AN EXPLORATORY STUDY OF NNS MEDICAL WRITERS' AWARENESS OF THE COLLOCATIONAL PATTERNING OF ABSTRACT NOUNS IN MEDICAL DISCOURSE

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ABSTRACT. *Research has demonstrated that it is challenging for non-native speaker (NNS) writers to acquire phraseological competence in academic English and develop a good working knowledge of domain-specific collocational patterns. This paper aims to investigate if NNS writers, in our case Spanish doctors, who are required to publish in medical journals, are aware of the common collocational patterns of abstract nouns that occur in published health science discourse. Twenty-four Spanish doctors completed a worksheet based on the collocational patterning of four abstract nouns (*conclusion, comparison, agreement *and* decision*). The analysis of the collocation exercises in the worksheet highlights that the participants were aware of some of the common collocational patterns that occur but still would need support for some others. The paper concludes with a brief reflection on the teaching and learning of collocations and the implications of publishing in English.*

KEY WORDS. *Collocation, abstract nouns, health science, non native speaker writers, medical community, corpus investigation.*

RESUMEN. *Diversos estudios sobre inglés académico han demostrado que tanto la competencia fraseológica como el dominio de patrones colocacionales propios de un registro específico suponen un reto para los escritores no nativos (ENN). Este artículo tiene como objetivo principal investigar si los escritores no nativos, en este caso docto-res españoles que están obligados a publicar en revistas médicas, están familiarizados con los patrones colocacionales en los que aparecen nombres abstractos frecuentemen-te utilizados en el discurso médico. Una población de veinticuatro médicos españoles completó una hoja de ejercicios basada en patrones colocacionales relacionados con cuatro nombres abstractos (*conclusion, comparison, agreement *and* decision*). El análi-sis de dichos ejercicios ha puesto de manifiesto que los participantes eran conscientes de algunos de los patrones colocacionales de los nombres abstractos analizados, pero*

necesitan apoyo para algunos otros. El artículo concluye con una breve reflexión sobre la enseñanza y el aprendizaje de las colocaciones así como las implicaciones de la publicación de textos médicos en inglés.

PALABRAS CLAVE. *Colocaciones, nombres abstractos, ciencias de la salud, escritores no-nativos, comunidad médica, investigación sobre corpus.*

1. Background

1.1. *Medical discourse: phraseology, collocations and NNS writers publishing in English*

For more than thirty years, research has explored the characteristics of scientific discourse. Linguistic features such as modality (Huddleston 1971; Widdowson 1979; Adams-Smith 1984; Banks 1994; Gledhill 2000a/b), hedging (Myers 1989; Swales 1990; Banks 1994; Varttala 1999; Gledhill 2000), the use of the passive and the anticipatory *it*-pattern (Huddleston 1971; Swales 1990; Banks 1994; Biber et al. 1998/1999; Hyland 2008) are hallmarks of this type of writing. Additionally, features such as the tendency to use grammatical metaphor (Salager-Meyer 1992; Banks 1994; Halliday 1998; Gledhill 2000a/b) and the high use of abstract nouns in the expression of processes and methods (Halliday 1993; Flowerdew 2003) have also been identified as linguistic features which characterise scientific discourse. Underpinning this research is an understanding that "[i]n order to understand texts, we must look at them closely to find the lexico-grammatical strategies that they adopt to assist communication within a specialised community" (Williams 2002: 60). Scientific discourse is understood to be "highly stereotypical in nature", and it seems important that members of this discourse community become familiar with phraseology which might be considered "good scientific style" (Gledhill 2000a: 116).

In order to produce phraseologically competent texts, it appears important to master the typical collocational patterns in that discourse (Gledhill 2000a, 2000b; Flowerdew 2003; Hyland 2008). Writing a good scientific text therefore not only entails the accurate selection of correct terms and grammatical constructions but also a good command of lexical combinations; i.e. collocations (Carter 1998; G. Williams 1998; Biber 2006; Hyland 2008). As Gledhill (2000a: 133) points out, "[c]ollocations in science writing are undoubtedly selected as the best ways of expressing certain ideas, although this selection does not mean that these expressions are the best, or the only possible selections, the selection is largely a feature of convention and acceptability within the discourse community".

For NNS writers, however, acquiring phraseological competence and the knowledge of domain-specific collocational patterns may be quite challenging (Carter 1998; Howarth 1996/1998; Wray 2000; Oakey 2002a/b; Williams 2005; Nesselhauf 2005; Ellis 2007; Hyland 2008; Granger and Meunier 2008; Paquot 2008, among others). According to Howarth (1996: 192), non-native speakers' difficulties with phraseological competence are partly due to the fact that they are not taught collocations explicitly. His findings suggest that non-native speakers tend to use fewer collocations and that their level of proficiency

does not seem to have any remarkable influence on their phraseological competence. His research emphasises that phraseology should play a dominant role in foreign language instruction, as other empirical studies (Granger 1998; Kaszubski 2000; Nesselhauf 2005) besides his have revealed that difficulties with collocations are particularly frequent in non-native speakers' oral and written production. Granger's (1998) analysis of the production of adverb-adjective constructions shows that learners make less use of prefabricated expressions in comparison with native speakers. Likewise, Kaszubski's (2000) comparison of the collocational uses of five verbs (i.e. *do*, *get*, *have*, *make* and *take*) both in native and non-native corpora yields similar results concerning the limited number of collocations used by non-native speakers. Nesselhauf's (2005) work on non-native speakers' production of multiword units also presents a thorough investigation of the difficulties German learners face when producing verb-noun combinations. Her data reveal that the collocations provided by advanced learners of English show a high degree of deviation and, therefore, her study corroborates Howarth's (1996) conclusion that non-native speakers' advanced level of English does not have any attested positive effect on their collocational competence.

