

tasks involving pre-reading, vocabulary, noun compounding, cohesive ties and discourse markers, text organization and reading for meaning.

Two of the editors of this journal have been closely involved with the Latin American Colloquium: Ann Johns was a keynote speaker, and Tony Dudley-Evans co-edited this issue with Maria Horsella and Anamaria Harvey. It was a pleasure for both of us to work with the colloquium participants and to publish their research for a wider audience. We hope that in the future, *English for Specific Purposes* will be able to publish more special issues devoted to regional or international conferences on ESP.

The ESP Interest Session has been instituted by TESOL. If you plan to attend the TESOL '93 conference, you might want to consider submitting to the ESP Interest Section.

And we have our first award to announce: Frances Boyd has been named co-winner of the 1991-92 Fred W. Malkemes Prize presented by New York University, for her article which appeared in *English for Specific Purposes* entitled "Developing Presentation Skills: A Perspective Derived from Professional Education. Congratulations, Frances.

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A Text-Type and Move Analysis Study of Verb Tense and Modality Distribution in Medical English Abstracts

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Abstract — In order to account for finite verb tense and modality usage in medical English (ME) abstracts, and to examine how the meaning conveyed by the different tenses and modal verbs is related to the communicative function of the different rhetorical divisions of abstracts and to that of each ME text type (see below), we carried out a genre-specific discourse study and move analysis of 84 well-structured ME abstracts. The three major ME *text types* were considered: (a) research papers, (b) case reports, and (c) review articles. These covered the four basic ME *research types*: (a) *clinical*, (b) *basic*, (c) *epidemiological*, and (d) *operative* research. The different moves were identified in each abstract, and the frequency of occurrence of the above-mentioned microlinguistic surface signals was recorded for each move. Chi-square tests were run for the observations. Our study shows that: 1. There is a close relationship ($p < .05$) between the rhetorical function of the "history" type of discourse (in the *purpose, methods, results, and case presentation* moves of *research papers* and/or *case reports*) and the past — the predominantly used tense in our corpus. 2. The present — particularly favored in the "comment" type of discourse in the *conclusion, recommendation, and data synthesis* moves ($p < .001$) — serves the purpose of enhancing and emphasizing the generalizability of specific findings. It is also the preferred tense for reference to established knowledge (or universal truths) that should be part of the readers' conceptual schemata (*statement of the problem*). On a text-type basis, the present was found to be associated ($p < .01$) with *reviews* (analytic and critical state-of-the-art articles) which claim universality. 3. The present perfect — the third most frequent tense and one of the two tense markers of the statement of the problem move ($p < .01$) — is predominantly used in ME abstracts to show the authors' *disagreement* with previous findings as a way of justifying the new investigation and showing a gap in knowledge. 4. Modals are move- and research-type determined and have the discursive function of signalling the tentative and suggestive author-marked moves. 5. Modality is significantly more frequent in review articles, which means that the more universal the pretension of a claim, the more hedged the discourse. 6. Medical text types do have a direct bearing on the use of tenses and modality whereas research types do not.

Introduction

Nobody in today's medical world can read every interesting journal from cover to cover or expects to read thoroughly every relevant article. Journals are scanned for eye catching articles, and these are then usually skimmed (Ad

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Working Group for Critical Appraisal of the Medical Literature, 1987; Smith, 1987a, 1987b, 1989; Politser, 1987). The only part of the article which is read more receptively is the article abstract (Harvey & Horsella, 1988; Rodnick, 1988), which is gaining in importance and becoming a useful piece of text in its own right. According to Ulijn (1985), titles and abstracts of reports of scientific papers will soon have the highest priority for scientists. Indeed, as mentioned elsewhere (Salager-Meyer, 1990), abstracts are very important both as a prereading and a postreading phase to the point that they should be the starting point of any professional reading. What is more, on-line bibliographic retrieval systems (e.g., MEDLAR, ELHILL, MEDLINE) almost exclusively publish paper abstracts, thus giving researchers an adequate view of whether particular papers are worth requesting for further attention (Ad Hoc Working Group for Critical Appraisal of the Medical Literature, 1987; Horowitz et al., 1983; Rodnick et al., 1988). As Frahm (1986) also remarks, besides using a means of identifying which articles are of value to their needs, very often students have to be satisfied with abstracts only because of problems involved in the acquisition of material. Such a situation is particularly frequent in developing countries.

In short, (a) because abstracts play such a pivotal role in any professional reading, (b) because they can be treated as an integral piece of discourse (van Dijk, 1980), and (c) because they are manifestations of a restricted language in the Firthian sense with controlled vocabulary and syntax (Hartley, 1987), we can safely assert not only that they deserve special attention from linguists, but also that they can usefully represent the first stage in a phased program of LSP reading. Such a statement holds especially true when ESP courses are taught at the graduate level where students must not only read and understand scholarly papers written in English, but also critically assess them and apply what they have learned from them in their daily routine.

Research into abstract micro- and macrostructure has suffered from ESP neglect, and many questions still remain unanswered (Frahm, 1986). Some linguists, however, have approached the problem from varying perspectives. The majority of them have concentrated either on the processes of abstract writing (Hartley, 1987) and abstract writing (Cremmins, 1982), on their discursive structures (Graetz, 1985; Harvey, 1986; Harvey & Horsella, 1988), or on their surface linguistic features (Gopnik, 1972). Undoubtedly, all these studies are very valuable, but our main criticism is that they seem to have overlooked the close relationship that exists between form and function. The research reported here is an initial attempt to bridge this gap by relating the use of some formal features (defined hereafter) to their purpose in terms of their functional value, and to the communicative function of medical English (ME) discourse.

