LEXICAL ANALYSIS OF HEALTH SCIENCE MASS CIRCULATION ARTICLES (HSMCA) FROM THE FRAME SEMANTICS PERSPECTIVE[1]

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1. INTRODUCTION

The use of Health Science Mass Circulation Articles (HSMCA) is increasing in prevalence as a teaching aid for courses dealing with English for Academic Purpose (EAP) and English for Specific Purposes (ESP). The relative value of this teaching resource remains largely unquestioned by instructors in this field of study.

Traditionally, the study and research of 'health science' genres have focused on analyses of rhetorical formal structure, and main linguistic features which typify a genre in scientific literature of this nature. Swales (1981, 1987, 1990) one of the pioneers in studying formal scientific articles, used a procedure referred to as structural-moves. From this linguistics perspective, Salager-Meyer (1990, 1992) worked on medical abstracts, analysing not only the structural-moves of this scientific kind of genre, but their linguistic features, verb tenses and modality distribution. Banks (1994), following a similar research pattern, studied the clause organisation of scientific report articles. Martínez & Estévez (1995) and Estévez & Martínez (1997), assessed how verb tenses and their semantic values appear in different 'macro-moves' and 'micro-moves' in these specific scientific discourses. Inman studied as early as 1978 the quantity and quality of scientific and technical vocabulary in secondary or hard literature; that is, report articles. Busch-Lauer (1998) analysed the occurrence and function of non-verbal material in three medical genres: research papers (RP), review articles (RA) and care reports (CR), and investigated the interface between text and non-verbal material. Finally, Piqué & Andreu (1998) evaluated the linguistic and formal structure of a considerable volume of scientific nursing

literature. These studies have collectively resulted in a substantial quantity of linguistic information which can be adapted as teaching material[2]. Nevertheless, a major proportion of this linguistic research has mainly focused on the study of specific scientific report articles, referred to as 'complex', 'strong', or 'secondary genres' for adaptation to EAP/ESP scientific and academic requirements[3].

Few studies have centred their work on analyses of the linguistic features of HSMCA or this type of 'sub-genre', which could provide an additional source of teaching and learning material for instructors and students (Nwogu 1991). The need to assess the varied scientific lexical items and syntactic features in HSMCA encouraged Estévez & Martínez (1994) to conduct a study on this literary source domain. The lexical identification process was based on the definition of technical and sub-technical terms provided by Powell (1990). Technical terms for Powell were particular to a specific field of study, sub-technical terms generic in nature and common to all scientific and technical fields. Despite the useful information collected by this linguistic exercise, the present authors have designed a more consistent and scientific experimental approach, which enhances the mechanism of identification and annotation of this specific lexis. The objective being the collection of data relating to the quality and quantity of HSMCA.

This paper presents an experimental research process applied to a large language corpus, HSMCA, to assess the quality and quantity of specific lexemes under the domain of 'HEALTH' as found in daily newspapers and weekly magazines. The research procedure applies a cognitive linguistic perspective, which assumes that the relationship between the different categories provides meaning and is represented in our mind by the vocabulary in a text (Lakoff 1987, Taylor 1995). The research procedure is based on the principles of *Frame Semantics* (Fillmore 1975, 1985). Frames, in general, are defined to evoke and encode a certain amount of real-world knowledge in a schematised form, and are defined by Fillmore & Atkins as "cognitive structures (…), a knowledge of which is a prerequisite for concepts encoded by the words" (1992: 75). Thus, a semantic frame

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[2] This formal linguistic research has supplied instructors and students with considerable linguistic and formal information relating to biomedical articles, enabling adaptation to a specific cultural, academic and social group. The following authors underline some of the texts, books and articles applied to teaching the writing of scientific report articles: Weissberg & Buker (1990), Swales & Feak (2000), Estévez & Piqué (1997), Gartland (1993), Day (1988) and Cremins (1992).