The challenge with domain-specific collocational competence is made all the more acute as NNS professional academic writers face an increasing pressure to publish in English medium international journals. Recent research (e.g. Burrough-Boenisch 2003; Curry and Lillis 2004; Benfield and Feak 2006) has highlighted the significant difficulty that non-native academics and researchers face with publishing in English, mostly due to the challenges they encounter when writing in academic English. This difficulty is noted as being particularly apparent in Spain by Pérez-Llantada *et al*. (2011). In their paper, they note three reasons why the issue of publishing in English has become of primary importance in Spain. Firstly, promotions are related to publishing in international as opposed to national journals; secondly, English has become the language of international research collaborations; and, thirdly, the increase in the use of the English language as the medium of instruction in Spanish universities. These factors undoubtedly increase the pressure to publish in English and heighten the need for more research in the area of supporting NNS writers in their publications in English.

1.2. *The study: context, aims and participants*

Based on the discussion above, the present study aims to add to the growing body of research on the challenges that non-native writers face with publishing in English. This study investigates the collocational patterning of abstract nouns, i.e. *agreement*, *comparison*, *conclusion* and *decision*, in scientific English and examines NNS Spanish medical writers' awareness of the collocational patterning of these nouns.

Abstract nouns were chosen as an item of investigation for two reasons. Firstly, abstraction is one of the many characteristics of scientific writing (see 1.1). Secondly, this decision was based on the findings from an initial study (Laso and Verdaguer 2005) of one such abstract noun, *conclusion*, and its restricted collocations in scientific writing.

While focusing on *conclusion*, it became apparent that there was a frequent list of comparable nouns, etymologically related to a verb (*conclusion ~ conclude*; *agreement ~ agree*; *comparison ~ compare*; *contribution ~ contribute* and *decision ~ decide,* to name but a few), which needed more investigation. Taking this as the starting point, four frequently occurring abstract nouns (*conclusion, comparison, agreement* and *decision*) as occurring in the *Health Science Corpus* (see section 2 for details on this corpus) were selected for preliminary investigation.

Our chosen group of non-native writers are doctors practising medicine in Spain in three different Spanish hospitals; namely, *Complejo Hospitalario Universitario de Albacete*, *Hospital Universitario Puerta de Hierro* and *Hospital de Navarra*. A total of twenty-four Spanish doctors constitute the community of informants considered in this research study. Regarding their area of expertise, they work on the following fields: endocrinology and nutrition, internal medicine, medical oncology, (neuro)pathology and radiology.

With respect to their English background, 75% (eighteen participants) of the sample had devoted a minimum of five years to the continuous study of English. Indeed, seven out of these eighteen informants had been learning English for more than 13,16 years on average. This actually means classroom instruction of English for Specific Purposes (ESP), on the one hand, and content-based courses in English, on the other. Besides, fifteen informants reported to having lived in an English-speaking country for a minimum of one month. These two factors cannot claim to prove (nor did they seek to prove) that all the informants can be placed within the same level of proficiency in English. However, it can certainly be stated that these twenty-four doctors had been attending English lessons for a number of years and a 62.5% of them had also been in real language communicative settings either for professional (conferences, work practices) or academic (scientific / English courses) reasons.

As part of their on-going professional development, they are expected to conduct research and publish in international journals. Against the backdrop of current research on the difficulties Spanish academics (Pérez-Llantada *et al*. 2011) are facing with publishing in English, this group of participants seemed a relevant group to explore, as they are not taken into account in Pérez-Llantada *et al*'s paper. Their paper focussed exclusively on Spanish academics whereas our investigation considers professional medical writers.

In order to investigate NNS writers' awareness of the collocational patterning of the four selected nouns, a worksheet comprising four exercises was distributed among a group of twenty-four doctors. The findings obtained from the worksheet were then compared against the *Health Science Corpus* (*HSC*). The investigation of the collocational patterning of abstract nouns in the *HSC* served as a benchmark against which to measure NNS' written production. This comparison would provide information about participants' awareness of the collocational patterns associated with the abstract nouns under investigation. While the number of participants in the study is small, the results, nonetheless, reveal the challenge non-native writers', in our case Spanish writers, face with publishing in English. We hope this exploratory study will provide the basis for future studies and add a dimension to the current literature on this issue within this community of Spanish writers.

2. CORPORA, THEORETICAL FRAMEWORK AND METHODS

2.1. *The Corpus*

The corpus used for designing the worksheet and for comparing the results obtained is the *Health Science Corpus* (*HSC*), which is a domain-specific sample of texts assembled for the investigation of the use of abstract nouns by the health science community (Laso 2009). The *HSC* consists of approximately 4 million words of scientific research articles from online journals that cover different disciplines such as medicine, biology, biochemistry and biomedicine (all these articles correspond to the years 1998 and 1999). The software used in retrieving data from the *HSC* and refining the results further was version 3.0 of the concordancing program *WordSmith Tools* (Scott 1998). This program provided a list of words which allowed us to find out what general terms are most frequently used in scientific English and to extract frequently occurring abstract nouns.

2.2. *Theoretical framework: collocations and lexical bundles*

In an earlier, more detailed, study, Laso (2009) investigated the collocational patterning of abstract nouns in the *HSC*. The findings from the study indicated that abstract nouns in combination with other parts of speech were frequently used to refer to scientific processes, methods, evidence and findings. It also revealed that these abstract nouns in the *HSC* occurred in units whose overall meaning was the result of the combination of these linguistic features. The notion of 'lexical bundle' (Biber *et al*. 1999) or multiword unit has already been investigated in innumerable corpus studies (Sinclair 1991; Biber *et al*. 1999; Gledhill 2000; Altenberg and Granger 2001; Oakey 2002a/b; Stubbs 2001; Simpson 2004; among many others). Biber *et al*. (1999: 992) define lexical bundles as combinations of words that "recur most commonly in a given register". In line with research that meanings are clustered into lexicogrammatical patternings and are not a result of isolated linguistic items, our investigation was aimed at shedding light on how aware our NNS writers were of these lexicogrammatical combinations in health science discourse.