Purpose

Bearing in mind that it is...

that viable correlations between cognitive, rhetorical, and linguistic features can be established (Dudley-Evans, 1989; Swales, 1981), we decided to carry out a genre-specific discourse study of ME abstracts to answer the following questions: How are finite verb tenses and modals distributed across the different moves of ME scholarly paper abstracts and in the different ME text types (i.e., case reports, research papers and review articles)? Can verb tense and modal markers (of each move and in each text type) be identified? How can we relate the use of these formal microlinguistic features to their purpose in terms of their functional value? In such a way, we have followed Halliday (1985, p. xvi), who stated that a discourse analysis that is not based on grammar is not an analysis at all, but simply a running commentary on a text. In addition, we hope that our research will partly satisfy Hopkins and Dudley-Evans's call (1988, p. 120)

for more work to build up a solid stock of information about the structure of various genres and sub-genres as well as to develop our knowledge of regularities and varieties of textualization associated with particular moves and move cycles within identifiable groups of texts.

Corpus and Methods

The data for this study have been collected from 84 abstracts representing the three major types of ME scholarly papers (hereafter referred to as *text types*): 49 *research papers* (RP), 21 *reviews* (RV), and 14 *case reports* (CR) from four different types of medical research (hereafter referred to as *research types*), namely, *clinical*, *basic*, *epidemiologic*, and *operative* research (see Figure 1). A preliminary study of 10 leading medical journals published last year indicated that RP form about 60% of the papers published, RV 25%, and CR 15%. It can thus be claimed that our corpus reflects the distribution of the

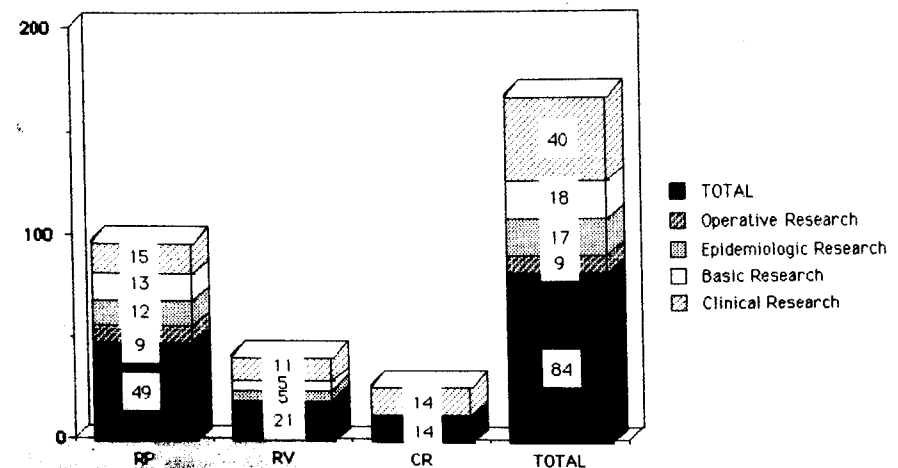


Figure 1. Distribution of abstracts per text and research type.

different text types in medical journals. Over the 117 journals indexed in the *Abridged Index Medicus*, journals with a circulation greater than 50,000 were identified. Forty-three abstracts were taken from general readership journals (e.g., *The Lancet*, *Annals of Internal Medicine*, *The New England Journal of Medicine*, *JAMA*, *The American Journal of Medicine*), and 41 from 24 more specialized journals (e.g., *Kidney International*, *The American Heart Journal*, *Circulation*). Such a corpus has the advantage of being genuine science material typically representative of the kind of bibliographical material medical graduates have to consult in the course of their studies.

A specialist informant, a Spanish-speaking medical researcher fluent in English, helped us to classify the journals and abstracts according to research and text type. All the abstracts were considered well-structured in the sense that they all stated in their "natural order" (cf. Kintsch & van Dijk, 1983) the four moves that are fundamental and obligatory in the process of scientific inquiry and patterns of thought, and that correspond to the basic intellectual structure of the whole article, namely, *purpose, methods, results, and conclusions*.¹ Our specialist informant independently analyzed the internal structuring of 47 of the 84 abstracts. The interrater reliability was estimated at .95.

We recorded the frequency of occurrence of the finite verb tenses along with their voice in each compulsory (as well as optional) move. Modals were classified apart. Chi-square tests were run for the observations. Although a number of linguists have been critical of frequency as a criterion for selection, it remains in our opinion a most valuable one, especially, as is the case with this research, when this criterion is also looked at from a textual angle. As Voracek (1987) and Siliakus (1989) have pointed out, "quantitative frequency analyses of both vocabulary and grammar have become an inevitable part of research into the microlanguages of special languages and are suitable for solving practical problems" (Voracek, 1987, p. 55). This, precisely, was our starting point. Finally, the communicative function of each ME abstract move (cf. Appendix 1) and ME text type (see Appendix 2) was elaborated from and based on the "Notes for Contributors" and "Instructions for Authors" sections of four leading medical periodicals (*The New England Journal of Medicine*, *JAMA*, *Annals of Internal Medicine*, and the *British Medical Journal*), and from two books on scientific writing (Trelease, 1982; Woodford, 1983).

Results

In order to get an overall view of the situation, we first present our results as regards finite verb tense and modal distribution per text and research type (cf. Table 1 and Figure 2). Secondly, in order to appreciate the distribution of

¹These four compulsory units are also the ones generally required from authors in the "Guidelines for Authors" in scholarly journals, scientific style manuals, and "Rules for Authors" at conferences. Some well-structured abstracts could also present optional units such as *conclusions* or *recommendation* (see Salager-Meyer, 1988).

