed to carry this out, the materials which were eventually included, as well as the exploitation process of the corpus once it was compiled.

3.1. Corpus design and Compilation process

As Sinclair stated "the beginning of any corpus study is the creation of the corpus itself." ("Collocation" 13), a corpus generally arises to answer a question or to be the object of a study, therefore, this first step is influenced by the questions the linguists would like to answer based on the corpus data or the kind of study that is going to be based on this corpus. In this case, this corpus will study the usage and frequency of *since* in research articles dealing with spine deformities. The compilation process is the most important part of the process due to the fact that "the results are only as good as the corpus" (Sinclair, "Collocation" 13). The following section focuses on the characteristics that texts should have in order to be included in our research corpus, named Corpus of Spine Deformities (CSD).

3.1.1. Selection criteria

According to Bowker and Pearson "Texts in a corpus are selected according to explicit criteria in order to be used as a representative sample of a particular language or subset of that language." (10). Corpora are collected following several criteria which are determined by the goal of the corpus, or by the intentions of the linguist compiling the corpus. When compiling a corpus, we have to include those criteria which better adapt to our purpose or those which will better answer our research questions. Sinclair stated that "Any selection must be made on some criteria and the major step in corpus building is the determination of the criteria on which the texts that form the corpus will be selected" ("Collocation" 4) , he continued by saying that criteria should be small in number, clearly separated from each other, and efficient as a group. According to him, common criteria should include mode, type, domain, language of the texts and date.

Table 1 summarizes the criteria followed to select our materials and the corpus characteristics according to those criteria.

Criteria	**Corpus characteristics**
Level of specialisation	Specialized
Type of communication	Experts to experts
Language(s)	English
Mode	Online written articles
Genre	Academic research articles
Topic	Medicine: Spine deformities
Number of tokens	788,023
Number of texts	200
Date	2001 – 2014

Table 1: Building criteria.

The first aspect that should be taken into account is the specialization of the language used in the articles. As we plan to analyze the use of *since* in the specialized language, texts were collected from five specialized journals on the topic the topic of spine deformities. Hunston defines a specialized corpus as a corpus of texts of a

particular type, such as academic articles in a particular subject, which aims to be representative of a given type of text and to investigate a particular type of language (14). There is no limit in the degree of specialization involved. According to Bowker and Pearson "LSP is the language that is used to discuss specialized fields of knowledge." (25). They continue by saying that "These fields of knowledge can include everything from professional activities to hobbies, as long as they treat a restricted subject." (Bowker and Pearson 39) However, there is a difference between knowing a subject and being able to use the LSP (Language for Specialized purposes) concerned with it. LSP and LGP (Language for General Purposes) overlap sometimes. LSP includes some terms that are only used in this area of knowledge and can sometimes combine language in a different way. However, it is developed upon the bases of general language. A corpus can be a useful resource for learning about the linguistic features of a LSP. There are several degrees of specialization, but articles included in the CSD, are written by experts and addressed to experts in the field of Orthopedics since previous knowledge is needed in order to understand them or to be able to work with them. Experts are those people who have training or experience in a specialized field. When experts communicate they tend to use a highly specialized language as they share a common background and thus, text written by experts for other experts, will be different from those written for non-experts.

The compilation of a specialized corpus is different from that of a reference corpus. For instance one of the criteria of a specialized corpus which differs from that of a reference corpus is the size, both in terms of the optimal length of each sample text, but also in terms of the optimal number of texts included in the corpus as discussed by McEnery and Wilson (80). Although the topic of size has been discussed by many different authors, Hunston (25), O'Keefee, McCarthy, and Carter (3), etc., there is not agreement about the optimal overall size, because it highly depends on the goal of the corpus or the questions it is trying to answer. Following Bowker and Pearson (45) I considered 788,023 words to be a respectable amount of words for a specialized corpus and for the needs of my research:

> Unfortunately, there are no hard and fast rules that can be followed to determine the ideal size of a corpus, instead you will have to make this decision based on factors such as the needs of your project, the availabity of data and the amount of time that you have. (…) Corpora intended for LSP studies can be smaller than those used for LGP studies and there are logical reasons for this. First, it is more difficult and more time consuming to obtain samples of specialized texts as

> opposed to general texts, and second because LSP represents a more restricted subset of natural language. (Bowker and Pearson 45)

However, bigger does not always means better. This decision will be based on what it is been investigated, because much more information could be found in a smaller, well design specialized corpus than in a several million word reference corpus. Several authors have discussed this topic, for instance, for Bowker and Pearson well-designed corpora which are anywhere from a few thousand to a few hundred thousand words, have proved to be useful for LSP studies (45). As quoted in O'keefe, McCarthy, and Carter (4), "Aston (1997), Maia (1997) and Trible (1997) suggest using a small corpus if we are dealing with a very specialized language register [….] In terms of what constitutes a large or small corpus, it depends on what it is seeking to represent."

Corpora are intended to be representative of a particular kind of language; the CSD is representative of the language used to describe the most common spine deformities in research articles published in several journals. Biber stated that common features of language are stable and, thus, smaller corpora are needed to study them (1). Conjunctions, prepositions and adverbs are functional words and some of the most common elements in any language which can be easily found in nearly any kind of language. Important information could be found anywhere in the texts, thus, as texts had a reasonable extension, from 2,500 to 7,000 words, it was found more useful to include full texts instead of extracts.

With respect to the authorship of the texts, there is a big difference between a corpus which only includes texts by one author and texts written by several ones. Our corpus includes a great variety of authors as the linguist will find more variety and will get a better idea of the language used in that concrete specialized area of knowledge. In this way, language is not limited to just one person's style and linguistic choice.

At the beginning of the compilation process, 300 texts were included dealing with the three main spine deformities, kyphosis, scoliosis and lordosis. However we needed to reduce the number of texts, as those dealing with scoliosis could not be converted to txt format, the only format read by most linguistic tools. Finally, these texts were removed from our corpus, composed now of 200 texts dealing with two spine deformities, kyphosis and lordosis.

Articles included in the CSD are written texts, they were collected from online newspaper and not transcribed, for instance from spoken lectures. "Medium refers to whether the text in question was originally prepared as a written text or whether it is a transcription of a spoken text." (Bowker and Pearson 49). Written texts are easier to compile than transcribing oral texts as you do not need to transcribe them, which would be time consuming. Texts collected to be included in this corpus were found in online journals instead of printed journals, given that they were going to be analyzed with a linguistic tool, they needed to be computerized.

Regarding de number of languages included, corpora can be monolingual or multilingual, but in our case it only includes texts written in English. "Using original language material in a monolingual corpus will provide you with authentic examples of typical LSP use." (Bowker and Pearson 54), so special attention was paid to the authors and institutions, and only texts published by institutions from English speaking countries were included. However, although texts were published in English speaking countries, it was not possible to figure it out if all the authors were English native speakers.

Another aspect that must be taken into account when selecting the materials is the genre or genres that best suit our purpose. The concept of *genre* has been discussed by Bhatia (16), Freedman and Medway (24), and Swales (58) to mention just a few. Swales defines it as follows:

> A genre comprises a class of communicative events, the members of which share some set of communicative purposes. These purposes are recognized by the expert members of the parent discourse community, and thereby constitute the rationale for the genre. […] In addition to purpose, exemplars of a genre exhibit various patterns of similarity in terms of structure, style, content and intended audience. (Swales 58)

In this case we were interested in the study of *since* within the academic genre and the research article (described in Section 2) dealing with texts in medicine, more specifically with spine deformities.

Finally the last criteria that was taken into account, was the date of the texts. As specialized language changes so quickly, and we are just interested in the current state of language in this particular area, only texts from the last fifteen years were included.

3.1.2. Materials

Once we had determined which criteria should be followed to compile our corpus, this section shows which materials were eventually included. As the complete list was too long to be included in this section it was included in the Appendix, but the following table is brief sample of how materials were organized and codify in order to work with them later. It includes ten samples, five of them dealing with kyphosis, and the other five dealing with lordosis. The table also includes the number of words included in each article.

CODE	ARTICLE	WORDS
Kyphosis_ClinOrthopRelatRes_2009_001	Vertebral Column Resection for the Treatment of Severe Spinal Deformity	4.828
Kyphosis_PhysMedRehabil_2005_015	Pulmonary Rehabilitation for Restrictive Lung Impairment Secondary to Osteoporotic Sternal Fracture	1.737
Kyphosis_SeminSpineSurg_2004_029	The Management of Infections Involving the Cervicothoracic Junction	4.918
Kyphosis_SpineDeform_2012_050	Spinal Deformity in Children With Achondroplasia	3.8811
Kyphosis_SpineJourn_2009_090	Thoracic vertebral osteomyelitis secondary to chronic esophageal perforation	2.785
Lordosis_ClinOrthopRelatRes_2008_105	Measurement of Hip Range of Flexion-Extension and Straight-leg Raising	2.981
Lordosis_PhysMedRehabil_2002_117	Static Trunk Posture in Sitting and Standing During Pregnancy and Early Postpartum	4.798
Lordosis_SeminSpineSurg_2004_131	Sacral Pelvic Fixation in Neuromuscular Deformities	4.219
Lordosis_SpineDeform_2013_161	The Effect of Contouring on Fatigue Strength of Spinal Rods: Is it Okay to Re-bend and Which Materials Are Best?	3.796
Lordosis_SpineJourn_2002_165	Measurements of lumbopelvic lordosis using the pelvic radius technique as it correlates with sagittal spinal balance and sacral translation	4.363

Table 2: Articles included in the Corpus of Spine Deformities.