Additionally and more specifically, in this paper, we are investigating NNS writers' awareness of verb collocations with the abstract nouns under study, as these were one of the most common combinations (e.g. *reach an agreement, make a decision, draw a conclusion, make a comparison*) in the *HSC*. In the *HSC*, abstract nouns were found to co-occur with two groups of verb collocates – free and restricted (Laso 2009). Free collocates, as defined by Wang and Shaw (2008: 204) are "items used in their literal senses and freely substitutable" for example, *support a decision, perform a comparison*. These include "all possible and semantically natural combinations", while restricted collocates "usually have one item used in a non-literal sense, often a specialized, or figurative sense, and the other used in its normal meaning"; for example, *reach an agreement, draw a conclusion*. Typically, the choice of vocabulary is "less predictable in this category of collocations". Given that verbs + abstract nouns combinations were

frequent in the *HSC*, we were keen to discover how aware our NNS writers were of the use of free and restricted collocates with abstract nouns.

2.3. *Methods: the worksheet*

In order to explore non-native speakers' lexical and phraseological command of the four selected nouns, a worksheet of four exercises, purposely designed for a broader research study (Laso 2009), was distributed among participants. The findings obtained from NNS' written production were compared against *HSC* data. This comparison has supplied an incredible amount of data with respect to participants' competence in the use of abstract nouns in medical English.

Bearing in mind that the main purpose of these exercises was exploring the way in which NNS writers made particular collocations with the abstract nouns selected, the recurrent lexicogrammatical patterns of these nouns across the *HSC* was carefully observed when designing the worksheet of exercises. All the examples included in this worksheet were therefore extracted from the *HSC*.

In this paper, in order to enable a detailed discussion, we are reporting on the results from two of the four exercises which specifically shed light on the awareness of NNS writer's collocational knowledge. In Exercise 1, participants were asked to predict the missing words in a list of fifteen sentences, randomly extracted from the *HSC*. Each example contained either one or two blank spaces that participants had to complete with a suitable lexical item. No additional guidance about the word class expected was supplied. In Exercise 2, participants were provided with two lists – one of the selected abstract nouns from the *HSC* and one of six, highly frequent verbs (*make, draw, reach, lead to, take* and *do*) found in the corpus. From these lists, they were required to match the abstract nouns with what they thought to be the most appropriate verb.

It is worth pointing out that the findings are restricted to what was produced in the worksheet and measured against the *HSC*. These are therefore not exhaustive since participants' publications in English have not been explored yet. The results obtained however can still be seen as an indication of the challenges Spanish medical doctors who aim to publish internationally are likely to encounter. It is also possible to make a few broader conclusions about the challenges NNS writers may face with collocational patterning in published medical discourse.

3. RESULTS OF THE STUDY

This section reports on the results of the worksheet. We have narrowed our discussion to the exercises involving verb (restricted and free) + abstract noun collocations and lexical bundles which provided us with the most useful information on how our NNS writers' were responding to the collocational patterns of the abstract nouns under investigation. For ease of discussion, we have divided this section into three parts - restricted verb collocates, free verb collocates and lexical bundles. Each section will begin with an overall summary of the results followed by illustrations through the sentences in these exercises.

3.1. *Restricted verb collocates*

Evidence from the worksheet indicates that participants seemed to be aware of the most commonly used verbs in combination with the abstract nouns examined (e.g. *reach/ draw/ lead to a conclusion*, *make a comparison*, *reach an agreement*). However, the use of verbs such as *give* (e.g. *give a conclusion*), *do* (e.g. *do a comparison*) and *achieve* (e.g. *achieve an agreement*, *achieve a conclusion*) where a different or more appropriate verb was required in the contexts of the sentences reveals that some of these restricted verb + abstract noun combinations appear to be challenging for the participants. The investigation also revealed that a wide repertoire of free collocates was used when perhaps a restricted verb collocate was more appropriate in the context of the sentences (e.g. *report/ give/ adopt/ publish a conclusion*; *draw/perform a comparison*).

An analysis of Exercise 1, which shows some of the challenges with restricted verb + abstract nouns combinations is presented next. These sentences involve the abstract nouns *comparison*, *conclusion* and *agreement*.

Sentence 1: Comparisons between mice have been *made*.

Table 1 shows that the verb + abstract noun combinations *make a comparison* (8 participants) and *do a comparison* (7 participants) stand out as the most commonly produced collocations in sentence 1. Data from the *HSC* show a stronger preference for the use of *make* in combination with the abstract noun *comparison*, while the collocation *do + comparison* hardly ever occurs in the *HSC*. There were 28 instances of the combination *make + comparison* as opposed to only 3 instances of *do + comparison* in the *HSC*.

HSC Sentence: **Comparisons** between mice have been **made**.		
Words provided	**Number of occurrences in the *HSC***	**Number of occurrences in the worksheet**
MADE	28	8
DONE	3	7
SIGNIFICANT	0	2
WRONG	0	1
PERFORMED	10	1
CLEAR	0	1
CONTRADICTORY	0	1
FAR-REACHING	0	1
DRAWN	1	1
CORRECT	0	1

Table 1. Collocations of the noun *comparison* provided in Sentence 1 (worksheet) compared against the *HSC*.