TABLE 1
Distribution of Verb Tenses and Modals per Text Type and Research Type in the 84 Medical English Abstracts (Relative Figures)

	Research papers				Reviews			CR	RP	RV	Total
	Clinical	Basic	Oper.	Epidem.	Clinical	Basic	Epidem.				
Present	21.9	25.9	25	21.2	53	54.2	55.5	26.3	23.5	57.6	32.8
act.	19	22.4	20.7	21.2	49	41.7	46.7	22	20.8	45.8	26.3
pass.	2.9	3.5	4.3	—	14	12.5	8.8	4.3	2.7	11.8	6.5
Past	69.8	64.3	64.1	68.1	1.7	20.8	22.2	56	66.6	15	51.4
act.	48.5	37.8	51	39.9	—	16.7	11.1	39.6	44.3	9.4	34
past	21.3	26.5	13.1	28.3	1.7	4.1	11.1	16.4	22.3	5.6	17.4
Pr. Pf.	1.8	4.9	3.3	1.8	7.9	2.5	15.5	9.9	3	12	5.6
act.	1.2	4.2	—	0.9	6.1	8.3	6.7	3.3	1.6	7.1	2.3
pass.	0.6	0.7	3.3	0.9	1.8	4.2	8.8	6.6	1.4	4.9	3.3
Ps. Pf.	1.8	—	—	5.3	—	—	—	—	1.8	—	1.1
act.	1.8	—	—	5.3	—	—	—	—	1.8	—	1.1
pass.	—	—	—	—	—	—	—	—	—	—	—
Future	0.6	—	—	—	1.7	2.1	—	—	0.1	1.3	0.5
act.	0.6	—	—	—	1.7	2.1	—	—	0.1	—	0.5
pass.	—	—	—	—	—	—	—	—	—	—	—
May	2.9	1.4	3.2	1.8	6.1	4.2	4.4	3.3	2.3	5.3	3.2
Can	0.6	—	2.2	—	7.9	4.2	—	2.2	0.6	5.3	2
Should	0.6	0.7	2.2	0.9	6.1	2.1	—	2.2	1	3.9	1.8
Must	—	—	—	—	5.3	—	2.2	—	—	3.4	0.9
Could	—	—	—	—	—	—	—	—	—	—	—
Might	—	2.8	—	0.9	—	—	—	—	1	—	0.6
Total											
N	169	143	92	113	114	48	45	91	517	207	815
%	20.7	17.5	11.3	13.9	14	5.9	5.5	11.2	63.4	25.4	99.9

Note. CR = case reports, RP = research papers, RV = reviews, Oper. = operational research, Epidem. = epidemiologic research, Pr. Pf. = present perfect, Ps. Pf. = past perfect, act. = active voice, pass. = passive voice.

these variables according to the communicative function of each move, we will present our findings per move (cf. Table 2 and Figures 3 and 4). Appendix 3 displays a summary of the results regarding the relationship between the rhetorical function of the most frequently used tenses in our sample (past, present, and present perfect) and the communicative function of the different rhetorical divisions of ME abstracts as well as that of the three ME text types considered in the study. The main findings of previous research with regard to rhetorical function of the above-mentioned verb tenses are also mentioned in Appendix 3 and are discussed at length in the Discussion section.

General Results per Text and Research Type

Our corpus yielded a total of 815 verb forms (including modal verbs), 746 (91.4%) of which belonged to nonmodal verbs and 69 (8.5%) to modals (see Figure 2).

Verb Tense Distribution (Nonmodal). If we consider the three text types altogether, the past is the most frequently used tense (51.4%), followed by the present (32.8%); both are predominantly used in the active voice (see upper section of Table 1). The difference in the frequency of occurrence of these two tenses is statistically significant ($\phi < .05$). As can also be observed, the text-

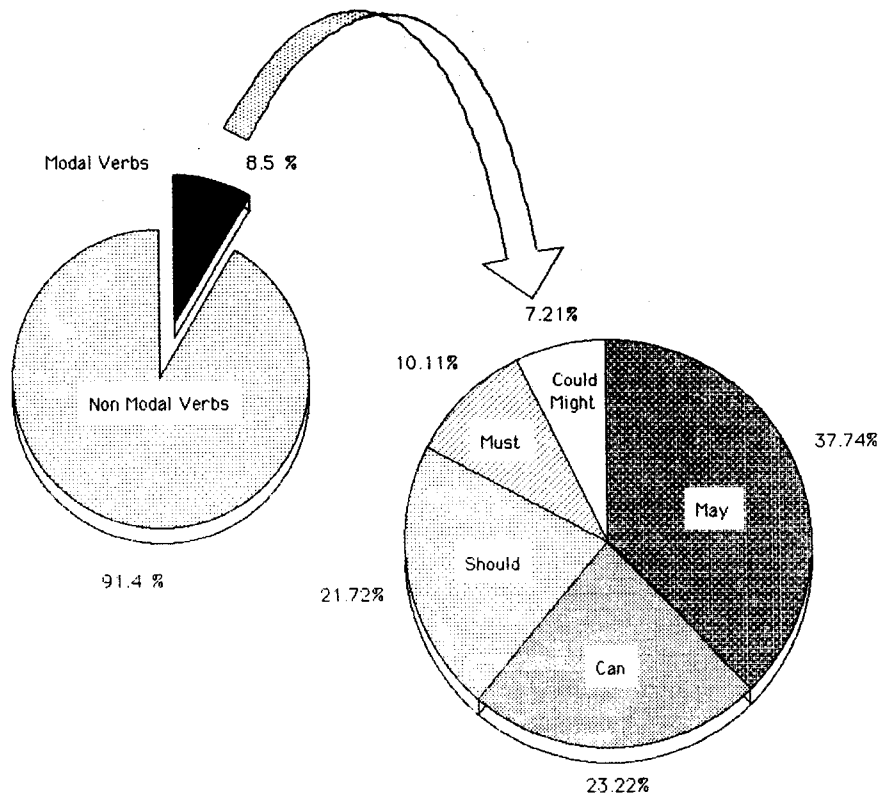


Figure 2. Frequency and distribution of modals in the 84 medical English abstracts.

type factor is a discriminatory variable whereas the research-type one is not. Indeed, whatever the research type is (clinical, basic, epidemiologic, or operative), there is a large degree of consistency in the verb tense distribution *within* each text type (RP, CR, and RV), but there is a considerable divergence in the frequency rate of verb tenses *across* text types. For example, in RP as a whole, the past is by far the predominant tense as compared with other tenses: 66.6% versus 23.5% for the present, the second most frequent tense ($p < .01$). The same holds true with CR: 56% for the past versus 26.3% for the present ($p < .01$). But exactly the reverse situation is observed when we look at the figures obtained in RV as a whole. Indeed, a sharp drop in the frequency of occurrence of the past (15%) and a noticeable increase in the use of the present (57.6%) is to be observed. Here, too, the difference is statistically significant ($p < .01$). Finally, in the three text types, the combined frequency of the less frequently used tenses — that is, the present perfect, past perfect, and future — is very small (13.3% in RV, 9.9% in CR, and 4.9% in RP) and definitely inferior ($p < .001$) to that of the present and the past. It can also be noted that the difference in the combined frequency of occurrence of these three tenses in the three text types is statistically significant ($p > .05$).