A code was designed for every article in the corpus, in order to identify them easily when working with the corpus. Codes include in first place the spine deformity the research article is dealing with (kyphosis or lordosis), the source from where they were collected (abbreviation of the journal), the year of publication and the number assigned to each text file.

3.2. Corpus exploitation

Once we had determined the materials and finished collecting our specialized corpus, we could start working with it. First we needed to convert the 200 texts to txt format in order to be readable by AntConc 3.2.4 (Laurence Anthony). In its official website, AntConc is described as a freeware, multiplatform tool for carrying out corpus linguistics research and data-driven learning. It has several tools which can help the researcher to study linguistic features that manually would be harder to find and time consuming. These tools are the File View Tool, Clusters Tool, Word List Tool, Keyword List Tool, Concordance Plot Tool, Collocates Tool, and the Concordance Tool. The last one was the one used to find all the occurrences of *since* in the research articles included in the CSD, and to see these in context. "Also referred to as key word in context (KWIC), a concordance is a list of all of the occurrences of a particular search term in a corpus, presented within the context in which they occur, usually a few words to the left and right of the search term." (Baker, Hardie, and McEnery 43). Concordances can be sorted alphabetically to the left or right of the search term, allowing linguistic patterns to be more easily observed by researches.

The Collocates Tool was used to determine the collocations of *since* in order to classify according to its function in the examples that were found. A collocation is described by Firth as a word which occurs within the neighborhood of another word.

All the occurrences of *since* in our corpus were displayed with the help of AntConc 3.2.4 (Laurence Anthony) then, these were analyze and manually classified as preposition, conjunction or adverb, depending on the function of *since* within the texts. Afterwards, we looked for *since* in two of the most popular reference corpora, the British National Corpus (BNC) and the Corpus of Contemporary American English (COCA). First we looked for *since* in both corpora in order to have a general overview of its total frequency; on a second stage we narrowed the search and we looked for it with the academic genre and, finally, we performed a third search focusing on the

Medicine subgenre as it was the one which was closer to the topic of our corpus. Once we had the total frequency of *since* in all the research fields, a distinction was made between each of its different functions (preposition, conjunction and adverb). Then, results were compared to those found in the Corpus of spine deformities.

4. Findings

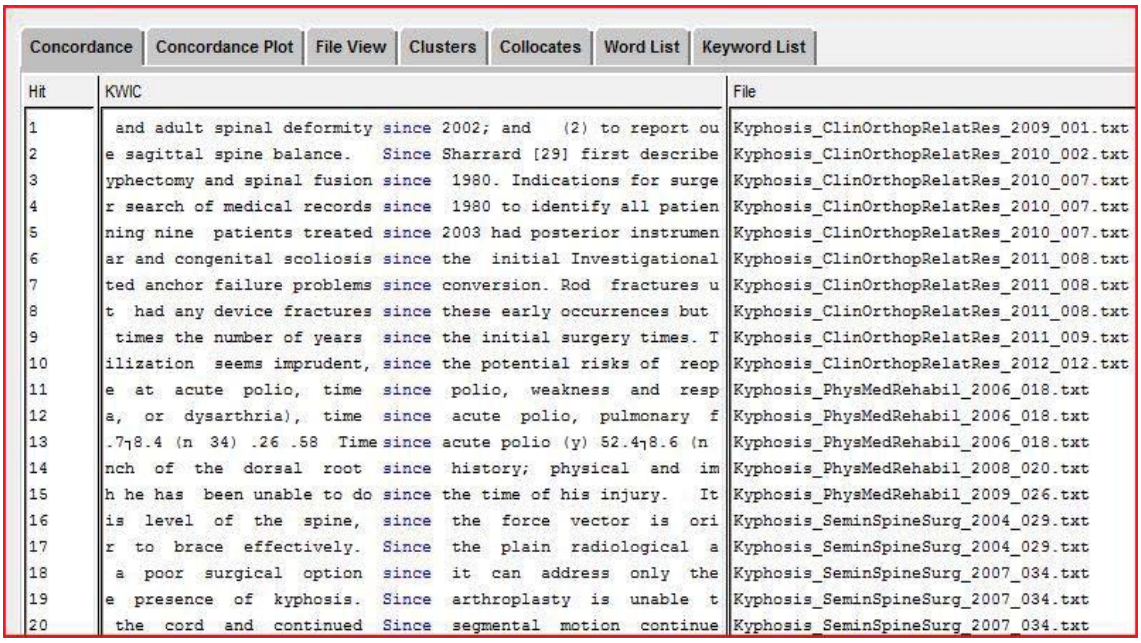
The present section depicts the results found in terms of frequency in the corpora research and compares them with those found in two reference corpora, COCA and BNC. First we made a query in the three corpora in order to find quantitative data of the use of *since*. After this, we made a distinction in our query between the three different functions of *since* according to the different grammars and dictionaries we consulted (See section 2): preposition, adverb, and conjunction.

4.1. Total results

First, we searched for *since* in the three different corpora. As the Corpus of Spine Deformities (CSD) was composed by research articles dealing with spine deformities, *since* was searched in BNC and COCA in the fields and domains we considered more similar to the materials included in our corpus. Among the different genres these corpora offered, we chose academic and within the subgenres it comprises we selected *Medicine* as our corpus is composed by texts dealing with Spine deformities and we could not find any other subgenre more accurate.

Corpus of Spine Deformities

In the CSD, all the occurrences of *since* were found with the help of AntConc and its Concordance tool.



Concordance | Concordance Plot | File View | Clusters | Collocates | Word List | Keyword List

Hit	KWIC	File
1	and adult spinal deformity since 2002; and (2) to report ou	Kyphosis_ClinOrthopRelatRes_2009_001.txt
2	e sagittal spine balance. Since Sharrard [29] first describe	Kyphosis_ClinOrthopRelatRes_2010_002.txt
3	yphectomy and spinal fusion since 1980. Indications for surge	Kyphosis_ClinOrthopRelatRes_2010_007.txt
4	r search of medical records since 1980 to identify all patien	Kyphosis_ClinOrthopRelatRes_2010_007.txt
5	ning nine patients treated since 2003 had posterior instrumen	Kyphosis_ClinOrthopRelatRes_2010_007.txt
6	ar and congenital scoliosis since the initial Investigational	Kyphosis_ClinOrthopRelatRes_2011_008.txt
7	ted anchor failure problems since conversion. Rod fractures u	Kyphosis_ClinOrthopRelatRes_2011_008.txt
8	t had any device fractures since these early occurrences but	Kyphosis_ClinOrthopRelatRes_2011_008.txt
9	times the number of years since the initial surgery times. T	Kyphosis_ClinOrthopRelatRes_2011_009.txt
10	ilization seems imprudent, since the potential risks of reop	Kyphosis_ClinOrthopRelatRes_2012_012.txt
11	e at acute polio, time since polio, weakness and resp	Kyphosis_PhysMedRehabil_2006_018.txt
12	a, or dysarthria), time since acute polio, pulmonary f	Kyphosis_PhysMedRehabil_2006_018.txt
13	.7ŋ8.4 (n 34) .26 .58 Time since acute polio (y) 52.4ŋ8.6 (n	Kyphosis_PhysMedRehabil_2006_018.txt
14	nch of the dorsal root since history; physical and im	Kyphosis_PhysMedRehabil_2008_020.txt
15	h he has been unable to do since the time of his injury. It	Kyphosis_PhysMedRehabil_2009_026.txt
16	is level of the spine, since the force vector is ori	Kyphosis_SeminSpineSurg_2004_029.txt
17	r to brace effectively. Since the plain radiological a	Kyphosis_SeminSpineSurg_2004_029.txt
18	a poor surgical option since it can address only the	Kyphosis_SeminSpineSurg_2007_034.txt
19	e presence of kyphosis. Since arthroplasty is unable t	Kyphosis_SeminSpineSurg_2007_034.txt
20	the cord and continued Since segmental motion continue	Kyphosis_SeminSpineSurg_2007_034.txt

Figure 1: *Since* in CDS with AntConc Concordance Tool

The Corpus of Spine Deformities has a final length of 788,023 occurrences, in which *since* was found 86 times. As in the reference corpora the number of occurrences is expressed in times per million, we decided to extrapolate our findings to calculate the number of occurrences per million in order to be able to compare this to the reference corpora.

86 in 788,023 = 109.13 per million

In a million, *since* would be found 109.13 times, if we compare this result to the two reference corpora, the number of occurrences of *since* in both reference corpora is much higher than in our corpus, as we are going see below.

BNC:

In the British National Corpus *since* has a frequency of 431.76 times per million in the subgenre of Medicine.