A further point to note is that 25% of participants produced an adjective rather than a passive form of the verb. With the only exception of the adjective *significant*, the other five adjectives provided were not found as collocates of the noun *comparison* in the *HSC*. In fact, there were very few *HSC* examples of adjectives (i.e. *comparison is unique/ valid*; *comparisons are difficult*) modifying the noun *comparison*. Six participants (25%), on the contrary, associated adjectives (e.g. *correct*, *contradictory* and *wrong*) as common collocates of the noun *comparison*.

Sentence 2: Further trials are needed before any <u>conclusions</u> can be drawn about the protocol's efficacy.

Unlike the rest of the sentences in this exercise where participants were asked to fill in the verb, in sentence 2, participants were asked to elicit the abstract noun *conclusions* subcategorised by the restricted verb *draw*. The verb *draw* is the most frequently occurring verb collocate of the noun *conclusion* in the *HSC*. 39.4% (26 instances) of the total number of occurrences of the pattern 'restricted verb + conclusion' in the *HSC* occurs with the verb *draw*. Of these 26 instances, 18 are in the passive and 8 in the active voice. Some examples from the *HSC* are provided below.

WordSmith Tools —

1   rials are therefore needed before any conclusion can be drawn about the
2   ntal transfer are necessary before any conclusions can be drawn about the
3   nt quality to draw definitive conclusions Limited evidence
4   tal. There were too few twins to draw conclusions. Several variables were not
5   in Drosophila. Where possible we draw conclusions that have broad implication
6   lity should be considered when drawing conclusions from observations in chimer
7   the student has little insight into how conclusions are drawn. Here, the redee
8   rrors (discussed below). Two important conclusions were drawn from this study.
9   lami.(24) Overall, the most interesting conclusion to be drawn from these obse
10   ion mutants were generated in total. No conclusion drawn in this manuscript wa
11   f distinct genes, we can draw several conclusions about Nipped functions and
12   d, GAL4±Bcd or Bcd±VP16. Several conclusions can be drawn from the gene
13   n-Alder and Bennett (Æ81) drew similar conclusions for animals generally. Esti
14   culate, quite reasonably, that similar conclusions might be drawn about many d
15   s no effect on body weight. The simple conclusion drawn from these genetic obs
16   h45 mutation). Before drawing strong conclusions from the above DNA sequenc
17   across-generation analyses support the conclusions drawn from the within-gen
18   etween vital and nonvital genes, so the conclusions drawn here should apply to
19   by N17 Rac, and therefore support the conclusion drawn from the use of the V
20   uteri of mice mated to t/1 males. The conclusion drawn is that TRD cannot be
21   velopment to term was much better. The conclusion drawn from this elegant stud
22   t there were no interferences with the conclusions drawn because of alkanes f
23   sm driving the outbreaks. In turn, the conclusions that one can draw from thi
24   er field conditions. Nonetheless, the conclusions that can be drawn from eac
25   bias. Discussion The conclusions that can be drawn from our
26   the data do not permit unequivocal conclusions to be drawn. Using CTC analysis

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Figure. 1 Overall number of occurrences of *draw + conclusion* in the *HSC*.

Table 2 illustrates the abstract nouns provided by participants for this sentence.

HSC Sentence: Further trials are needed before any ***conclusions*** can be drawn about the protocol's efficacy.	
Abstract nouns produced in the worksheet	**Number of occurrences in the worksheet and percentage (n=24)**
CONCLUSION	19 (79.2%)
CONCLUSIONS	2 (8.3%)
AGREEMENT	1 (4.2%)
INFORM	1 (4.2%)
{NO REPLY}	1 (4.2%)

Table 2. Abstract nouns provided by participants in Sentence 2.

As can be inferred from Table 2, a total of twenty-one participants (87.5%) identified the abstract noun *conclusion* as the collocate for the restricted verb *draw*. What is worth mentioning in this case is the fact that nineteen participants chose the form *conclusion* instead of its inflected counterpart *conclusions*, which was only chosen by two participants. This points to the fact that participants focussed more on the selection of possible terms rather than on their accuracy. Both forms are equally acceptable in this context, but it should be borne in mind that the analysis of the noun *conclusion* in the *HSC* shows a preference for the use of the inflected form (145 occurrences) as opposed to its base form (39 occurrences).

The other two answers provided (there was one participant who did not answer this item) correspond to two unexpected uses of the abstract noun *agreement* in the sentence "*before any agreement can be drawn*", on the one hand, and the verb *inform* used as a noun in "*before any inform can be drawn*", on the other. Overall, the participants appear to have a reasonable awareness of the collocational patterning of the abstract noun *conclusion* in the current data.

Sentence 3: They *reached* the final agreement that clinical examinations for defects in hips, vision and hearing, and other congenital abnormalities is less well founded on scientific evidence.

In this example, thirteen participants (54.2%) associated the restricted verb *reach* with the abstract noun *agreement*. This corresponds with the *HSC* where *reach* is the most common restricted verb collocate of the abstract noun *agreement*. Table 3 shows the restricted verb collocates of the abstract noun *agreement* in the *HSC*.

Restricted verb + *agreement* collocations in the *HSC*	Number of occurrences in the *HSC*
REACH	4
FIND	3
LEAD TO	1
MAKE	1

Table 3. Restricted verb collocates + *agreement* in the *HSC*.

Table 4 shows the verbs produced by participants:

HSC Sentence: They ***reached*** the final ***agreement*** that clinical examinations for defects in hips, vision and hearing, and other congenital abnormalities is less well founded on scientific evidence.	
Verbs produced by participants	**Number of occurrences (percentage) n=24**
REACHED	13 (54.2%)
ACHIEVED	2 (8.3%)
CONCLUDED	2 (8.3%)
NO REPLY	2 (8.3%)
SUPPORTED	1 (4.2%)
LEAD TO	1 (4.2%)
ARE	1 (4.2%)
HAVE GOT	1 (4.2%)
PORPOUSE	1 (4.2%)

Table 4. Verb collocates + *agreement* provided by participants in Sentence 3.