[3] Secondary genres, complex, strong or hard texts (journal articles, scientific reports, etc.) as they have been defined by Bakhtin (1986), Brandt (1990), and Connor (1996) respectively. Bakhtin (1986) distinguished between 'primary' and 'secondary' types of genres; primary, or simple genres, being those used in oral and real-life communicative activities, whereas secondary, or complex genres are used for academic and scientific disciplines.

description is a structure of inferences, which are linked to the meaning of linguistic lexical items and each frame identifies a set of Frame Elements (FEs), and these frame elements having a specific role within the frame.

This current experimental approach study, utilising Frame Semantics, extends the morph-syntactic approach postulated by the traditional linguistics. In this way, the authors have developed an experimental lexical identification and annotation system following the frame 'HEALTH', as designed and postulated by Lowe, Baker & Fillmore (1997). This current experimental frame semantic analysis under the domain of 'HEALTH', embraces learning, identification and annotation of the lexical items in this domain into the FEs, and evaluation, of the quality and quantity of specific lexis.

In the following sections, the authors describe the theoretical identification and annotation process, and present how the frame semantic annotation process developed, providing specific lexical item information from HSMCA. Ultimately, the information obtained will yield a resource data base for assessment of material used for the design of EAP and ESP courses.

2. MATERIAL AND METHOD

The material used for the analyses consisted of a language corpus of 10 samples, derived from daily newspapers and weekly magazines articles such as: *Newsweek*, *Daily Mirror*, *Time* and *Independent*. Having collected material to be analysed and rather than immediately proceeding to the identification process of the vocabulary, we thought of the lexemes 'open class items' –nouns, verbs, and adjectives, and compound-nouns– which provide meaning to the text. Not included in this initial analysis were 'words or closed class items', including prepositions, pronouns, articles, adverbs and verbs which have auxiliary function in the meaning of the text (Talmy 1985).

2.1. *A sample of the 'HEALTH' frame*

The frame semantic model used is based on the 'HEALTH' frame as designed by Lowe, Baker & Fillmore (1997), illustrated in Table 1. This frame was also used as the guide for FEs which are proposed for the identification and classification of lexical items under this domain.

TABLE 1. *Proposal by Lowe, Baker & Fillmore (1997)*

Label	Meaning
HEALER	Individual who tries to bring about an improvement in the PATIENT
PATIENT	Individual whose physical well being is low
DISEASE	Sickness or health condition that needs to be removed or relieved
BODY PART	Limb, organ, etc. Affected by the DISEASE or WOUND
SYMPTOM	Evidence indicating the presence of the DISEASE
TREATMENT	Process aimed at bringing about recovery
MEDICINE	Substance applied or ingested in order to bring about recovery

2.2. *Frame Elements (FEs) labelling criteria*

In order to provide a more flexible and operative process for the identification and annotation of lexical items in this study, several changes were introduced to the original list of FEs within the frame 'HEALTH' as proposed by Lowe, Baker & Fillmore (1997). The objective being to simplify the collection and maximise the volume of lexical information derived from this specific sub-genre.

The main justification for changes to the FEs was the difficulty of identifying the close related meaning of some lexemes and their annotation in the list of FEs as proposed by Lowe, Baker & Fillmore (1997). Therefore several of the original frame elements were amalgamated and, where appropriate, the labels modified to ease the identification and annotation process. The changes introduced were to the frame element label BODYPART, for which the substitute term, HUMAN ANATOMY {HA} is used. To avoid missing some specific lexemes, the label of the original frame element DISEASE as proposed by Lowe, Baker & Fillmore (1997) is substituted by a broader and more flexible version, DISEASE/DISORDER {D/D}. These two latter categories are used in a great deal in oral and written health sciences discourse having more or less the same semantic function.

