Ditransitive Complementation in Medical Research Articles

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Abstract The present research analyzes ditransitive verbs from a systemic experiential perspective according to six process types which are material processes, mental processes, relational processes, verbal processes, behavioral processes, and existential processes in a particular genre which is the research article genre and in a particular discipline which is the medical discipline. This research attempts to display the distribution of ditransitive process types and to account for the differences as well as the similarities found in these distributions. Both quantitative and qualitative approaches are adopted to the analysis of the corpus. The present research demonstrates that the corpus displays variations in the distribution of the ditransitive process types. Indeed, while material and relational processes are the most frequent in the medical corpus, verbal and mental processes are the least presented. This is accounted for in terms of the specificities of the medical discipline and the norms of research article writing.

Keywords: Ditransitive Complementation, Experiential Metafunction, Process Types, Research Articles Genre, Medical Discipline

1 Introduction

Since verb complementation is "an all- pervading structural feature of language and thus likely to be more significant in giving a variety in its character than, for example, lexis." (Olavarria de Ersson & Shaw, 2003, p. 138), studying its distribution in a particular genre is important. Actually, genre determines the choice of linguistic patterns. (Swales, 1990, p. 41)

Research on ditransitive verbs in the research article genre and the scientific writing genre is explained by the gap in the literature as far as this structure is concerned. As Mukherjee (2005, p. 267) puts it: "at the level of language description, it will be useful to complement the language-as-a-whole description offered in [my] study with a more fine-grained analysis of genre-specific trends in using ditransitive verbs." The analysis of these verbs will be based on a systemic functional analysis as the distribution of process types according to genre is scarcely studied in the literature; while Harvey (2001) investigates relational identifying clauses in English technical manuals, Arùs and Lavid (2001) focus on the grammar of relational processes in English and Spanish along two genres which are machine-aided translation and multilingual generation. From a systemic functional perspective, « clauses which have a Recipient or Beneficiary as an Indirect Object are referred to as ditransitive » (Lock, 1997, p.76). In particular, in the experiential metafunction, ditransitive processes are classified into main types of process including material, relational and mental processes and borderline ones referring to existential, behavioural and verbal processes (Halliday & Matthiessen, 2004, p.171). These processes are semantically different.

- Material processes represent processes of doing and happening. E.g. *I gave my love a ring that has no end*. (Halliday & Matthiessen, 2004, p.191).

- Mental processes are "processes of sensing" (Halliday and Matthiessen, 2004, p.197). E.g. *What really irritates me is that a lot of people go to socialise in pubs.* (Halliday & Matthiessen, 2004, p.205)

- Relational clauses are used for characterization and identification. E.g. *We might call it the authorial voice*. (Halliday & Matthiessen, 2004, p.237)

- Verbal processes are used to say a message. E.g. *Did you repeat that to your parents?* (Halliday & Matthiessen, 2004, p.255)

- Existential processes refer to the happening or existence of something. E.g. *In Bihar, there was no comparable political campaign.* (Halliday & Matthiessen, 2004, p.256)

- Behavioural processes are "processes of (typically human) physiological and psychological behavior" (Halliday and Matthiessen, 2004, p. 248). E.g. *He᾽s always grumbling*. (Halliday & Matthiessen, 2004, p.251)

Since the present research focuses on the scientific writing genre, its main characteristics have to be identified. Indeed, Alley (1996) claims that scientific writing and in particular medical science are based on precision, clarity, familiarity, fluidity and forthrightness. Not only does the present research focus on this genre, but also on the research article genre. Actually, articles in the present corpus conform to the IMRAD format; they are composed of four main sections: Introduction, Methods, Results and Discussion. The Introduction section contains a statement of the problem, references to previous works, a description of the methodology, and a statement of the results and the corresponding conclusions. The Methods section involves a

description of the experimental design, the subjects and the materials. The Results section presents the results and the limitations of the experiment. Finally, the Discussion section includes a discussion of the results, a statement of the limitations, a statement of the conclusion, a summary and comparison with previous works. (Day and Gastel, 2006, p. 58-69)

Obviously, the present research aims at studying the distribution of ditransitive process types in medical research articles from a systemic functional perspective. This study is based on a quantitative analysis conducted thanks to the UAM corpus tool and a qualitative analysis. The analysis shows that material and relational processes are the most frequent ones. It also reveals that mental and verbal processes are rarely present in the corpus while behavioural and existential processes are completely absent. This can be explained by the nature of scientific writing and in particular the medical discipline, the specificities of the research article and the patterns of ditransitive complementation.