The verbs listed in Table 4 reveal that six of them are not found in the *HSC* (i.e. *achieve, conclude, support, be, have got* and *porpouse* (this may be an interpretation of the verb *suggest* in Spanish, *proponer*). These were all produced by at least one participant in the study. Although the number is small, eight participants in total, this accounts for a third of the total number of participants, suggesting that perhaps this combination may prove challenging for some of them.

The sentences in Exercise 1 show that participants are mostly familiar with some of these combinations, but there is some indication that they lack full collocational awareness of the combinatorial patterns with abstract nouns typically found in the *HSC*.

Exercise 2 confirms these findings. Data from Exercise 2 show that participants are familiar with many of the restricted verb collocates of the abstract nouns examined in this study. As was the case in Exercise 1, participants identified some restricted verb + abstract noun collocations that typically occur in the *HSC* (e.g. *draw a conclusion*, *reach a conclusion*, *lead to a conclusion*, *reach an agreement*, *make a comparison*, *do a comparison*). Table 5 displays all the combinations of the type restricted verb + abstract noun provided by participants and compares this with the *HSC*:

	Make Data (*HSC*)	**Draw** Data (*HSC*)	**Reach** Data (*HSC*)	**Lead to** Data (*HSC*)	**Take** Data (*HSC*)	**Do** Data (*HSC*)
Comparison	17 (27)	1 (1)	0 (1)	1 (2)	0 (0)	4 (5)
Conclusion	1 (7)	10 (24)	10 (12)	4 (16)	0 (0)	0 (0)
Agreement	2 (1)	0 (0)	19 (4)	3 (0)	0 (0)	0 (0)
Decision	10 (14)	1 (0)	6 (2)	3 (1)	7 (1)	0 (0)

Table 5 Verb + abstract noun combinations in the data as compared to the *HSC*

Table 5 reveals that participants' restricted verb + abstract noun collocations regarding the nouns *conclusion*, *agreement* and *comparison* are very similar to the findings observed in the *HSC,* as discussed previously with regard to sentences in Exercise 1. Restricted word combinations such as *draw a conclusion*, *reach an agreement* and *make a comparison* appeared to be the most frequent collocations both in the *HSC* and the participants' data.

The abstract noun *decision* in the participants' data occurred with the most frequent verbs also found in the *HSC* (i.e. *make* [14 occurrences], *take* [1 occurrence] and *reach* [2 occurrences]). In the participants' data, however, it was also used in combination with verbs such as *lead to* and *draw*, which are not found in the *HSC*.

In line with the findings observed in Exercise 1, participants did not appear to have many problems with restricted verb collocates except for the production of some restricted verb + *decision* patterns, in which there are a few instances of the use of verbs, such as *draw a decision*, which are not found in the *HSC*.

3.2. *Free verb collocates*

Free verb collocates were identified as the next area of investigation to see if Spanish doctors would find this a challenge in their writing. Their use of the pattern free verb + abstract noun can be seen in the following three sentences from Exercise 1, extracted from the *HSC*.

Sentence 4: Such a conclusion is <u>*supported*</u> by our observations.

37.5% of the participants produced either *support a conclusion* or *confirm a conclusion*, which are also the most frequent free combinations in the *HSC*. Five

participants produced an adjective, giving rise to combinations such as "*such a conclusion is contradictory / valid / wrong by our observations*". In terms of grammatical patterning, these combinations are problematic as, in the examples provided, the *by*-prepositional phrase requires a passive participle rather than an adjective.

Among the other free verb collocates (*take a conclusion*, *prove a conclusion*, *share a conclusion*, *give a conclusion* and *obtain a conclusion*) provided by the participants, it should be stressed that they do not appear as collocates in the *HSC*. The word string *enforce a conclusion*, though inappropriate in its morphological form, should not be grouped along with the already cited collocations since it seems to refer to *reinforce a conclusion*, which is used three times in the *HSC*.

HSC Sentence: Such a ***conclusion*** is <u>***supported***</u> by our observations.	
Free verb collocates	**Number of occurrences in the data and in the (*HSC*) (n=24)**
SUPPORTED	6 (47)
CONFIRMED	3 (9)
CONTRADICTORY	3 (0)
TAKEN	2 (0)
MADE	2 (0)
ENFORCED	1 (0)
DRAWN	1 (0)
PROVEN	1 (0)
VALID	1 (0)
WRONG	1 (0)
SHARED	1 (0)
GIVEN	1 (0)
OBTAINED	1 (0)

Table 6. Free verb collocates + *conclusion* in the *HSC*.

Another observation is the use of restricted verb collocates in this context. Data from Table 6 reveal that two participants used *made* and *drawn* in their answers. These two verbs indicate that these two participants have found it difficult to discriminate between restricted and free verb collocates in combination with the abstract noun *conclusion*.

Sentence 5: Despite these conservative features, our analysis broadly <u>*supports*</u> the recent decision by the Department of Health that HIV testing should be offered universally.

HSC Sentence:	
Despite these conservative features, our analysis broadly __*supports*__ the recent ***decision*** by the Department of Health that HIV testing should be offered universally.	
Free verb collocates with *decision*	**Number of occurrences in the data**
SUPPORT/S	15
LED/LEAD TO	2
NO REPLY	2
AGREEMENT	1
ACCEPTED	1
CONCLUDE	1
CONFIRM	1
CORROBORATE	1

Table 7. Free verb collocates + *decision* provided by participants in Sentence 5.