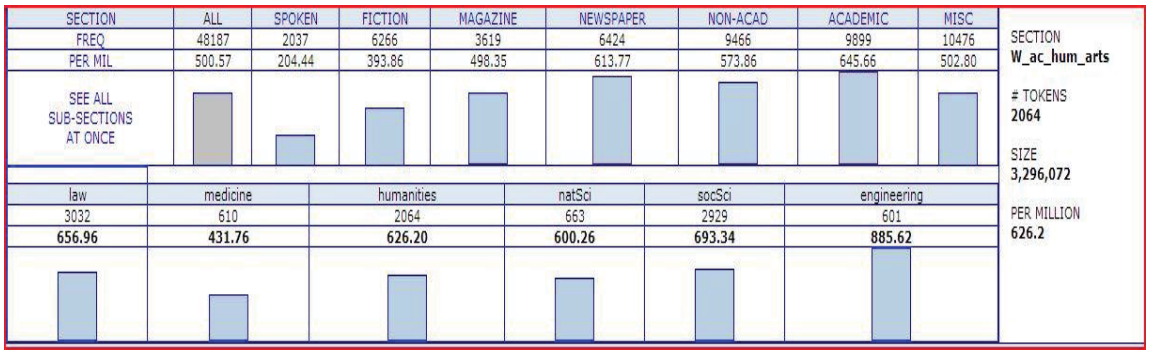


Figure 2: *Since* in BNC

However, if we compare this result to its use in all the different genres and domains contained in the BNC (total frequency) and to the academic genre in general, we can observe that the number of occurrences per million in Medicine is lower than in the other two research fields. The frequency of *since* in the different subgenres contained within the academic genre is around 600 times per million except for Engineering, where the use of *since* is higher and our research field which is below average.

General: 500.57 per million

Academic: 645.66 per million

Medicine: 431.76 per million

COCA:

In the Corpus of Contemporary American English *since* has a frequency of 358.78 per million in the subgenre of *Medicine*, which means it would appear nearly 100 times less in a million than in the British corpus.

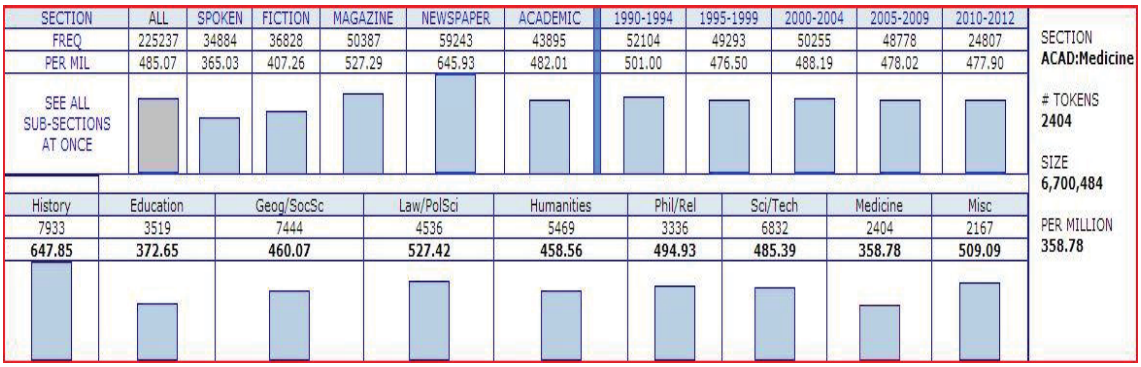


Figure 3: *Since* in COCA

In this case, although the frequency of *since* in the general language and the academic genre is similar, the number of appearances of *since* in the medical subcorpus is again lower than within the other two. It is also the lowest frequency if we compare it to the other subgenres comprised by the academic genre.

General 485.14 per million

Academic: 482.01 per million

Medicine: 358.78 per million

Summary:

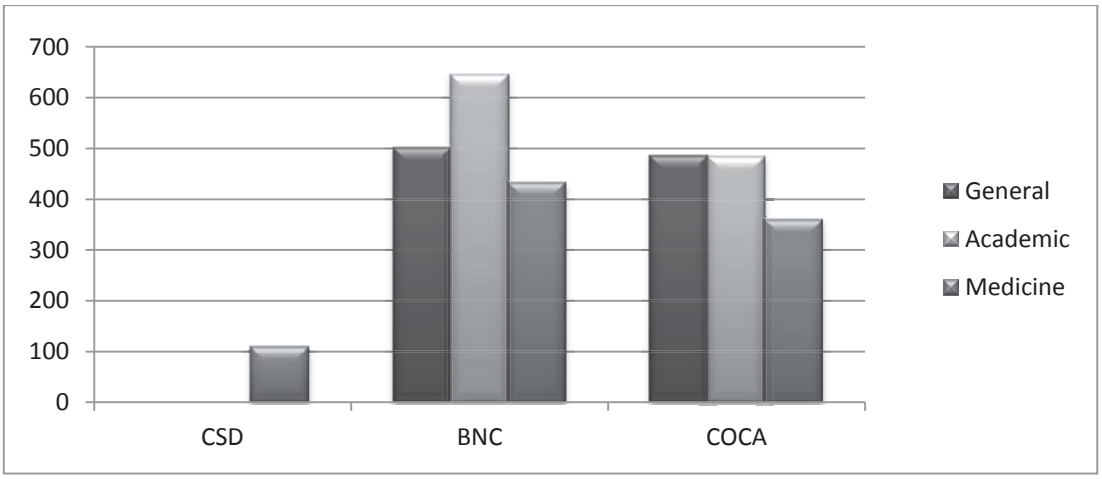


Figure 4: Occurrences of *Since*

Figure 1 summarizes the results found in terms of frequency comparing the number of occurrences of *since* in my corpus, the BNC, and COCA.

These results show a big difference between the number of occurrences of *since* in both reference corpora and in the CSD. Whereas in BNC and COCA the number of occurrences per million within the Medicine subgenre is around 400, in our corpus it was just found 109,133 times per million. Frequencies are always higher in the British National Corpus and in COCA and BNC the lowest frequency is the one found in the subgenre of Medicine.

4.2. Findings by Part of Speech.

A second search was made by specifying the function of *since* within the examples according to those determined in the different grammars and dictionaries we have consulted in Section 2. In every section results are organized the same way. First

the Corpus of Spine Deformities was analyzed and the results were manually classified into one of the three different categories discussed in Section 2: preposition, conjunction and adverb. Then we looked for *since* in the reference corpora and finally we compared the frequencies of each corpus in the subgenre of Medicine.

4.2.1. *Since* as preposition

In first place we examine *since* when it performs the function of preposition, which was found to be the highest frequency in my corpus.

Corpus of Spine Deformities:

Results found in my corpus were manually analyzed and classified in one of the three categories (preposition, adverb and conjunction) based on the function it performed within the different examples. In this way, *since* was found to have the function of preposition a total number of 49 times, which constitutes the 56.97% of the examples found. This means that more than half of the examples found have the function of preposition. However, as in the previous case, results in both reference corpora are expressed in times per million, so we once again extrapolated our findings to times per million. So if in 788,023 we found *since* 49 times, in a million it is supposed to appear 62.18 times.

BNC:

One of Leech's maxims of annotation is that corpus annotation is not infallible, but simply a potentially useful tool, which is supported by Potter (1999:35), "As tagging is something automatic, accuracy may not be complete". This means that some errors could be found in those reference corpora, although they usually constitute a very low percentage.

In the British National Corpus the number of occurrences of *since* as preposition in the Medicine subgenre was 84.23 per million, being the highest frequency in the three corpora we have analyzed.

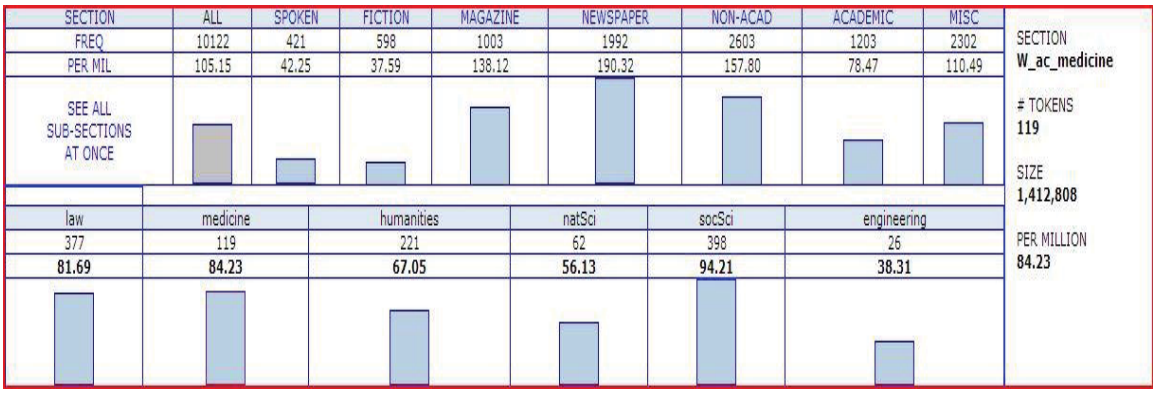


Figure 5: *Since* as Preposition in BNC

If we compare this to its frequency in the academic genre, the frequency is higher in the subgenre than in its genre, as the frequency of the research word in the academic genre was 78.47. However, both frequencies would be lower if we compare them to that of the general language, in which *since* is found 105.15 times per million.

General 105.15 per million.

Academic: 78.47 per million.

Medicine 84.23 per million.

COCA:

In the case of COCA the number of occurrences of *since* in the Medicine subgenre was lower than in the British Corpus, 74.62 per million.