TABLE 2
Distribution of Verbs Tenses and Modals in Each Move in the
84 Medical English Abstracts (Relative Figures)

	Statement of the problem	Purpose	Methods	Results	Conclusion	Recom.	CP	DS	Total
Present act.	59.5	28.6	3.4	4.4	77.5	55	30.8	58.1	32.8
pass.	53.2	19	2.3	3.8	70.8	35	15.4	38.7	26.3
Past act.	6.3	9.6	1.1	0.6	6.7	20	15.4	19.4	6.5
past	8.9	57.1	88.6	92.2	1.7	—	69.2	11	51.4
Pr. Pf. act.	3.8	38.1	28.4	69.3	1.7	—	61.5	6.6	34
past	5.1	19	60.2	22.9	—	—	7.7	4.5	17.4
Ps. Pf. act.	30.4	—	6.8	0.3	—	—	—	9.7	5.6
pass.	11.4	—	2.3	0.3	—	—	—	4.5	2.3
Ps. Pf. pass.	19	—	4.5	—	—	—	—	5.2	3.3
Future act.	—	—	1.1	2.5	—	—	—	—	1.1
pass.	—	—	1.1	1.9	—	—	—	—	0.8
Future act.	1.3	4.8	—	—	—	—	—	1.3	0.5
pass.	1.3	4.8	—	—	—	—	—	1.3	0.5
May	—	9.5	—	—	12.5	—	—	5.8	3.2
Can	—	—	—	—	4.2	—	—	7.1	2
Should	—	—	—	—	1.7	35	—	3.9	1.8
Must	—	—	—	—	—	10	—	3.2	0.9
Could	—	—	—	—	—	—	—	—	—
Might	—	—	—	0.6	2.5	—	—	—	0.6
Total	79	21	88	319	120	20	13	155	815
N	9.7	2.6	10.8	39.1	14.7	2.4	1.6	19	99.9

Note. CP = case presentation, DS = data synthesis, Recom. = recommendations, Pr. Pf. = present perfect, Ps. Pf. = past perfect, act. = active voice, pass. = passive voice.

Modal Distribution. As reported in the previous section, a total of 69 modals was recorded in our sample, which means that they make up 8.5% of all the verb forms used in our corpus. An interesting feature is that they are much more frequently used in RV than in the other two text types: 17.9% in RV versus 7.7% in CR ($p < .05$), and 4.8% in RP ($p < .05$) (see Table 1, lower section, and Figures 2 and 3). Figure 2 also shows that in our corpus *may* is the

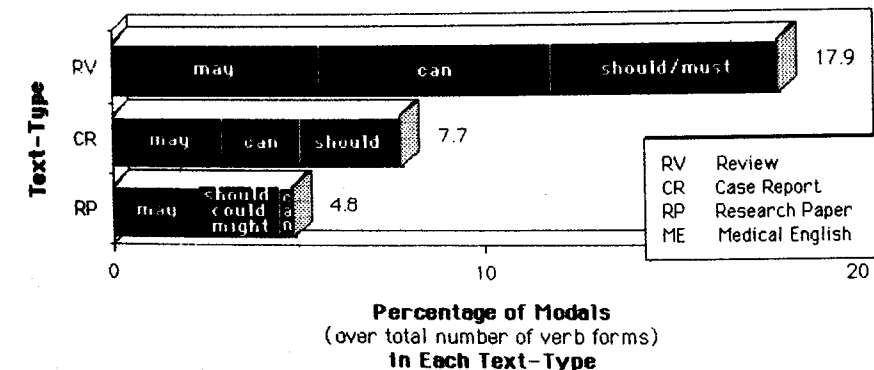


Figure 3. Distribution of modals per text type in the 84 medical English abstracts (N modals = 69).

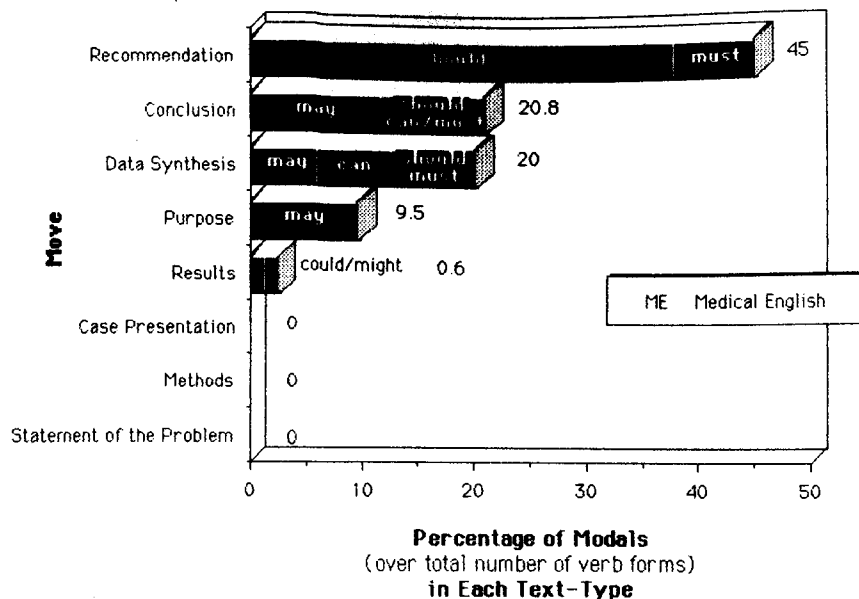


Figure 4. Distribution of modals per move in the 84 medical English abstracts (N modals = 69).

modal of highest frequency ($p < .001$ when compared with *can*, the second most frequent modal). However, if we consider the three text types separately, the difference in the frequency of occurrence of *may* and *can* is not statistically significant in either CR or in RV ($p > .05$), and although *may* is much more frequent than *can* in RP, the difference in their frequency does not reach statistical significance either.