The frame elements WOUND and MEDICINE, as proposed by Lowe, Baker & Fillmore (1997), were also too specific for this type of frame semantic description, and could be embraced within a sub-division of the frame elements DISEASE/DISORDER {D/D} and TREATMENT

respectively. Although there are some slight semantic differences between WOUND and DISEASE/DISORDER {D/D}, the two categories maintain some semantic connotations easily justified in cognitive linguistics (e.g. the lexeme 'wound' or related words such as 'cut, burn, injury, hurt, lesion' describe a kind of physical disorder), therefore, we decided to enclose them in the frame element DISEASE/DISORDER {D/D}. Following these arguments, we deleted the frame element WOUND proposed by Lowe, Baker & Fillmore (1997) and enclosed lexical items related to that element in the frame element DISEASE/DISORDER {D/D}. Finally continuing with this simplification process, we decided to combine, in the same frame element, two categories; PREVENTION and TREATMENT because these have such a close semantic relation that it is difficult to differentiate the lexemes in the context of the discourse.

In conclusion, the FEs proposed provide sufficient cognitive linguistic argument for the identification and annotation of the specific vocabulary in HSMCA and avoid the need to introduce less useful lexical identification and classification problems which might lead to endless subdivisions of FEs. Therefore, following the above cognitive linguistics arguments, the final version of FEs model used under the domain 'HEALTH' is illustrated in Table 2.

TABLE 2. *Authors' proposal*

'HEALTH' Frame Elements (FEs)						
Healer {H}	Patient {P}	Disease/Disorder {D/D}	Causes {C}	Human Anatomy {HA}	Symptom {S}	Prevention/Treatment {P/T}

2.3. *Some lexical identification criteria*

Briefly, we regard the following constituents to avoid the annotation of lexemes widely used in General English (GE) (e.g. 'men, people, woman'), as well as auxiliary verbs, modal verbs and verbs with a neutral meaning (e.g. be, have, can, need, must, have to, should, increase, use) so as not to distort the resulting data of our research.

Nevertheless, in this preliminary exploration of identification and annotation, the authors decided to include certain well known lexical items with common usage in General English (GE), such as 'doctor, patient, nurse,

physician, experts', and verbs also in common usage, 'fight, stop, attack, seeking clues, mitigate, cut out, give up, test or assess'. These were classified into the most appropriate FEs. Although these words may not be specific to this domain, they contain a combination of semantic metaphorical properties which enrich and contribute to the lexical meaning of this specific sub-genre. At the same time, they are also in such frequent usage in oral and written communications within this domain, that these lexical items have acquired a tone and a certain degree of specificity, mainly to express 'prevention/ treatment' (e.g. 'give up smoking, stop drinking alcohol, cut out having fatty food, and test your blood regularly').

After setting the basic semantic identification criteria, the authors have faced other semantic difficulties with the analysis of identification and classification of the vocabulary into the corresponding Fes of this domain. To sort out these lexical semantic difficulties the authors have taken into account the grade of similarity of the lexemes within the domain of the 'HEALTH' frame and also the prototypical effect among different categories, since different categories may have in the meaning of the text the same semantic function or goal (e.g. 'angina, aids, stroke, tumour, and rheumatoid arthritis'). Although these lexemes, among others, describe diverse physical disorders which are produced by different causes and may have various treatment approaches, and may also show lack of attribute similarity, yet they share a certain degree of prototypical features, in this case a physical disorder. Taylor states that "the category is not structured in terms of shared criteria features, but rather by a criss-crossing network of similarities. These are indeed attributes typically associated with the category. Some members share some of these attributes; other members share other attributes" (1995: 38). However, some of these lexical items could have a different frame (sub-frame) semantic classification such as a 'kind of cardiovascular disorder' or a 'kind of cancer'. This classification, however, would not be operative or practical within the scope of this analysis.

Other important cognitive linguistic factors in the annotation task, have been the constraints conditioned by social and cultural aspects (Labov 1973; Ungerer & Schmidt 1996). Some of the authors of the articles analysed provide information relating to preventing and treating certain cardiovascular disorders and recommend 'losing weight' or 'going on a diet'. Nevertheless, the information reported in these texts or articles is addressed to people who live in developed countries and need to reduce the level of fat in their blood or are suffering obesity, thus, we have included these and similar lexical items in the frame element PREVENTION/TREATMENT {P/T}. Information of this type is less appropriate and perhaps less understood in underdeveloped countries or poor countries as a way of maintaining a healthy

lifestyle. The lexical item identification and annotation should be understood with reference to the meaning and content within the text that support and motivate the writers to communicate. In the description and selection of the lexical item meanings, we have followed the cognitive linguistic criteria that have previously been established and argued in this section.