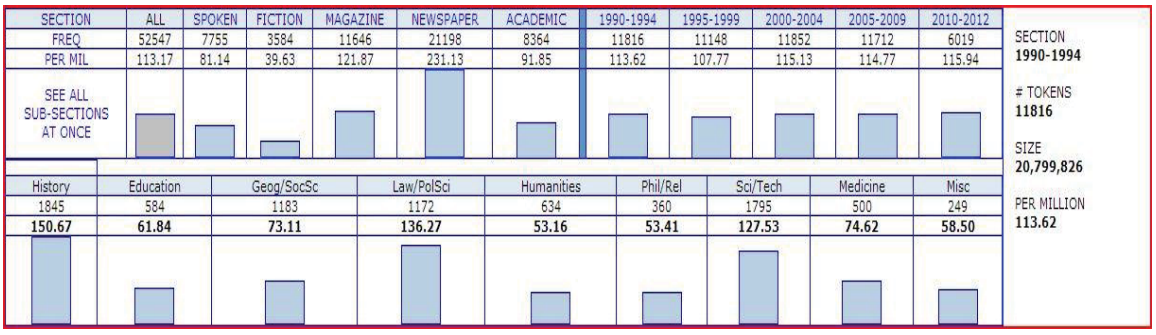


Figure 6: *Since* as Preposition in COCA

However, in this case the frequency in the academic genre this time is about 17 times higher in every million, as the frequency of the research word in the academic genre was 91.85. If we compare the frequency of *since* in the texts dealing with

Medicine to its frequency in the general language, the difference is bigger as it is found 113.16 times per million.

General: 113.16 per million.

Medicine: 74.62 per million.

Academic: 91.85 per million.

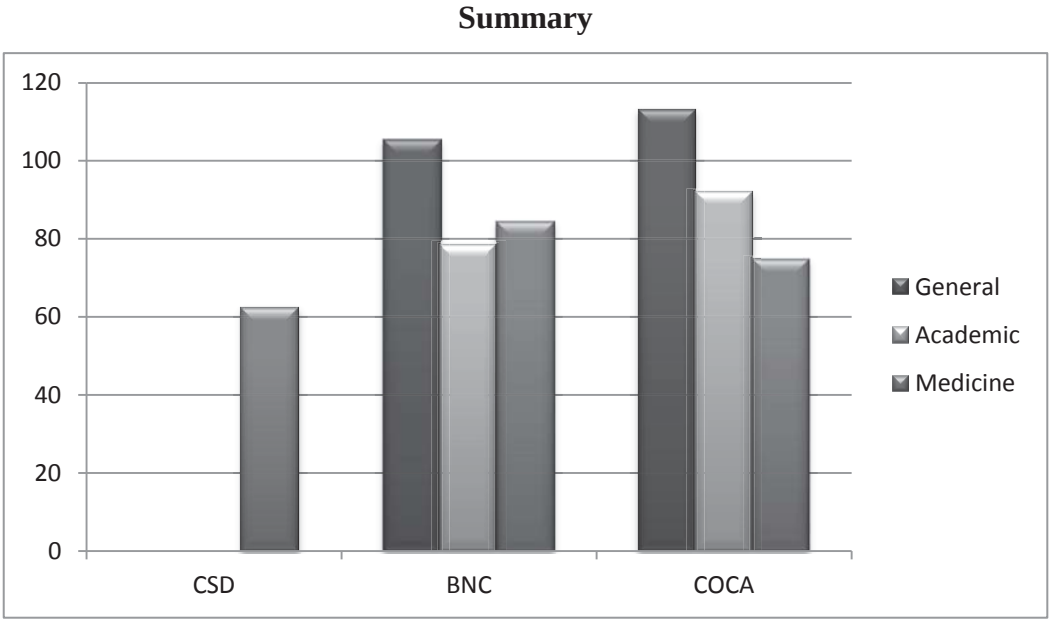


Figure 7: *Since* as Preposition

Figure 2 summarizes the frequency of *since* when it acts as preposition in the three corpora. As in the general language, the highest frequency is the one in the British National Corpus in all the categories and the lowest one is the one found in CSD when comparing frequencies in the subcorpora of Medicine. However, this time the difference between my corpus and the reference corpora is not as significant as in the previous section.

4.2.2 *Since* as conjunction

The second frequency registered in my corpus is that of *since* when this one acts as a conjunction.

Corpus of Spine Deformities:

Since was found to act as a conjunction a total of 29 times in the CSD, which means a 33.7%. If we extrapolate this to times per million in order to compare it later to

both reference corpora (COCA and BNC) the number of occurrences per million would be 37.27.

BNC:

In the British National Corpus the number of occurrences of *since* as conjunction in the *Medicine* subgenre was 336.21 per million, being once again the highest frequency in the three corpora. This frequency is similar to the frequency of *since* in the general language.

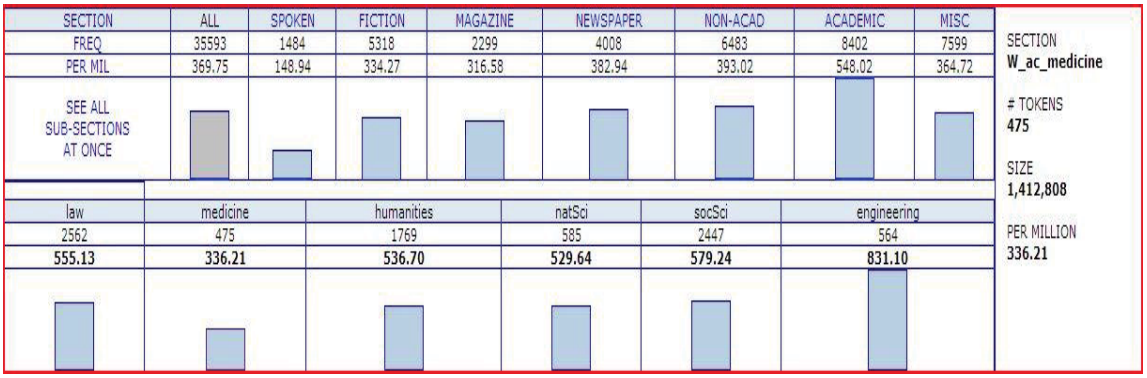


Figure 8: *Since* as Conjunction in BNC

However, if we compare these two to the frequency of *since* in the academic genre, the frequency is more than 200 times per million higher in the genre than in its subgenre and in the general language.

General: 369.75

Academic: 548.02

Medicine: 336.21

COCA:

In the case of the American Corpus, the frequency of *since* in the Medicine subcorpus was of 275.95 times per million.

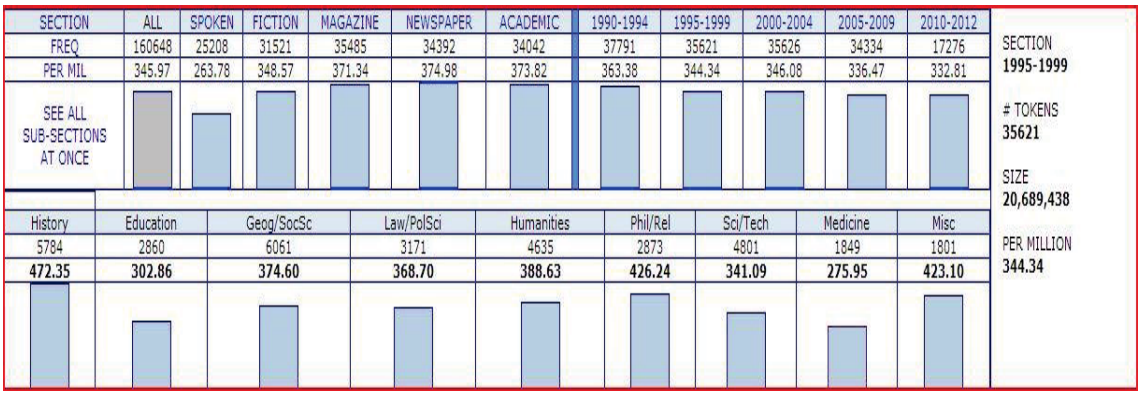


Figure 9: *Since* as Conjunction in COCA

However, this time this frequency is not close to that found when querying *since* in the general language or the academic subcorpus. The frequencies in these are 80 and 100 times higher in a million respectively.