General Results per Move

Verb Tense Distribution (Nonmodal). Table 2 (upper section) shows the distribution of verb tenses per move. The two moves labeled CP (*case presentation*) and DS (*data synthesis*) have been set apart because they are characteristic of a specific text type (CR and RV respectively). Therefore, they could not be mixed with the other six moves. Table 2 clearly indicates that the use of tenses varies according to the abstract rhetorical section. Some preferences are particularly striking. For instance, the past is overwhelmingly used in the results (92.2% vs. 4.4% for the present, the second most frequent tense: $p < .001$) and the methods (88.6% vs. 3.4% for the present: $p < .001$), the only difference being that the former move is predominantly marked by the active voice, whereas the latter is mostly signalled by the passive. The difference in the frequency of occurrence of the passive and the active voice is statistically significant in both moves ($p < .001$). On the other hand, the present is the only nonmodal verb tense of any frequency in the conclusion (77.5% vs. 1.7% for the past: $p < .001$) and in the data synthesis (58.1% for the present vs. 11%

for the past), as well as in the *recommendation* (55%), where it is the only nonmodal tense employed. In the remaining moves, the difference in the frequency of occurrence of the two most frequently used tenses is also significant, but to a lesser extent ($p < .01$). For example, the *statement of the problem* is either marked by the present (59.5%), mostly in the active voice, or the present perfect (30.4%), mainly in the passive. The purpose is either signalled by the past (57.1%) or the present (28.6%), both mainly in the active voice.

Modal Distribution. Figure 4 and Table 2 (lower section) indicate that modals are particularly frequent in the recommendation (45% of all the verb forms used), the conclusion (20.9%) and the data synthesis (20%) moves. In these three moves, modals represent 85.9% of the total number of modals used in the whole corpus. Our results also show that *may* is the typical modal exponent of the conclusion ($p < .001$ when compared with *can*, which assumes the second highest rate of occurrence among modals in this move), *should* of recommendation ($p < .001$), and both *can* and *may* of data synthesis ($p < .005$).

Discussion

In the first place, our results show that the tense profile in ME abstracts varies greatly according to the abstract rhetorical divisions. This corroborates other researchers' findings (Hanania & Akhtar, 1985; Heslot, 1985; Lackstrom, Selinker, & Trimble, 1970; Malcolm, 1987; Selinker, Trimble, & Vroman, 1972; Swales, 1981) that different tenses are exploited for different functions and that the choice of tense does not merely depend on temporal considerations. In this respect, the following comment is very significant and provides a very good synthesis of the conclusions arrived at by the above-mentioned researchers:

It is misleading to talk only about time lines with regard to the selection of tenses, because there are factors other than time-sense relationships governing tense choice in scientific journal articles. Factors such as the writer's attitude towards the importance of events, the degree of generality of the research described, or the particular context in which the discourse appears may influence the choice of tense. (Gunawardena, 1989, p. 272)

Our finding that the most frequently used tenses are, in decreasing order of frequency, the past, present, and present perfect is in agreement with Heslot (1985), who noted a similar distribution of tenses in a corpus of EST articles (although in a slightly lower proportion to ours).

On a more detailed rhetorical level, a close relationship was found in our sample between the rhetorical functions of the results, methods, case presentation, and purpose (what Benveniste [1974] called "history discourse") and the meanings expressed by the past — this tense that Heslot (1985, p. 217) so aptly called "*le cliquotant du fait expérimental pur et dur*." In the

methods move of ME abstracts, the past passive — which can be said to play the role of an obligatory constraint — indicates the sequence of procedures in the actual research that is being reported. As for the past active, it is used in the results section as an obligatory constraint in making statements about the likely significance of the (timebound) findings obtained from the research. Wingard's (1981) and Malcolm's (1987) findings that one of the functions of the past in EST is to refer to specific events, actions, or processes that occurred during an experiment or study are thus confirmed here. In the purpose move, it seems that the choice of tense (past or present) is basically a rhetorical or strategic choice rather than an obligatory constraint. The authors are free to use a time location that best fits their communicative purpose. In the following examples, reference is made to the report itself (Malcolm's deictic axis) by means of the present tense: "We report an atypical plasma cell granuloma . . ." (case presentation move of a CR), and "We describe severe central nervous system toxicity . . . in 3 patients undergoing liver transplantation" (purpose move from a RP). But when reference is made to the activities carried out, the past is preferred: "The purpose of this study was to assess the prevalence and treatment of alcohol abuse among patients of 19 senior medical residents . . ." (RP), and "A previously healthy young man presented with acute respiratory distress and diffuse bilateral infiltrates on chest radiograph" (CR). It is interesting to note in this respect that scientists who report their research in French express all the above-mentioned functions by means of the present tense, which gives their description and experience-related facts a timeless aspect (Causse, 1985; Heslot, 1985).

Our results also support the claim that the present tense not only refers to a situation that holds true up to the moment of utterance, or to omnitemporal assertions ("basic meaning," see Appendix 3), but also that it is employed in scientific English literature when the authors wish to emphasize the relevance of their own study and to enhance its generalizability (Heslot, 1985; Lackstrom, 1978; Vasquez, 1987). Indeed, deductions and implications of the research are expressed in ME abstracts by means of the present. As stated before, the conclusion and, to a lesser degree, the recommendation (the "comment type of discourse" in Benveniste's terminology) show a high frequency of the present. It is worthwhile noting here that Benes (1981), in a study of scientific German articles, found that the simple present was used to state general truths as well as new conclusions, that the past was employed in the narrative style only, and that the future was very rare.