3. RESULTS

This section presents the resulting database with tables to illustrate the lexical items identified and annotated in the different 'HEALTH' frame elements and the statistical results of evaluating the quantity and quality of these specific lexical items in HSMCA. Table 3 illustrates a selection of the lexical items annotated in the different FEs, as a sample of the vocabulary identified in HSMCA. The resulting statistical evaluation of the Frame Semantic analysis is shown in Table 4. The number of lexical items in each of the individual frame elements that constitute the frame 'HEALTH' is used as the basis for assessing the variety of the lexical items.

Table 3 contains an overall example of the style and volume of lexical information that has common usage in this specific domain. Certain words have been selected in these frame elements, which, although in common daily usage in General English (GE), and generic in nature, could not be considered strictly specific to the 'HEALTH' domain as 'strong' technical lexical items. These include words such as 'shield, fight, stop, halt, obstruct, block, subject, smoker, severe cause, suffer, coffee drinker, stiffen, thicken, fatigue, tear, or seek advice', which, nevertheless, provide information which is conceptual at a metaphorical level when used in daily health sciences contexts. This way of communication, despite having common usage in the 'HEALTH' domain, may in some cases be more difficult to understand than a technical version[4]. This is why the authors deem them as important, for they constitute a very useful learning tool for L2 health science students. Thus, Table 3 has been designed to illustrate and assess the variety of specific words collected in the different elements of the frame 'HEALTH'.

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[4] In most cases the authors agree with Salager-Meyer when she states that, "Moreover, psycholinguistic research has shown that lexical and conceptual difficulties are greater than syntactic difficulties in general reading at L1 and L2" (1990: 145).

TABLE 3. *Selection of lexical items annotated in each FEs label*

Label	Lexical items
Healer	Neuroscientists, physician, surgeon, health care workers, nurses, cardiologists, researchers, scientists, immunologists, clinicians, biochemist, pharmacists.
Patient	Cancer patients, subjects, smokers, HIV-infected dentists, severe cases, suffers, coffee drinkers, infected individuals.
Disease/Disorder	Arthritis, heart disease, cardiac conditions, rheumatoid arthritis, joint stiffness, swollen joints, lung cancer, malignant tumour, clogged arteries.
Causes	Virus, Caffeine, chemical product, smoking, weight, HIV virus, normal duties, cell's behaviour, cholesterol, fatty substances, nicotine, chemical.
Human Anatomy	Blood, cells, uterus, genes, tissues, pancreas, colon, brain, arteries, veins, capillaries, lungs, blood vessels, bones.
Symptoms	Onset, side effects, tumour shrank, stiffen, thicken, fatigue, tear.
Prevention/Treatment	Vaccine, preventive measure, cancer research, HIV tests, diagnostic, seek advice, surgery, aspirin, drug treatment, cholesterol test, low fat-diet, nicotine gums, anti-tumour proteins, clinical trials, injection.

3.1. *Statistical data*

For this experimental frame semantic classification system, the authors have used a multilevel statistical analysis to evaluate the total core of key words from the 'HEALTH' domain in the corpus of 'mass circulation articles' (MCA), and evaluate the variety of lexical items within the different frame elements.

At this respect, Estévez & Martínez[5] came up with a similar percentage of specific vocabulary in their study of 1994. If the lexical items which have not been accounted for (e.g. prepositions, conjunctions, auxiliary and modal verbs, and nouns and verbs which are non-specific to this domain), had been included, the total percentage of vocabulary of the 'HEALTH' domain used in this specific sub-genre studied would have been considerably increased. On the other hand, when observing Inman's results in his above mentioned analysis (1978), we only see a proportion of 20% of technical words in scientific articles, which also corroborates the present authors' resulting data. Furthermore, consideration should be taken of the fact that some of the lexical items accounted as a single item, are compound words with to two or more items (e.g. 'go on a diet, infected individuals, swollen joints, lung cancer, clogged arteries and fatty substances'). Specific words which have been repeated in the articles have been accounted for as single items (280 words of the total 6225) to avoid distorting the resulting lexical information.