General: 346.02

Academic: 373.82

Medicine: 275.95

Summary:

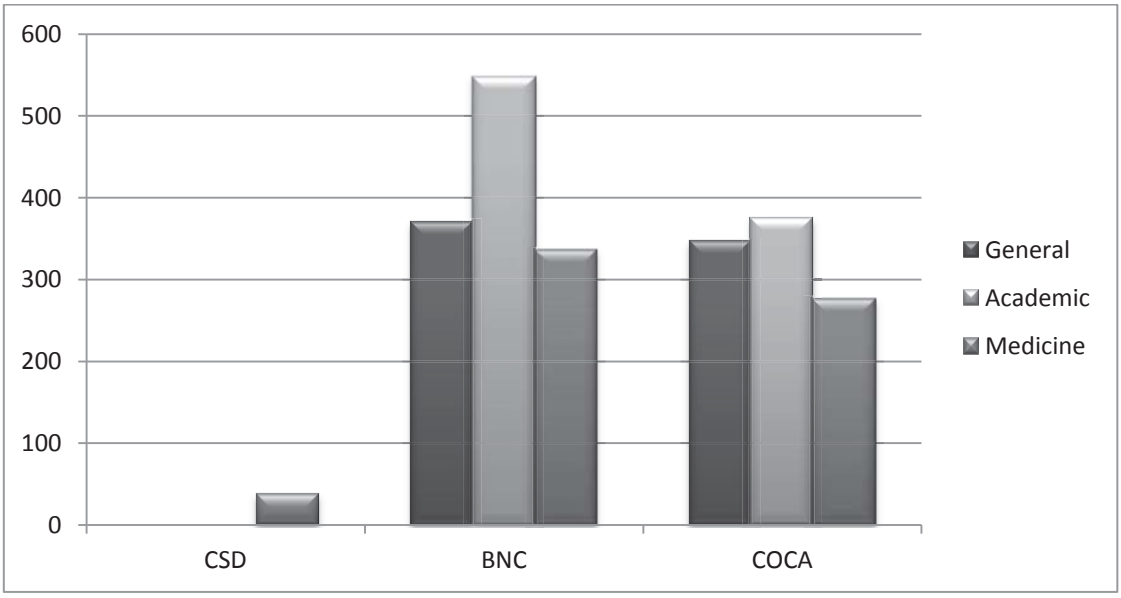


Figure 10: *Since* as Conjunction

Figure 3 summarizes the frequency of *since* as conjunction in the three corpora. In the case of *since* as conjunction, the difference in terms of frequency between the two

reference corpora and my corpus is very significant. A frequency of 37.27 times in a million is a really low frequency if we compare it to those found in the reference corpora, in which its use as conjunction is nearly 100 times higher. In CSD *since* is more frequently used as preposition than as conjunction. However, in the reference corpora there is a much higher use of *since* as conjunction than as preposition. Section 5 provides several hypotheses that try to explain why the usage of *since* is so different between the three corpora.

4.2.3 *Since* as adverb

The frequency of *since* as adverb is considerably inferior if we compare it to the previous ones, not only in the Medicine subgenre, but in all research fields. It was found no more than 30 times per million in any field, whereas we were discussing a frequency around 400 times per million in the previous section. However, in this case not only the frequency is lower, but differences between corpora are smaller too.

Corpus of Spine Deformities:

Within my corpus, *since* was only found to have the function of adverb 8 times out of 86, or, what is the same 10.15 times per million, which would constitute the 9.30% of the cases.

BNC:

In the British National Corpus the number of occurrences of *since* as adverb in the *Medicine* subgenre was 11.32 per million.

Figure 11: *Since* as Adverb in BNC

According to the results found in the BNC, if we compare the frequency of *since* in the subgenre of Medicine to the frequency of the general language, this last one duplicates the number of times we found it in a million, as we can find *since* 25.68 times per million. Although the difference is no so high when we compare it to the academic genre, frequency in this research field is higher than the one found in Medicine too.

General: 25.68

Academic: 19.18

Medicine: 11.32

COCA:

The general frequency of *since* in COCA is similar to that found in the BNC, however, the frequency in the academic genre and the Medicine subgenre, are underneath the rest.

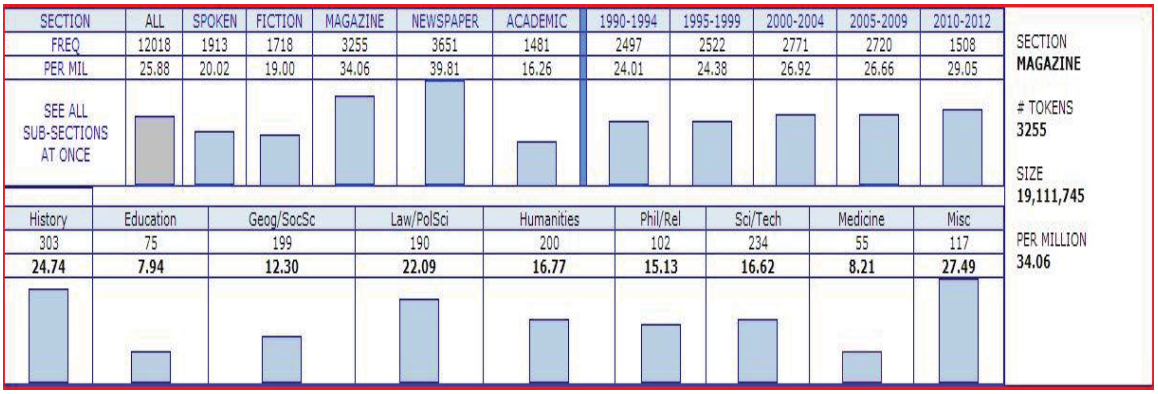


Figure 12: *Since* as Adverb in COCA

Since was found to occur 25.88 times per million in the general language; 16.26 in the academic genre; and 8,21 in the subgenre of Medicine, being this one the smallest frequency in this subfield if we compare it to the other corpora.

General: 25.88

Academic: 16.26

Medicine: 8.21

Summary:

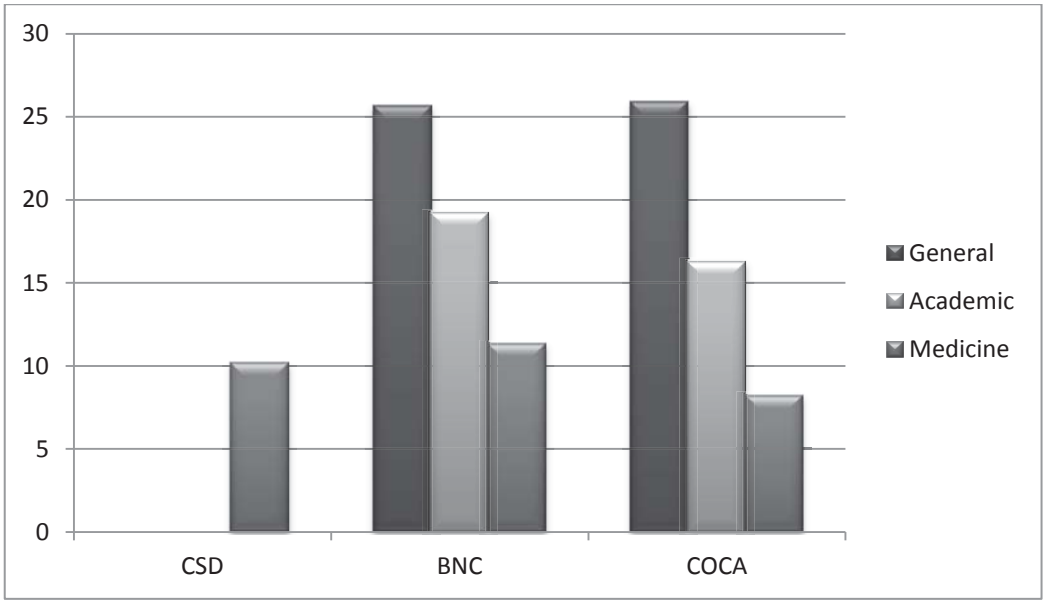


Figure 13: *Since* as Adverb

The use of *since* as adverb is considerably inferior if we compare it to the previous ones, not only in the Medicine subgenre, but in the general language and in the academic genre too. It was found no more than 30 times per million in any research field, whereas we were talking about a frequency of around 400 times per million in the previous section. However, in this case not only the frequency is lower, but differences between corpora are smaller too. The number of times *since* is found in a million is similar in both reference corpora. When searching it in the Medicine subcorpus, frequency was once again bigger in the BNC, but, although higher than in the rest of the corpus, in this case it is still low.

4.2 Summary: *Since* by POS in the subgenre of Medicine

Section 4 describes the results found in terms of frequency in the Corpus of Spine Deformities and two reference corpora, the BNC and the COCA. This part of the section provides a summary of the results found.

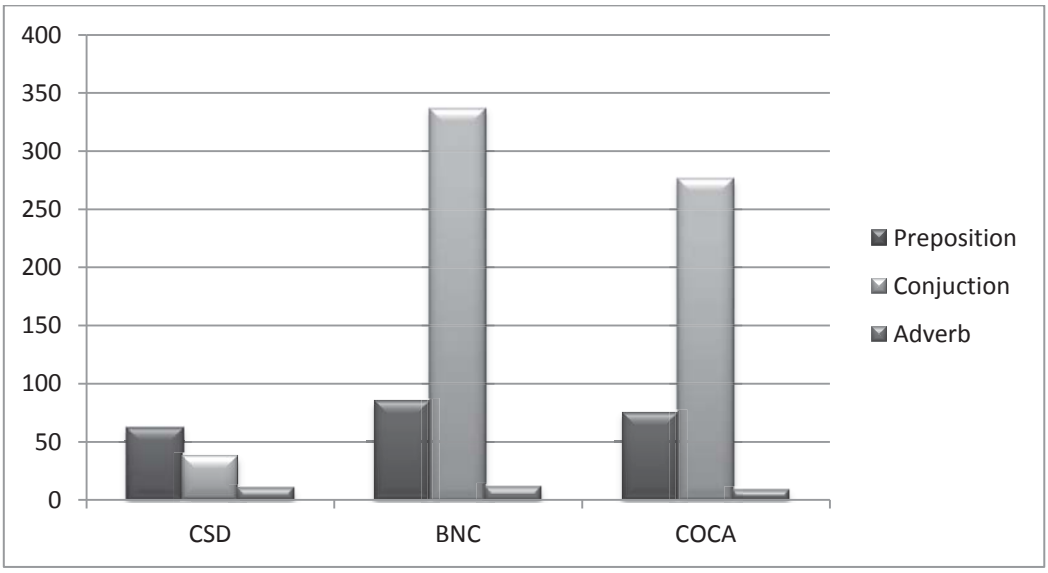


Figure 14: Frequency of *Since*

Looking into detail at the results, it can be deduced that the frequencies found in the Corpus of Spine Deformities are considerably inferior to those found in the Medicine subcorpora in both reference corpora. It can also be observed if we compare frequencies in the three corpora, that frequencies are always higher in all sections within the British variety. So, according to this, we could state that in the medical specialized language *since* is more frequently used by British people than by American people. Moreover, in COCA the use of *since* can be depicted yearly since 1990 to 2012. We can see how in this corpus the use of *since* tends to diminish along the years from a starting frequency of 501.00 times per million in the first time period, to one of 477.90 from 2010 to 2012 which means a reduction of around 5%.