Special mention must be made here of the results obtained from the data synthesis move of RV articles, where the present is a signalling tense. Communicatively speaking, this section is very similar to the conclusion move of RP (cf. Appendix 1). Indeed, RV papers are basically *state-of-the-art* articles (cf. Appendix 2) that claim generalizability. Because they are selective, critical, analytic, and synthetic surveys of *research previously reached* on a given topic, RV claim to represent *the state of the art in that field*. This contrasts with the *fundamental research* which is to present, retell,

TABLE 3
Medical English Text Types: From Individuality to Universality

Case Reports	<ol style="list-style-type: none"> 1. Anecdote-like; short story-like 2. From the particular to the particular 3. No pretension to generalization 4. Individuality
Research Papers	<ol style="list-style-type: none"> 1. Novel-like; book-like 2. From the particular to the general 3. Pretension to generalization 4. Family/group
Reviews	<ol style="list-style-type: none"> 1. Dictionary-like; encyclopedia-like 2. From the general to the universal 3. Pretension to universality 4. Universe

in both text types the past is the predominant tense — which is to inform the readers about the results obtained from a specific, generally unusual, case or group of cases with educational value (see Appendix 2). Therefore, linguistically speaking, review articles cannot be expected to follow the same patterns as research papers. The present, then, in the *data synthesis* move finds its semantic justification in that the data presented in this move are to be treated as generic, timeless, and omnitemporal generalizations (i.e., as general statements of established knowledge and propositions). A closer look at the communicative function of each ME text type considered in this study allows us to draw an "individuality–universality continuum" (cf. Table 3), which explains and justifies why it can safely be said that the present is not only the *data synthesis* move marker, but also the RV one, and why the past is the tense marker of both RP and CR. Indeed, the attitude adopted by the writer towards the addressee varies along a scale from almost pure descriptive, "anecdote-like" discourse based on the particular which does not pretend to go beyond the individual case (or few cases) described (CR), through the advice and suggestions of a more "novel-like" discourse based on a group of subjects with pretension to generalization (RP), to an "encyclopedia-like" discourse based on the general with pretension to universality (RV). Incidentally, it is precisely because the communicative function of the RV is different from that of the RP that the guidelines proposed for RP abstract structuring (cf. Ad Hoc Working Group for Critical Appraisal of the Medical Literature, 1987) differ from those suggested for RV abstracts (Mulrow, 1987; Mulrow, Thacker, & Pugh, 1980).

The present perfect, as our results indicate, is, along with the present, the tense marker of the statement-of-the-problem (or "establishing the field") move.² Judging from evidence from our corpus, we may claim that there are two typical modes in ME abstracts of summarizing the relevant research his-

²As was mentioned elsewhere (Salager-Meyer, 1990), the amount of background knowledge provided in an abstract varies from journal to journal. It is present mostly in general readership journals like *The American Journal of Medicine*, where it provides a context for subsequent sentences.

tory related to the topic under investigation. Each mode, the communicative function of which appears to be an obligatory constraint, is signalled by a specific tense. On the one hand, this opening move can either be "neutral" in the sense that it simply aims at refreshing (or updating) the reader's knowledge by stating facts, generic and timeless theoretical statements, or qualified results (i.e., background material related to the topic under consideration and established as true) that should be part of the readers' conceptual schemata (Swales's "subject orientation"). The present tense, mostly in the active voice, is employed in such a situational context: "Vascular complications constitute a widespread clinical problem," or "The Timm method for the histochemical detection of metals defines accurately many terminal fields in the brain of mammals." On the other hand, the statement-of-the-problem move may be more intentional: The authors can relate the history by describing in broad terms what previous research has established (Swales's "weak author orientation"), but very often with the intention of challenging its validity, illustrating a gap of information, and, at the same time, justifying the publication of the study being reported. The rationale behind the new investigation is thus implicitly expressed. Such an intention is conveyed in ME abstracts with the present perfect, mostly in the passive voice. Here are some examples encountered in our corpus: "It has previously been reported/established/thought that . . . Diacylglycerol has been proposed to be a secondary messenger." Malcolm's claim (1987) that references to previous research can be either in the present or in the present perfect is thus confirmed here.

It is worthwhile emphasizing the fact that in our corpus the present perfect was not only used to refer to past experiments related to the present study in order to express a certain degree of generality or relevance to the research described — a now well-documented finding (Gunawardena, 1989; Heslot, 1985; Lackstrom, Selinker, & Trimble, 1973; Oster, 1981; Swales, 1981) — but also and mainly to imply the authors' disagreement with and questioning of previous research findings (cf. Appendix 3). Our study thus indicates that the way medical scientists refer to previous research in their abstracts does not allow us to accept totally the idea that the past is one of the most appropriate tenses used for reporting past research (Hanania & Akhtar, 1985). The past — used in our study only in 8.9% of the cases in the background information/statement of the problem, and 11% in the data synthesis — seems to be restricted in these two reporting-past-research moves to references to "discrete findings" or previous work, the conclusions of "which have not yet entered the Pantheon of received knowledge" (Heslot, 1985, p. 214), or which do not bear directly in terms of importance on the work described in the abstract (Lackstrom et al., 1973). Here is an example: "Wilson first described the syndrome but further progress in development of the concept has occurred only within the past ten years." This example clearly illustrates the shift from the past tense (specific reference or Swales's "strong author orientation") to the present perfect (greater generality and relevance of findings referring to an experience that has been demonstrated repeatedly in the past). It is interesting to note in this respect that Gunawardena (1989) found very few

occurrences of the present perfect in the Methods and Results sections of biology and biochemistry articles, but a high incidence of this tense in the Introduction sections. Heslot (1985) also found a high incidence of the present perfect in the first and second paragraphs of the Introduction section of scientific English articles. Such findings are consistent with ours, since from a communicative standpoint the Introduction section of scholarly papers corresponds to the statement-of-the-problem move of abstracts.

Finally, the claim that the present perfect is associated with time orientation (Ota, 1963; Quirk & Greenbaum, 1973) and, consequently, with time indicators is also supported by our study. However, in ME abstracts, time indicators do not make reference to exact publication dates (as Gunawardena found in scholarly papers), but rather vaguely point to some earlier time (e.g., *lately*, *previously*, *so far*). Not a single example of exact time reference was found in our corpus. This is probably because space restriction in abstracts does not permit unnecessary information that the interested reader will in all likelihood find in the body of the article.