As shown in Table 7, most participants (15; 62.5%) produced the verb *support* as the most common free verb collocate of the noun *decision*. With the only exception of two participants who provided the restricted verb collocate *lead to* (e.g. "*our analysis broadly led to the recent decision by the Department of Health that HIV testing should*") and another participant who appeared to have confused the verb *agree* with the abstract noun *agreement* and, thus, produced an ungrammatical sentence (i.e. "*our analysis broadly agreement the recent decision by the Department of Health that HIV testing should be offered universally*"), the rest of the participants' contributions correspond to free verb collocations:

(1) Our analysis broadly accepted the recent decision by the Department of Health that HIV testing should be offered universally.
(2) Our analysis broadly conclude(s) the recent decision by the Department of Health that HIV testing should be offered universally.
(3) Our analysis broadly confirm(s) the recent decision by the Department of Health that HIV testing should be offered universally.
(4) Our analysis broadly corroborate(s) the recent decision by the Department of Health that HIV testing should be offered universally.

It is interesting to note that none of these collocations was observed in the examination of the *HSC*. The *HSC* data reveal the following free verbs as collocating with the abstract noun *decision*. These free verbs all used in the active voice are *govern* (1), *influence* (1), *contemplate* (1), *control* (1), *allow* (1), *force* (1), *formulate* (1), *communicate* (1), *guide* (1), *face* (1), *think about* (1), *support* (2), *reconsider* (2), *base on* (2).

In this respect, Nesselhauf (2005: 210) suggests that a possible reason for this type of free combinations lies in the fact that in these cases both the verb and the noun are chosen independently of each other, which may bring about an independent selection of individual elements. The next sentence reveals further interesting uses of the free verb + *decision* pattern in our data.

Sentence 6: They will certainly *support* the decision the group has made.

41.7% wrote either *support* (5 participants) or *accept* (5 participants) in sentence 6. Both *support a decision* (53.2%) and *accept a decision* (1.6%) are also found in the *HSC* although the frequency of the latter is not as high as in the data from the participants.

HSC Sentence: They will certainly ***support*** the ***decision*** the group has made.	
Free verb collocates	**Number of occurrences in the data and the (*HSC*) (n=24)**
SUPPORT	5 (2)
ACCEPT	5 (0)
ADOPT	3 (0)
MAKE	3 (10*)
RESPECT	1 (0)
OBEY	1 (0)
AGREEMENT	1 (0)
NO REPLY	1
ENCOURAGE	1 (0)
BELIEVE	1 (0)
AGREE	1 (0)
CONFIRMED	1 (0)

* *make a decision*, but not in a context such as "They will certainly ***make*** the ***decision*** the group has made".

Table 8. Free verb collocates + *decision* in the *HSC*.

Interestingly, Table 8 reveals that more than half of the participants (54.1%) either offered free verb + *decision* collocations that do not occur in the *HSC* data (41.6%; 10 participants) or produced restricted verb + *decision* collocations with the verb *make* (12.5%; 3 participants), which resulted in linguistically awkward sentences (e.g. "*they will certainly make the decision the group has made*"). The results from Sentences 5 and 6 with the abstract noun *decision* appear to suggest that NNS writers' awareness of the combinations occurring with this particular abstract noun differs from the *HSC* data.

3.3. *Lexical bundles*

The third aspect highlighted as a result of Exercise 1 concerned participants' difficulties regarding the use of three main lexical bundles; namely, *in agreement with*, *there is* (adjective) *agreement that* and *in comparison with/to* which are very productive in the *HSC*. The table below shows the frequency of these bundles in the *HSC*.

Lexical bundles	Number of occurrences in the *HSC*
in agreement with	48
There is (adjective) agreement that	25
in comparison with	30
in comparison to	10

Table 9. Frequency of occurrence of the bundles *in agreement with, there is* (adjective) *agreement that, in comparison with* and *in comparison to* in the *HSC*.

The analysis of the following sentences shows our NNS writers' awareness of these lexical bundles.

Sentence 7: The data presented here are not *in* agreement *with* the model of Studier and Bandyopadhyay.

A total of nine unusual collocations were found in sentence 7. Evidence from the participants' responses reveals that only eleven participants (45.8%) produced the lexical bundle *in agreement with* correctly. Table 10 displays all the collocations provided:

HSC Sentence: The data presented here are not ***in agreement with*** the model of Studier and Bandyopadhyay.	
Lexical bundles	**Number of occurrences in the worksheet**
IN…WITH	11
NO REPLY	4
TOTALLY…WITH	2
FULLY…WITH	2
REPORTED…WITH	1
INCLUDED IN THE…OF	1
VALID…IN	1
VALID…FOR	1
ENOUGH…WITH	1

Table 10. Variants of the bundle *in agreement with* provided by participants in Sentence 7.

Among the unexpected collocations, two different types stand out. The most salient one is the use of an adjective (*enough*), a passive participle (*reported*) or an adverb (*totally*, *fully*) for the preposition *in*:

(5) The data presented here are not <u>enough</u> agreement <u>with</u> the model of Studier and Bandyopadhyay.

(6) The data presented here are not <u>reported</u> agreement <u>with</u> the model of Studier and Bandyopadhyay.

(7) The data presented here are not <u>totally</u> agreement <u>with</u> the model of Studier and Bandyopadhyay.

(8) The data presented here are not <u>fully</u> agreement <u>with</u> the model of Studier and Bandyopadhyay.

The adverb collocates produced ungrammatical sentences, although there is the possibility that participants may have been attempting to produce the adjectives *full* and *total*, which occur in the *HSC* as pre-modifiers of the noun *agreement* (*full* (3 out of 18 occurrences) and *total* (2 out of 18 occurrences)). This seems to indicate that participants were familiar with some collocates of the abstract noun *agreement* but did not have full control over the lexical bundle *in agreement with*.