	1990-1994	**1995-1999**	**2000-2004**	**2005-2009**	**2010-2012**
RAW FREQUENCY	52104	49293	50255	48778	24807
FREQUENCY PER MILLION	501.00	476.50	488.19	478.02	477.90

Table 3: Frequency of *Since* in COCA over the years.

If we analyze *since* by POS we find that in COCA and BNC the most common use of *since* is the one that it has when it acts as conjunction, being this result the opposite to the one found in my corpus.

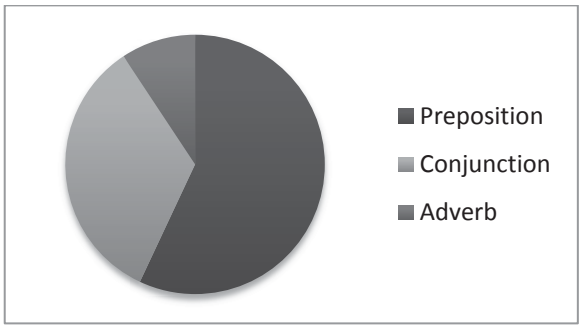


Figure 15: *Since* in CSD

In the Corpus of Spine Deformities, the highest frequency is the one it has when it has the function of preposition, which constitutes the 56.97% of the cases. This is followed by its use as conjunction, 33.7%, and the smallest frequency, as in the other two corpora is the one when it acts as adverb, being only the 9.30% of the cases. The following section provides several hypotheses which could explain why frequencies are different between corpora.

5. Discussion

As it has already been stated in the previous section, the frequency of *since* is, in most of the cases, higher in both reference corpora than in the Corpus of Spine Deformities. Two different aspects were surprising when analyzing these results. One was the difference in terms of frequency between the functions of *since*, because the highest use of *since* in COCA and BNC is the one it has when it functions as conjunction; whereas the highest frequency in the Corpus of Spine Deformities is the one it has when it functions as preposition (56.97%). And the other difference which was significantly surprising was the differences registered between COCA and BNC, and the Corpus of Spine Deformities when analyzing the frequency of *since* in the category of conjunction.

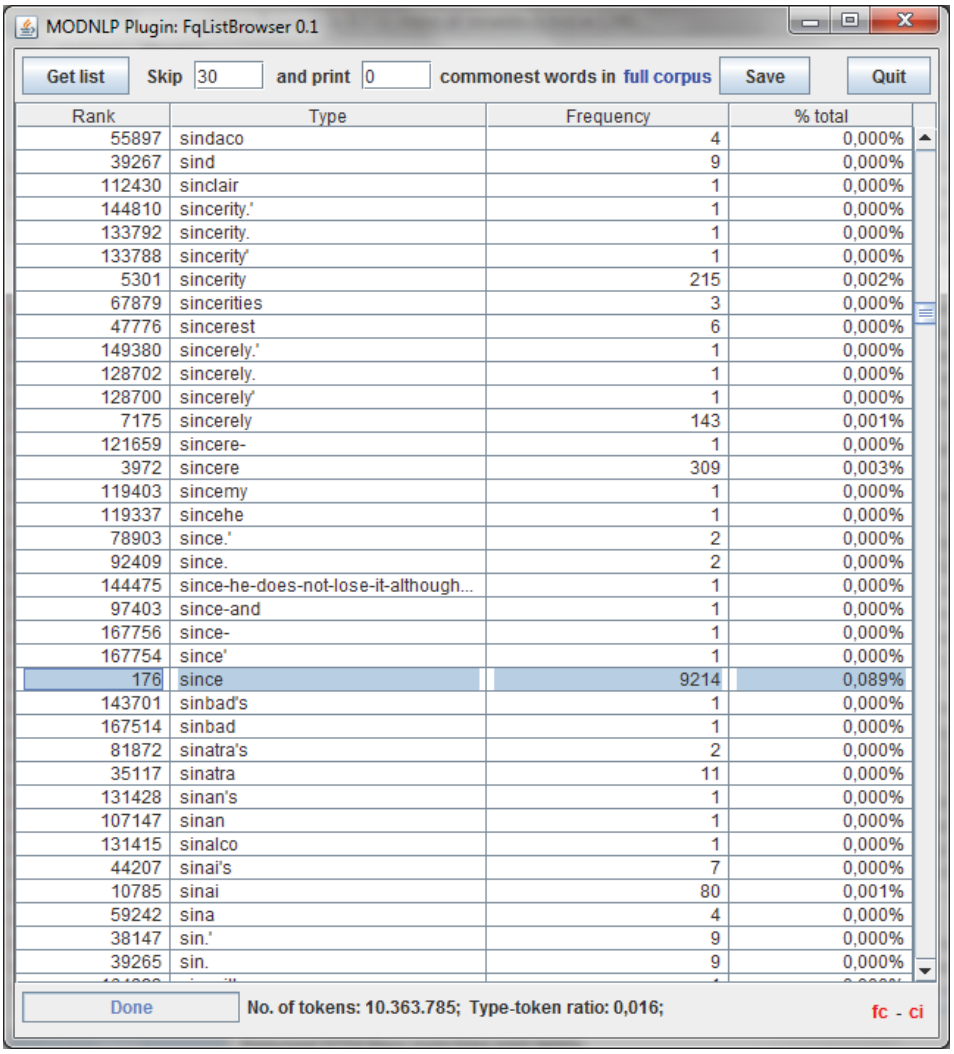
The present section presents several hypothesis that could explain why these differences between the reference corpora and the Corpus of Spine Deformities take place.

5.1. No native speakers: Universals of translations

One of the hypotheses we thought that could explain this difference between the frequencies of the functions of *since*, was that texts included in the Corpus of Spine

Deformities might not have been written by native English speakers. Although special attention was paid to the institutions where the articles came from, we cannot be completely sure that these articles were originally written by English native speakers. Despite the fact that only texts published by institutions from English speaking countries were included, it was not possible to figure it out if all the authors were English native speakers due to the multiculturalism happening nowadays in those countries. If some texts were not from English native speakers, this could influence the kind of language used in these articles in two different ways. First option could be that texts are originally written in English by people working in these institutions, although they might not be native speakers. And the second option, although less probable, could be that some of the articles included in my corpus are not the original ones but translations. Taking into account these two options, similar features influence the use and complexity of language. When dealing with translated texts, Baker stated that there are three main aspects that take place in the process of translation: simplification, explicitation and normalization (181). According to her, simplification is "the tendency to simplify the language used in translation" (182). Thus the amount of vocabulary will be lower and the length of the sentences will be sorter, which means that conjunctions, including *since*, will present lower frequency of use.

We cannot be sure if the texts included in the Corpus of Spine Deformities were written by native speakers, but being this a possible explanation, the frequency of *since* was checked in a corpus of translations in order to prove if this universal of translation affected the use of *since*. In this way, we queried *since* in the Translational English Corpus (henceforth TEC) from the University of Manchester which consists on translations into English from different source languages. It was created by Mona Baker and it is managed by her nowadays. In TEC, *since* has a total frequency of 921.4 times per million. The highest frequency in the previous section in the general language was found in the BNC, with a total of 500.57 times per million, therefore, the frequency found in TEC is much higher than the one found in the reference corpus.



Rank	Type	Frequency	% total
55897	sindaco	4	0,000%
39267	sind	9	0,000%
112430	sinclair	1	0,000%
144810	sincerity.'	1	0,000%
133792	sincerity.	1	0,000%
133788	sincerity'	1	0,000%
5301	sincerity	215	0,002%
67879	sincerities	3	0,000%
47776	sincerest	6	0,000%
149380	sincerely.'	1	0,000%
128702	sincerely.	1	0,000%
128700	sincerely'	1	0,000%
7175	sincerely	143	0,001%
121659	sincere-	1	0,000%
3972	sincere	309	0,003%
119403	sincemy	1	0,000%
119337	sincehe	1	0,000%
78903	since.'	2	0,000%
92409	since.	2	0,000%
144475	since-he-does-not-lose-it-although...	1	0,000%
97403	since-and	1	0,000%
167756	since-	1	0,000%
167754	since'	1	0,000%
176	since	9214	0,089%
143701	sinbad's	1	0,000%
167514	sinbad	1	0,000%
81872	sinatra's	2	0,000%
35117	sinatra	11	0,000%
131428	sinan's	1	0,000%
107147	sinan	1	0,000%
131415	sinalco	1	0,000%
44207	sinai's	7	0,000%
10785	sinai	80	0,001%
59242	sina	4	0,000%
38147	sin.'	9	0,000%
39265	sin.	9	0,000%

Figure16: S*ince* in TEC

As translated texts present a higher frequency of *since* than COCA, BNC, and the Corpus of Spine Deformities, this means that we can, thus, reject this premise to try to justify the difference between the frequencies of *since* in the reference corpora and in my corpus.