Our findings on modality — which Trimble (1985, p. 119) calls "semi-jargon" — corroborate other researchers' findings that *may* is the modal of highest frequency in scientific writing because it has greater hedging possibilities than the other modals (Vasquez, 1987). Moreover, our study not only points to an increase of subjectivity throughout the ME abstract moves, but also indicates that the choice of modals is move determined. *May*, which is used "when the authors are quite confident of their findings and when they want to indicate a high degree of probability" (Kibui, 1988, p. 11), can be called the conclusion modal marker; *can*, used to express possibility or uncertainty, the data synthesis one; and *should*, used as a tactful way of giving commands, warnings, and instructions, the recommendation modal exponent. Our results, then, are in agreement with the claim made by Selinker (1979) that modals have a special function in EST writing that normal linguistic description fails to identify. It can then be established that in ME abstracts modals have the discursual function of signalling the more tentative, suggestive (Kibui, 1988; Lackstrom, 1978), and author-marked conclusion, data synthesis, and recommendation moves. On the other hand, on a text-type basis, they are a linguistic marker of RV abstracts — that is, of articles which have a pretension to universality. Modals, then, are related to author markedness in ME abstract moves, and to pretension to universality in ME text types. This lack of assertiveness, formulated by "these words used to make things fuzzy" (Lakoff, 1972), is a consequence of the fact that research conclusions are indicative rather than definitive: Scientists do not want to commit themselves to absolute statements because they know that their interpretation may not be the only one. As Skelton (1988, p. 39) states "Hedges are a resource, not a problem."

By contrast, the other ME abstract moves present an extremely low incidence of hedges. The results move, which presents "hard facts" or "crude generalizations" in an assertive way, is relatively unhedged as compared to the three above-mentioned moves. The reason is that only the most salient and striking results are mentioned in abstracts (this is indeed a requirement from

most biomedical journal editors). In abstracts, claims are stated boldly, without explanations, they are usually left without comments, whereas in the article they tend to be stated with a note of personal response that mitigates the argument. The degree of tentativeness or reserve, the surprising or unexpected results, and comments on the results, are safely left to the article itself. This finding is in agreement with Bruce's (1984) finding that the explanations of the results are frequently hedged in ME scholarly papers.

Conclusion

The most salient finding of our study is that there is a close relationship between the rhetorical function of each abstract move and the use of verb tenses and modality. The present perfect (one of the two tense markers of the statement of the problem) is *essentially* used to introduce a topic of discourse and to imply the authors' disagreement with previous researchers' findings. On the other hand, the past is used not so much to report previous research (as has been so far stated in relation to scholarly papers, MSc theses and dissertations), but to retell the what, why, and how, as well as the results of the new investigation (purpose, methods, results, and case presentation). As for the present, which signals the "comment" type of discourse, it is mostly used to refer to established knowledge that should form part of the readers' conceptual schemata (statement of the problem), to emphasize the relevance of the study being described and to express pretension to generalization (conclusion, recommendation, and data synthesis). The remaining tenses are almost nonexistent.

Secondly, our research shows that the communicative function of each ME text type also determines the use of verb tenses, the most striking difference being in the predominant use of the present in RV papers — which have a pretension to generalize their knowledge claims so as to give them the status of a law or universal principle — and the overwhelming use of the past in RP and CR, which are both temporally and intellectually more limited types of discourse. Indeed, in contrast with RV, both CR and RP essentially retell the story of a specific research project, or of an unusual case, very much like short stories do.

Our work also reaffirms the relationship between suggestive discourse and the use of modality (or hedging), which reflects a limitation of claims and helps writers to move their findings away from fact-like status. Indeed, the most heavily hedged moves were found to be the conclusion, the recommendation, and the data synthesis. Now, if we consider the different text types, it can be claimed that the more universal the pretension of a claim is — which is the case in RV — the more hedged the discourse.

In conclusion, our research reaffirms other researchers' findings that it is misleading to teach verb tense choice according to time lines only. Factors other than the time-sense relationship govern tense selection in ME abstracts. In light of our findings it can then be inferred that, when teaching verb tenses to scientists for reading or writing purposes, it is crucial to point out their communicative purpose in the different rhetorical divisions of ME abstracts and

in the different ME text types. The present perfect, because of the variety of its functions and the difficulty it presents for nonnative learners (Gunawardena, 1989; Walker, 1967), deserves special treatment.

A final word of caution: This study is limited by its very nature, by the very fact of being based on a corpus, and a limited one at that. In linguistic analysis in general, one never knows when a corpus is large enough. This is why it seems necessary to corroborate further the findings of this research on a larger scale. Replications of design and methodology with different text types in other fields are needed in order that the findings of the present small-scale study can be considered representative of the genre of the scientific abstract in general. It would also be extremely interesting to carry out cross-linguistic studies to compare the use of verb tenses in other languages with their use in English.

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REFERENCES

- Ad Hoc Working Group for Critical Appraisal of the Medical Literature. (1987). A proposal for more informative abstracts of clinical articles. *Annals of Internal Medicine*, 106, 508-604.
- Benes, E. (1981). Struktur der wissenschaftlichen Fachsprachen in syntaktischer Hinsicht. In T. Bungarten (Ed.), *Wissenschaftssprache*. Munchen, Germany:
- Benveniste, E. (1974). *Probleme de linguistique générale*. Paris, France: Galilard.
- Bruce, N. (1984). Rhetorical constraints and information structure in medical research report writing. *EMP Newsletter*, 1(2), 5-18.
- Causse, F. (1985). Problématique d'une formation à la rédaction scientifique en anglais. In M. Perrin (Ed.), *Pratiques d'aujourd'hui et besoins de demain* (pp. 169-177). Bordeaux, France: Université de Bordeaux.
- Celce-Murcia, M., & Larsen-Freeman, D. (1983). *The grammar book: An ESL-EFL teacher's course*. Rowley, MA: Newbury House.
- Cremmins, E. T. (1982). *The art of abstracting*. Philadelphia: ISI Press.
- Dudley-Evans, T. (1989). An outline of the value of genre-analysis in LSP work. In C. Laurén & M. Nordman (Eds.), *Special language: From human thinking to thinking machines* (pp. 72-80). Multilingual Maters, Philadelphia: Clevedon.
- Frahm, G. F. (1986). What is the role of abstracts in language teaching? *The ESPecialist*, 14, 63-68.
- Gopnik, M. (1972). *Linguistic structures in scientific texts*. The Hague, Netherlands: Mouton.