The other type of collocations in this sentence corresponds to those combinations produced by three participants where the two elements associated with the noun *agreement* were grammatically unacceptable:

(9) The data presented here are not <u>included in the</u> agreement <u>of</u> the model of Studier and Bandyopadhyay.

(10) The data presented here are not <u>valid</u> agreement <u>in</u> the model of Studier and Bandyopadhyay.

(11) The data presented here are not <u>valid</u> agreement <u>for</u> the model of Studier and Bandyopadhyay.

Examples (9) to (11) suggest that these three participants were not familiar with the structure of the lexical bundle *in agreement with* expected in this sentence.

Sentence 8: <u>*There*</u> is general agreement <u>*that*</u> the primitive host cell was anaerobic.

In the *HSC*, 47% of the occurrences of the four/five-word bundle *there is* (adjective) *agreement that* are used to introduce clauses. The results reveal how competent participants were in producing this lexicalised expression.

HSC Sentence ***There*** is general ***agreement*** ***that*** the primitive host cell was anerobic.	
Lexical bundle	**Number of occurrences**
THERE…THAT	12
NO REPLY	5
IT…THAT	2
THERE…IN	1
THERE…ABOUT	1
FINALLY…THAT	1
THE RESULT…WITH	1
THIS…WITH	1

Table 11. Variants of the bundle *there is* (adjective) *agreement that* provided
by participants in Sentence 8.

Percentages in Table 11 show that 50% of participants in the study (twelve) produced the lexical bundle *there is (general) agreement that* accurately, while the other half had problems with at least one of its constituents. The existential *there* introducing this word string was not provided by five participants, among whom four either used different types of subjects, such as the impersonal pronoun *it* (2 participants), a noun phrase (e.g. *the result*; 1 participant) or the demonstrative pronoun *this*, whereas the fifth participant provided no subject (e.g. "*finally is general agreement that*"). In both cases, participants' examples resulted in word combinations not commonly found in the *HSC*.

On the other hand, there were two participants who had problems with the function word introducing the *that*-clause immediately following the abstract noun *agreement*. These two participants, as Examples (12) and (13) show, produced a preposition (i.e. *in*, *about*) instead:

(12) <u>There</u> is general agreement <u>in</u> the primitive host cell was anaerobic.

(13) <u>There</u> is general agreement <u>about</u> the primitive host cell was anaerobic.

Another significant point is the high percentage (20.8%) of participants who supplied no answer. This may imply that this type of collocation was fairly problematic for these five participants.

Sentence 9: To assess the cost effectiveness of universal antenatal HIV screening *in* comparison *with* selective screening in the UK.

Table 12 indicates the participants' awareness of this lexical bundle:

HSC Sentence: To assess the cost effectiveness of universal antenatal HIV screening *in comparison with* selective screening in the UK…	
Lexical bundles	**Number of occurrences**
IN…WITH	8
NO REPLY	7
IN…TO	4
WE'LL MAKE A…WITH	1
REQUIRE…WITH	1
AS…TO	1
WE MADE A…BETWEEN	1
STATISTICAL…LEADED TO	1

Table 12. Variants of the bundle *in comparison with* provided by participants in Sentence 9.

Altogether, twelve participants (50%) produced the appropriate collocations *in comparison with* (8 participants) or *in comparison to* (4 participants). These figures are also comparable to the results obtained in the *HSC*. As shown in the *HSC*, the occurrences of *in comparison with* outnumber the instances of *in comparison to* by 46 to 30. Five participants (20.8%) produced other word combinations with reference to a variety of clause types (Examples (14) and (15)), verb phrases (Example 16), prepositions (Example (17)) and adjectives (Example (18)):

(14) To assess the cost effectiveness of universal antenatal HIV screening we'll make a comparison with selective screening in the UK.

(15) To assess the cost effectiveness of universal antenatal HIV screening we made a comparison between selective screening in the UK.

(16) To assess the cost effectiveness of universal antenatal HIV screening require comparison with selective screening in the UK.

(17) To assess the cost effectiveness of universal antenatal HIV screening as comparison to selective screening in the UK.

(18) To assess the cost effectiveness of universal antenatal HIV screening statistical comparison leaded to screening in the UK.

Examples (14) and (15) were quite elaborate and included restricted verb collocates which typically occur with the noun *comparison* (i.e. *make a comparison*). However, one of the objects of *comparison* was missing in both of them (i.e. "*we'll make a comparison* [of]… *with*…", "*we made a comparison between selective screening in the UK* [and]…".

Accordingly, word combinations such as Examples (14) and (15) are regarded as unusual when compared against the *HSC*. Likewise, Examples (16), (17) and (18) are inappropriate in spite of the fact that they include some lexical items such as the adjective *statistical* and the preposition *as,* which in the *HSC* are usually associated with the noun *comparison* in other word combinations (e.g. *statistical comparison*, *as a comparison*).

As in sentence 8, there was a high percentage of participants (29.2%; 7 participants) who provided no answer. These figures seem to suggest that participants may find the lexical bundles explored in this exercise challenging.

4. CONCLUSION

The analysis of participants' production has yielded interesting findings regarding their command of restricted verb + abstract noun collocates and free combinations of the type verb + abstract noun on the one hand, and their knowledge of the use of some lexical bundles (e.g. *in agreement with*, *in comparison with/to*, *there is* (adjective) *agreement that*), on the other. With regard to restricted verb + abstract noun combinations, the participants appeared, on the whole, to be familiar with the combinations found in the *HSC*. Concerning the overall use of free combinations, it should be noted that while participants were able to produce the most common free collocates found in the *HSC*, they also proved to have difficulties in discriminating between appropriate and unacceptable word combinations since some of their collocations were not traced in the *HSC* (e.g. "*take a conclusion*"). These data have also highlighted some participants' uncertainty with the correct structure and use of some lexical bundles which typically occur in the *HSC*.