5.2. American variety

A second possible explanation to try to explain the difference registered in terms of frequency between the Corpus of Spine Deformities and COCA and BNC would be that the Corpus of Spine Deformities includes a high number of texts from American institutions (American variety of English). If we compare the frequency of *since* in the BNC to that found in the COCA, it can be deduced that, in most research areas, its use is higher in the British variety than in the American one. The Corpus of Spine Deformities includes a great amount of American articles, which could explain why the

use of *since* is lower than in the BNC. However, this fact would not explain the difference in terms of frequency between our corpus and the COCA. A possible explanation for this could be that, as has been seen in section 4, the use of *since* tends to diminish over the years.

	1990-1994	**1995-1999**	**2000-2004**	**2005-2009**	**2010-2012**
RAW FREQUENCY	52104	49293	50255	48778	24807
FREQUENCY PER MILLION	501.00	476.50	488.19	478.02	477.90

Table 3: Frequency of *Since* in COCA over the years.

The Corpus of Spine Deformities comprises texts from 2000 to 2014, whereas in COCA, texts from 1990 are included. As we can observe in table 3 the use of *since* decreased 12.81 times per million between those 10 years, which justifies part of its lower use in my corpus. The frequency of *since* continues decreasing over the years: from 1990 to 2012 it decreased 23.1 times per million. If the last period of years is analyzed, the frequency of *since* declined from 496.85 times per million in 2010 to 437.54 in 2012. In other words, the frequency of *since* declined 59.31 times per million in just three years. Following this, it can be deduced that the frequency of *since* will probably continue decreasing along the years in the American variety of English, which would be closer to the frequency found in the Corpus of Spine Deformities.

5.3. Degree of specialization

According to results found in COCA and BNC, the frequency of *since* is lower in the subcorpora of Medicine than in the general language and the academic genre. If we compare its frequency in the subgenre of Medicine to that of the other specialized fields comprised within the academic genre, it can be observed that the frequency in our research field is, in most of the cases, one of the lowest ones (See illustrations included in the previous section). A third hypothesis that was taken into account to try to explain these differences was the extremely high degree of specialization involved in the articles included in the Corpus of Spine Deformities. In this corpus only highly specialized articles were included, which could explain this difference in terms of frequency between the Corpus of Spine Deformities and the Medicine subcorpora of the reference

corpora in which the degree of specialization could be not so high as the one included in my corpus.

6. Conclusions and further research.

Corpus driven and corpus based studies are very significant for several reasons such as to study real examples of language, to provide examples of use or information regarding the context of a specific word, etc. This paper has presented a study of the use and frequency of *since* in a very specialized corpus which was compiled specifically for this study. This kind of studies allows the linguists to describe in detail the use of the language in a specific genre and topic, and to provide quantitative, as well as qualitative data of specific linguistic aspects as *since*, which can have different applications in translation or when teaching English as a second or foreign language in an English for Specific Purposes (ESP) teaching context.

Significant differences regarding the use and frequency of *since* were found in the Corpus of Spine Deformities if we compare this to the two reference corpora (COCA and BNC) consulted. Every function of *since* was studied independently and these differences were found to be higher when dealing with *since* as conjunction. Several possible explanations were taken into account when trying to justify why this differences took place.

However, after rejecting that the articles could be translations or could have been written by no native speaker of English by checking this with a corpus of translations as TEC in which the frequency of *since* nearly duplicated the one registered in COCA and BNC, the explanation which seemed more accurate was the one which stated that a high degree of specialization of a corpus, involves a lower use of the particle *since*. We also rejected the hypothesis regarding the reduction of the frequency of *since* along the years in the American variety because it would just partially explain those differences found between corpora, as the lowest frequency in the use of *since* along the years was only found in the Corpus of Contemporary American English. Besides, as stated in the Discussion Section, the decreasing tendency in the use of *since* along the time would support just a percentage of this reduction.

According to the results found in Section 4, the frequency of *since* is lower in the subcorpora of Medicine of COCA and BNC than in the general language and the

academic genre. Articles included in the Corpus of Spine Deformities were highly specialized articles as they were collected from journals dealing specifically with this topic. It could explain this difference in terms of frequency between the Corpus of Spine Deformities and the Medicine subcorpora of the reference corpora (COCA and BNC) in which the degree of specialization could be not so high as the one included in Corpus of Spine Deformities.

It could be interesting to perform another research with another highly specialized corpus of texts but of a different specialized area of knowledge in order to compare it to the results found in the Corpus of Spine Deformities to validate the highly specialized corpus explanation of the lower frequency of use of *since;* and a different research could be conducted in a less specialized corpus in the area of Orthopedics in order to check if the differences between frequencies are really caused by the degree of specialization of the texts included.

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Appendix

CODE	ARTICLE	WORDS
Kyphosis_ClinOrthopRelatRes_2009_001	Vertebral Column Resection for the Treatment of Severe Spinal Deformity	4.828
Kyphosis_ClinOrthopRelatRes_2010_002	Kyphectomy in Children with Myelomeningocele	4.611
Kyphosis_ClinOrthopRelatRes_2010_003	Correlation of Spine Deformity, Lung Function, and Seat Pressure in Spina Bifida	4.026
Kyphosis_ClinOrthopRelatRes_2010_004	Posterior Kyphectomy for Myelomeningocele With Anterior Placement of Fixation	4.515
Kyphosis_ClinOrthopRelatRes_2010_005	Laminoplasty versus Laminectomy and Fusion for Multilevel Cervical Spondylotic Myelopathy	5.183
Kyphosis_ClinOrthopRelatRes_2010_006	Can VEPTR1 Control Progression of Early-onset Kyphoscoliosis?	4.961
Kyphosis_ClinOrthopRelatRes_2010_007	Kyphectomy Improves Sitting and Skin Problems in Patients with Myelomeningocele	4.393
Kyphosis_ClinOrthopRelatRes_2011_008	VEPTRTM Growing Rods for Early-onset Neuromuscular kyphosis	4.122
Kyphosis_ClinOrthopRelatRes_2011_009	Surgical Technique ´Modern Luque Trolley, a Self-growing Rod Technique	5.479
Kyphosis_ClinOrthopRelatRes_2011_010	Convex Instrumented Hemiepiphysiodesis with Concave Distraction	4.168
Kyphosis_ClinOrthopRelatRes_2011_011	Combined Anterior-Posterior Surgery is the Most Important Risk Factor for Developing Proximal Junctional Kyphosis in Idiopathic Scoliosis	4.181
Kyphosis_ClinOrthopRelatRes_2012_012	Prolonged Bed Rest as Adjuvant Therapy After Complex Reconstructive Spine Surgery	5.412
Kyphosis_ClinOrthopRelatRes_2014_013	Minimally Invasive Surgical Techniques in Adult Degenerative Spinal Deformity: A Systematic Review	6.795
Kyphosis_ClinOrthopRelatRes_2014_014	Minimally Invasive Surgical Approaches in the Management of Tuberculosis of the Thoracic and Lumbar Spine	5.923
Kyphosis_PhysMedRehabil_2005_015	Pulmonary Rehabilitation for Restrictive Lung Impairment Secondary to Osteoporotic Sternal Fracture	1.737
Kyphosis_PhysMedRehabil_2006_016	Interrater Reliability of the History and Physical Examination in Patients With Mechanical Neck Paine	7.999
Kyphosis_PhysMedRehabil_2006_017	Effect of Different Sitting Postures on Lung Capacity, Expiratory Flow, and Lumbar Lordosis	5.582
Kyphosis_PhysMedRehabil_2006_018	Sleep-Disordered Breathing in Fatigued Postpoliomyelitis Clinic Patients	4.861
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Kyphosis_PhysMedRehabil_2008_020	Interventions in Chronic Pain Management. 2. Diagnosis of Cervical and Thoracic Pain Syndromes	6.174
Kyphosis_PhysMedRehabil_2008_021	Chronic Pain in Persons With Myotonic	8.439