2   Methods

2.1   Corpus

The corpus is composed of ten articles conforming to the IMRAD format. These articles published in 2011 contain 41.677 words. They are randomly selected from a peer-reviewed journal which is the British Medical Journal. The selection of reviewed research articles allows the selection of the best articles which conform to the standardized and formal code of each discipline. (Swales, 2004, p. 208)

2.2   Procedure

The analysis is based on three steps. In the first step, research articles are downloaded from the internet. In the second step, I create a new project thanks to the UAM corpus tool. Then, I design a scheme consisting of six systems which are MATERIAL-TYPE, MENTAL-TYPE, VERBAL-TYPE, RELATIONAL TYPE, BEHAVIOURAL-TYPE and EXISTENTIAL-TYPE. After the incorporation of medical research articles into the new project, I annotate them. First, I read each text, and I identify ditransitive verbs. Afterwards, I classify them into the abovementioned types. For example, *sent* is classified as a ditransitive material type in the following sentence: *we sent a questionnaire including the most important outcome measures to 29 of the 34 patients*. Finally, the different frequencies are presented thanks to the corpus statistics pane. The annotation of the articles has been performed individually without evaluation. The third step is devoted to the interpretation of the results. For instance, the differences in the distribution of process types in the medical discipline are explained.

3   Results

Table 1 displays the distribution of the six ditransitive process types in the medical corpus.

	Medical Discipline	
	Number	Percentage
Material	202	41.65%
Mental	18	3.71%
Relational	238	49.07%
Verbal	27	5.57%
Behavioural	0	0.00%
Existential	0	0.00%
Total	485	

Table 1: Distribution of Ditransitive Process Types in the Medical Corpus

The study shows that the six process types are not equally distributed in the medical corpus. In fact, behavioural processes and existential ones are completely absent; while ditransitive verbs are complemented by two constituents, behavioural and existential processes cannot take three participants. While relational processes are the most frequent as they represent 49.07%, material processes are rated second since the frequency of their occurrence is 41.65%. The frequency of relational and material processes goes hand in hand with the findings of Biber et al. (1999, p. 366) who claim that existence and activity verbs are the most common in academic prose in comparison with mental verbs.

The frequency of occurrence of ditransitive relational processes can be explained by the functions they play. Actually, these processes are important in defining or describing a particular variable in the research. In the following example, they are used to introduce and describe one procedure in the experiment.

The intervention … **was based** on the following four lifestyle behaviours: physical activity, nutrition, media use, and sleep. (Text 1)

Relational processes also serve as a tool to establish a relationship between two entities or things in the medical discipline. Consider, for example, the following sentence where the writer opts for a relational process in order to relate the problem with its reasons.

Adiposity and low aerobic fitness in children **are associated** with a clustering of cardiovascular risk factors. (Text 1)

As for material processes, they have two major roles. The first one is to denote the type of relationship between entities. When exposing the results of the research, writers opt for material processes in order to explain the kind of relationship between two major constituents in the research as is shown in the following example:

Angiotensin receptor blockers **exert** their action on angiotensin I receptors… (Text 9)

The second role is to describe the activities undertaken by the researchers while preparing the material and conducting the analysis. For example, material processes can reveal how researchers select the subject in the experiment. Take, for example, the following sentence:

They **were recruited** from local hospitals or primary care to their nearest university hospital as usual without any supplemental recruitment attempt. (Text 8)

Mental and verbal processes are not as frequent as relational and material processes since they represent 3.71% and 5.57% respectively. For example, mental processes can express the attempts of the researchers to undertake particular measures as is shown in the following subordinate clause:

As surgical procedures **should be evaluated** against non-surgical methods… (Text 8)

As far as verbal processes are concerned, they reveal the talk between the different participants in the research. Indeed, they report the talk between the researchers and the doctors. They also convey the talk between the researchers and the patients. Consider the following example:

We **asked** all competent patients who agreed to participate in the study to provide a specimen of blood for analysis of haematological and biochemical parameters. (Text 4)

Another infrequent function displayed by verbal processes is to make references to other works; in other words, they express the findings stipulated by previous pieces of research in order to give credibility to the present research. Take, for instance, the following sentence:

Most previous palliative prognostic studies… **have reported** only the results from "evaluable" patients. (Text 4)

4   Discussion

Unlike previous researches, the present one examines ditransitive complementation from a systemic functional perspective in the medical discipline. The present study shows that material and relational ditransitive process types are the most frequent while mental and verbal processes are the least presented. As for existential and behavioural processes, they are totally absent from the corpus. This can be explained by the communicative purposes of the research article, the characteristics of scientific writing and the patterns of ditransitive verbs. In fact, the absence of existential and behavioural processes is due to the fact that they do not require three participants as ditransitive verbs do. The limited frequency of mental processes can be explained by the nature of the discipline and genre. Indeed, scientific writing and in particular medical science are not based on thoughts and beliefs. They are characterized by precision. In this context, Alley (1996, p. 73) argues that "in scientific writing, precision is the most important goal of language." Verbal processes are unexpectedly infrequent; normally, they should be more frequent in order to report the findings of the present research as well as the previous ones. The frequency of relational and material processes can be accounted for by the exigencies of the research article genre. Since every piece of research should be reproducible, the research article should describe the conditions under which the experiment takes place including the variables, the procedures and the activities undertaken by the researchers. The research article should also be original in that it conveys a new piece of knowledge to the scientific community. In the medical corpus, relational processes are mainly used for identification and description while material processes are meant for denoting

activities and stipulating the results. This research could be more interesting if it was based on a larger corpus and if it compared the distribution of process types across different disciplines and different genres.

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