More specifically, evidence from the participants' collocational difficulties, as highlighted previously, has underlined the following challenges:

a) unfamiliarity with delexical uses of verbs in combination with abstract nouns (e.g. *make a comparison, reach an agreement*)

There were several uses of both restricted and free verb + abstract noun collocations which were not found in the *HSC* (e.g. *achieve an agreement*, *perform a comparison*, *draw a decision*) as well as an apparent difficulty in distinguishing between similar pairs of words (e.g. *do* vs. *make*, *reach* vs. *achieve*). It is worth noting that participants did use a wide range of free verb + abstract noun collocations in their responses (e.g. *perform a comparison*, *adopt a decision*), where typically in the *HSC* a restricted verb occurs.

b) unawareness of common lexical bundles (e.g. *in agreement with*, *there is* [adjective] *agreement that*, *in comparison with/to*)

Data drawn from the *HSC* had revealed that strings of words like "*there is* (adjective) *agreement that*" and "*in conclusion*" had undergone a process of grammaticalisation and, thus, should be regarded as compositional sequences of words

in which the abstract noun, by losing its original semantic content, forms part of an extended unit of meaning which has acquired a more grammatical function. On the contrary, results from NNS writers' production seem to indicate that participants were not aware of the peculiarities of these lexical bundles.

Our study has underlined the benefits of analysing specialist corpora so as to find out the "kinds of language data which particular communities of users might encounter and which will inform their use" (Hyland 2008: 8). More specifically, the findings, although small and preliminary in nature, exemplify the challenges that NNS writers might face with phraseology, in particular, collocations. It is reasonable to suggest that NNS writers in our study lack the awareness of the collocational patterning of abstract nouns in medical English. Wray (2000: 468) comments that "knowing which subset of grammatically possible utterances is actually commonly used by native speakers is an immense problem for even the most proficient of non-natives". Additionally, with reference to collocations, Howarth (1996: 136) suggests that "[t]he problems for learners are, firstly to recognize that the phenomenon of conventionally restricted collocability exists and is widespread and, secondly, to acquire knowledge of the particular facts of how the phenomenon is realised in practice". As can be inferred from Howarth's assertion, it is of vital importance to draw learners' attention to the phenomenon of collocations in language in order to raise their awareness of the conventions of linguistic production within a specific community of users.

5. IMPLICATIONS

The collocational patterns of abstract nouns in medical English appear to pose a challenge for some of the NNS writers in our data. The present results, yet far from exhaustive, highlight participants' awareness of proper collocability in medical English. The results also indicate that there are still collocations which prove to be challenging for them. Although in Nesselhauf's view (2005: 246) some other factors such as each participants' language aptitude and exposure to English, their motivation, their writing techniques and beliefs, among others, should also be taken into account when analysing NNS writers' collocational performance, we also believe that they need to be provided with useful resources and tools aimed specifically at improving their collocational competence.

Several implications can be drawn for NNS writers in general from the analysis conducted in this study. The investigation of the collocational patterning of abstract nouns in the *HSC* and the subsequent indication that NNS writers were not fully aware of the patterning of such units brings to the forefront the relevance of corpus-based studies, not only for the characterisation of language but also for the teaching and learning of collocations in specialised registers. There has been a substantial amount of work on the teaching and learning of collocations (Hunston 1995; Cowie 1998; Granger 1998; Howarth 1996; Hunston and Francis 2000; Kaszubski 2000; Wray 2002; Nesselhauf 2005, among others). More recently, the emphasis has been on the ways in which collocations can be meaningfully taught. To this respect, Walker (2008: 307)

stresses the need to design teaching materials that lay greater emphasis on collocations, understood as motivated and, therefore, susceptible to be explained. He argues that the right approach to the teaching of collocation should challenge learners to reflect on why some words are often associated with some others, so as to make their collocational learning process more meaningful, and perhaps even, more enjoyable.

The value of this study is in how it exemplifies "local lexical relationships, namely collocation and the lexico-grammar" (Gledhill 2000b: 202) in a specific discourse. As demonstrated in this exploratory investigation, a good command of prototypical combinatorial patterns of abstract nouns is essential in encoding messages in medical discourse. NNS writers who are part of the international medical research community are committed to ensuring accurate dissemination of their research findings. This inevitably means that they need to be aware of the conventions as well as the good academic style characteristic of medical writing, so that their research articles are accepted for publication in the prestige journals of their various specialised fields.

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NOTE

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APPENDIX

Exercise 1. Predict the words which are missing. Complete the sentences below with a suitable word.

1. Comparisons between mice have been _____.
2. Further trials are needed before any _____ can be drawn about the protocol's efficacy.
3. They _____ the final agreement that clinical examination for defects in hips, vision and hearing, and other congenital abnormalities is less well founded on scientific evidence.
4. Such a conclusion is _____ by our observations.
5. Despite these conservative features, our analysis broadly _____ the recent decision by the Department of Health that HIV testing should be offered universally.
6. They will certainly _____ the decision the group has made.
7. The data presented here are not _____ agreement _____ the model of Studier and Bandyopadhyay.

8. _____ is general agreement _____ the primitive host cell was anaerobic.
9. To assess the cost effectiveness of universal antenatal HIV screening _____ comparison _____ selective screening in the UK.

Exercise 2. *Make*, *draw*, *reach*, *lead to*, *take* and *do* are highly-frequent verbs in English. They tend to combine with a wide range of words to form fixed expressions. Combine the following nouns: *conclusion, comparison, agreement* and *decision* with the verbs provided in the chart.

MAKE	DRAW	REACH	LEAD TO	TAKE	DO