	Dystrophy and Facioscapulohumeral Dystrophy	
Kyphosis_PhysMedRehabil_2008_022	Outcomes After a Prone Lumbar Traction Protocol for Patients With Activity-Limiting Low Back Pain	5.372
Kyphosis_PhysMedRehabil_2008_023	The Impact of Increasing Paraspinal Muscle Activity on Stature Recovery in Asymptomatic People	4.022
Kyphosis_PhysMedRehabil_2008_024	Pelvic Floor Muscle Activity inDifferent Sitting Postures in Continent and Incontinent Men	5.421
Kyphosis_PhysMedRehabil_2009_025	Stability of Kyphosis, Strength, and Physical Performance Gains 1 Year After a Group Exercise Program in Community-Dwelling Hyperkyphotic Older Women	3.008
Kyphosis_PhysMedRehabil_2009_026	Implanted Electrical Stimulation of the Trunk for Seated Postural Stability and Function After Cervical Spinal Cord Injury: A Single Case Study	6.826
Kyphosis_PhysMedRehabil_2010_027	Biplanar Measurement of Thoracolumbar Curvature in Older Adults Using an Electromagnetic Tracking Device	4.472
Kyphosis_PhysMedRehabil_2012_028	Dynamic Lumbar Curvature Measurement in Acute and Chronic Low Back Pain Sufferers	4.801
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Kyphosis_SeminSpineSurg_2006_030	Postarthrodesis Cervical Stenosis: Incidence, Etiology, and Surgical Options	2.668
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Kyphosis_SeminSpineSurg_2007_032	The Role for Cervical Arthroplasty for Symptomatic Cervical Stenosis: Indicated for a Single-Level Cervical Disc Herniation Causing Stenosis with Myelopathy	1.957
Kyphosis_SeminSpineSurg_2007_033	Interspinous Distraction Devices for Spinal Stenosis	6.653
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Kyphosis_SeminSpineSurg_2009_035	Complications of Cervical Disc Arthroplasty	6.659
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Kyphosis_SeminSpineSurg_2010_037	Surgical Management of Adults with Congenital Deformities of the Spine	3.181
Kyphosis_SeminSpineSurg_2010_038	Management of Osteoporotic Fractures of the Thoracolumbar Spine	6.526
Kyphosis_SeminSpineSurg_2010_039	Surgical Management of Thoracolumbar Fractures: Rationale for Short Fixation	6.316
Kyphosis_SeminSpineSurg_2011_040	Fusion for Lower Lumbar (L3-L5) Fractures: Surgical Indications and Techniques	5.571
Kyphosis_SeminSpineSurg_2011_041	Osteotomies for the Treatment of Cervical Kyphosis Caused by Ankylosing Spondylitis: Indications and Techniques	6.344
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Kyphosis_SeminSpineSurg_2011_043	Normal Cervical Alignment	3.182
Kyphosis_SeminSpineSurg_2011_044	Degenerative Cervical Kyphosis: Anatomy, Biomechanics, and Etiology	1.685
Kyphosis_SeminSpineSurg_2011_045	Neurogenic and Myopathic Deformities of the Cervical Spine	3.031

Kyphosis_SeminSpineSurg_2011_046	Minimally Invasive Treatment of Pediatric Spinal Deformity	2.209
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Kyphosis_SeminSpineSurg_2011_048	Fixed Sagittal Plane Deformity: Causes, Prevention, and Treatment Options	4.444
Kyphosis_SeminSpineSurg_2013_049	Iatrogenic spinal instability: Cervical and thoracic	8.981
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Kyphosis_SpineDeform_2012_051	Preoperative Halo-Gravity Traction for Severe Pediatric Spinal Deformity: Complications, Radiographic Correction and Changes in Pulmonary Function	4.187
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Kyphosis_SpineDeform_2012_054	Review of Cervical Kyphosis in Larsen Syndrome	2.882
Kyphosis_SpineDeform_2012_055	Perioperative Outcomes and Complications of Pedicle Subtraction Osteotomy in Cases With Single Versus Two Attending Surgeons	5.484
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Kyphosis_SpineDeform_2013_058	Assessment of Morbidity and Mortality Collection Data 2009	4.325
Kyphosis_SpineDeform_2013_059	Type of Anchor at the Proximal Fusion Level Has a Significant Effect on the Incidence of Proximal Junctional Kyphosis and Outcome in Adults After Long Posterior Spinal Fusion	4.496
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Kyphosis_SpineDeform_2013_061	Proximal Junctional Kyphosis After Vertical Expandable Prosthetic Titanium Rib Insertion	4.634
Kyphosis_SpineDeform_2013_062	Maintenance of Thoracic Kyphosis in the 3D Correction of Thoracic Adolescent Idiopathic Scoliosis Using Direct Vertebral Derotation	3.462
Kyphosis_SpineDeform_2013_063	Improvement of Kyphoscoliosis in a 9-Year-Old Using Growth Modulation With a Posterior Tether: A Case Report	2.083
Kyphosis_SpineDeform_2013_064	Preliminary Results of the Effect of Prophylactic Vertebroplasty on the Incidence of Proximal Junctional Complications After Posterior Spinal Fusion to the Low Thoracic Spine	4.645
Kyphosis_SpineDeform_2013_065	Quantification of Increase in Three-dimensional Spine Flexibility Following Sequential Ponte Osteotomies in a Cadaveric Model	5.565
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	Compression Fractures in a Growing Child With Duchenne Muscular Dystrophy With Five-Year Follow-Up: Case Report and Review of Literature	
Kyphosis_SpineDeform_2013_067	Matched Cohort Analysis of Posterior-Only Vertebral Column Resection Versus Combined Anterior/Posterior Vertebrectomy for Severe Spinal Deformity	4.967
Kyphosis_SpineDeform_2013_068	Preoperative Pulmonary Function in Patients With Operative Scheuermann Kyphosis	4.092
Kyphosis_SpineDeform_2013_069	Minimally invasive treatment of osteoporotic vertebral body compression fractures	3.627
Kyphosis_SpineDeform_2013_070	Scheuermann kyphosis: long-term follow-up	4.472
Kyphosis_SpineDeform_2013_071	Thoracic kyphoscoliosis resembling neurofibromatosis: a case report focusing on subfascial instrumentation	2.652
Kyphosis_SpineJourn_2002_072	Lateral mass screw-rod fixation of the cervical spine: a prospective clinical series with 1-year follow-up	3.814
Kyphosis_SpineJourn_2002_073	A surgical revisitation of Pott distemper of the spine	10.872
Kyphosis_SpineJourn_2002_074	Comparison of thoracic kyphosis and postural stiffness in younger and older women	3.194
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Kyphosis_SpineJourn_2003_076	Preliminary results of staged anterior debridement and reconstruction using titanium mesh cages in the treatment of thoracolumbar vertebral osteomyelitis	3.924
Kyphosis_SpineJourn_2003_077	Posterior lumbar interbody fusion for lytic spondylolisthesis: restoration of sagittal balance using insert-and-rotate interbody spacers	5.452
Kyphosis_SpineJourn_2004_078	Influence of spine morphology on intervertebral disc loads and stresses in asymptomatic adults: implications for the ideal spine	7.582
Kyphosis_SpineJourn_2004_079	Neurofibromatosis type I with severe dystrophic kyphoscoliosis and its operative management via a simultaneous anterior-posterior approach: a case report and review of the literature	3.391
Kyphosis_SpineJourn_2005_080	Mini-open thoracoscopically assisted thoracotomy versus video-assisted thoracoscopic surgery for anterior release in thoracic scoliosis and kyphosis: a comparison of operative and radiographic results	4.875
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Kyphosis_SpineJourn_2005_082	Do anterior interbody cages have a potential value in comparison to autogenous rib graft in the surgical management of Scheuermann's kyphosis?	4.367
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Kyphosis_SpineJourn_2007_088	Juvenile degenerative disc disease: a report of 76 cases identified by magnetic resonance imaging	3.991
Kyphosis_SpineJourn_2008_089	Surgical management of posttraumatic thoracolumbar kyphosis	8.806
Kyphosis_SpineJourn_2009_090	Thoracic vertebral osteomyelitis secondary to chronic esophageal perforation	2.785
Kyphosis_SpineJourn_2009_091	Sagittal balance influences range of motion: an in vivo study with the ProDisc-C	3.748
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Kyphosis_SpineJourn_2011_099	Minimally invasive corpectomy and posterior stabilization for lumbar burst fracture	2.910
Kyphosis_SpineJourn_2012_100	Progressive severe kyphosis as a complication of multilevel cervical percutaneous facet neurotomy: a case report	2.295
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Kyphosis_SpineJourn_2013_104	Incidence, diagnosis, and management of sacral fractures following multilevel spinal arthrodesis	4.301
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Lordosis_ClinOrthopRelatRes_2008_106	The Classic: Congenital Dislocation of the Hip	5.620

Lordosis_ClinOrthopRelatRes_2009_107	Journal Scan: Spine	4.976
Lordosis_ClinOrthopRelatRes_2011_108	Multilevel Measurement of Acetabular Version Using 3-D CT-generated Models	6.109
Lordosis_ClinOrthopRelatRes_2011_109	Laminoplasty versus Laminectomy and Fusion for Multilevel Cervical Spondylotic Myelopathy	5.183
Lordosis_ClinOrthopRelatRes_2011_110	Increased In-hospital Complications After Primary Posterior versus Primary Anterior Cervical Fusion	4.463
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Lordosis_PhysMedRehabil_2002_116	Development of a Noninvasive Measure of Pelvic and Hip Angles in Seated Posture	5.924
Lordosis_PhysMedRehabil_2002_117	Static Trunk Posture in Sitting and Standing During Pregnancy and Early Postpartum	4.798
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Lordosis_PhysMedRehabil_2002_119	Changes in Sagittal Lumbar Configuration With a New Method of Extension Traction: Nonrandomized Clinical Controlled Trial	5.951
Lordosis_PhysMedRehabil_2004_120	Electromyographic Activity of the Trunk Extensor Muscles: Effect of Varying Hip Position and Lumbar Posture During Roman Chair Exercise	3.342
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Lordosis_PhysMedRehabil_2005_122	Inter- and Intrarater Reliability of a Back Range of Motion Instrument	5.457
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