Table 4 shows that the percentage of lexical items in articles 1, 2, 6, 8, and 10 represent an average of 9% to 13% of the total volume of lexical items in these HSMCA, while articles 3, 4, 5, and 7 have a reduced profile of lexical items averaging between 6.50% and 9%. This reduced percentage in this latter group may be a reflection of the smaller amount of total words (T.n. lexical items) in these articles. Finally, Table 4 illustrates the variety and number of lexical items in each frame element and how this identification and classification process has distributed them within the different elements. With the exception of the element PREVENTION/ TREATMENT {P/T}, a similar number of words is contained in the remaining frame elements. The resulting statistical information from this frame semantic analysis supports our main hypothesis and reveals that the vocabulary used in HSMCA contains a significant percentage of core key lexical items relating to the 'HEALTH' domain as well as others used also in L2 General English and EAP/ESP learning contexts.

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[5] One of the most striking items of lexical information to emerge from the primary analyses of our statistical results, is that core key items in this domain represent on average about 10% of the total volume of vocabulary in the corpus of HSMCA.

TABLE 4. *Results of Analysis*

	Frame Elements (FEs)							Total amounts		
	{H}	{P}	{D}	{C}	{A}	{S}	{P/T}	FE- lexical items	T.n. lexical items	% FE items/ T.n. items
Art. 1	5	9	4	8	9	6	34	75	685	10.94
Art. 2	8	5	9	6	12	3	23	66	720	9.15
Art. 3	9	8	2	4	0	0	8	31	479	6.47
Art. 4	5	5	10	17	2	4	7	50	557	8.97
Art. 5	4	3	6	9	4	4	19	49	661	7.41
Art. 6	5	5	9	1	11	8	23	62	540	11.48
Art. 7	5	8	3	5	0	6	24	51	743	6.86
Art. 8	6	3	6	6	10	6	31	68	677	10.04
Art. 9	6	3	13	24	6	2	16	70	663	10.55
Art. 10	10	4	11	11	8	9	10	63	500	12.64
T.n. lexical items	63	53	73	91	62	48	195	585	6225	9.39

4. CONCLUSIONS

Several conclusions can be drawn from this analysis of the quality and quantity of vocabulary identified within articles dealing with health science topics found in news print, journals and magazines in mass circulation. The lexical identification and annotation system applied through Frame Semantics provides a source of empirical results which revealing considerable promise for this type of lexical research and the possibilities for even more profound cognitive linguistics analyses in the future. The protocol for this study provides an alternative to previous protocols for lexical research, in addition introduces a more systematic and scientific approach to the classification of lexical items. This analysis provides an example of how Frame Semantics can be considered as a useful cognitive linguistics approach to evaluate the quality and quantity of lexical items in specific literature from a more systematic and scientific perspective.

The variety of vocabulary, as demonstrated by the results of the study, indicates that HSMCA warrant due consideration as one of the basic English language learning tools, to be applied in EAP/ESP courses. Apart from providing excellent linguistic material in terms of expansion of a learned

vocabulary, it can be a rewarding experience for EAP/EAP learners who enjoy this kind of literature while, at the same time, is helpful in the approach to new specific words facilitating a deeper insight into this semantic field. The range of vocabulary can assist students with improving their reading-writing communicative competence. This kind of 'sub-genre' may contribute to EAP/ESP and motivate instructors to appreciate and apply these sources of information, to provide a real world atmosphere in a classroom setting. Despite, its limitations, Frame Semantic analysis offers both a pathway for significant progress with the evaluation of quality and quantity of specific vocabulary, and a greater understanding of this specific vocabulary by comparison with previous studies and analyses of HSMCA.

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