- Graetz, N. (1985). Teaching EFL students to extract structural information from abstracts. In J. M. Ulijn & A. K. Pugh (Eds.), *Reading for professional purposes: Methods and materials in teaching languages* (pp. 123-135). Leuven, Belgium: Acco.
- Gunawardena, C. N. (1989). The present perfect in the rhetorical divisions of biology and biochemistry journal articles. *English for Specific Purposes*, 8, 265-275.
- Halliday, M. A. K. (1985). *An introduction to functional grammar*. Edward Arnold.
- Hanania, E. A. S., & Akhtar, K. (1985). Verb form and rhetorical function in science writing: A study of M.S. theses in biology, chemistry, and physics. *The ESP Journal*, 4, 49-58.
- Hartley, A. F. (1987). Computer-stimulated acquisition of reading ability in LSP. In A. M. Cornu, J. Vanparijs, M. Delahaye, & L. Baten (Eds.), *Beads or bracelet? How do we approach LSP?* (pp. 348-356). Leuven, Belgium: Oxford University Press.
- Harvey, A. (1986). *A macrostructure analysis of 20 computer-data-based abstracts in the field of engineering*. Paper presented at the National Seminar on Languages for Specific Purposes, Catholic University, Santiago, Chile.
- Harvey, A., & Horsella, M. (1988). Exploring and exploiting the structure of computational abstracts. *The ESPecialist*, 9, 229-247.
- Heslot, J. (1985). Apprendre a maitriser les spécificités textuelles. In M. Perrin (Ed.), *Pratiques d'Aujourd'hui et Besoins de Demain* (pp. 211-219). Bordeaux, France: Université de Bordeaux.
- Hopkins, A., & Dudley-Evans, T. (1988). A genre-based investigation of the discussion sections in articles and dissertations. *English for Specific Purposes*, 7, 113-121.
- Horowitz, G. L., Jackson, J., and Bleich, L. (1983). PaperChase: Self service bibliographical retrieval. *Journal of the American Medical Association*, 20, 2494-2499.
- Huth, E. J. (1987a). Keeping up with the medical literature: Reprint available. *Annals of Internal Medicine*, 106, 627.
- Huth, E. J. (1987b). Structured abstracts for papers reporting clinical trials. *Annals of Internal Medicine*, 106, 626-627.
- Huth, E. J. (1989). The underused medical literature. *Annals of Internal Medicine*, 110, 99-100.
- Kibui, A. (1988). *Aspect of hedging in the discussion of medical research discourse* (LSU ESP Collection, No. 3.4 D/2. Msc. dissertation, Aston University, Birmingham, UK).
- Kintsch, W., & van Dijk, T. A. (1983). *Strategies in discourse comprehension*. New York: Academic Press.
- Lackstrom, J. (1978). Teaching modals in EST Discourse. In M. Trimble, L. Trimble, & K. Drobnic (Eds.), *English for specific purposes: Science and*
- Lackstrom, J., Selinker, L., & Trimble, L. (1970). Grammar and technical English. In R. Lugton (Ed.), *English as a second language. Current issues*. Philadelphia: The Center of Curriculum Development.
- Lackstrom, J., Selinker, L., & Trimble, L. (1973). Technical rhetorical principles and grammar choice. *TESOL Quarterly*, 7, 127-136.
- Lakoff, G. (1972). Hedges: A study in meaning criteria and the logic of fuzzy concepts. *Journal of Philosophical Logic*, 2, 458-508.
- Lock, S. (1988). Structured abstracts. *British Medical Journal*, 297, 156.
- Malcolm, L. (1987). What rules govern tense usage in scientific articles? *English for Specific Purposes*, 6, 31-43.
- Mulrow, C. D. (1987). The medical review article: State of the science. *Annals of Internal Medicine*, 106, 485-488.
- Mulrow, C. D., Thacker, S. B., & Pugh, J. A. (1980). A proposal for more informative abstracts of review articles. *Annals of Internal Medicine*, 108, 613-615.
- Oster, S. (1981). The use of tenses in reporting past literature in EST. In L. Selinker, E. Tarone, & V. Hanzeli (Eds.), *English for academic and technical purposes: Studies in honor of Louis Trimble* (pp. 76-90). Rowley, MA: Newbury House.
- Ota, A. (1963). *Tense and aspect of present day American English*. Tokyo: Kenkyuska.
- Politzer, P. E. (1987). Medical education for a changing future: New concepts for revising texts. *Medical Education*, 21, 320-333.
- Quirk, R., & Greenbaum, S. (1973). *A concise grammar of contemporary English*. New York: Harcourt Brace Jovanovich.
- Rodnick, J. E., Simrin, S. M., Yang, M. G., & Altman, D. F. (1988). Teaching medical students to do bibliographical searching. *Journal of Medical Education*, 63, 728-730.
- Salager-Meyer, F. (1990). Discoursal flaws in medical English abstracts: A genre analysis per research- and text-type. *TEXT*, 10, 365-384.
- Salager-Meyer, F. (1991). Medical English abstracts: How well structured are they? *JASIS (Journal of the American Society for Information Science)*, 42, 528-532.
- Selinker, L. (1979). On the use of informants in discourse analysis and language for special purposes. *IRAL*, 17, 189-214.
- Selinker, L., Trimble, L., & Vroman, P. (1972). *Working papers in English for science and technology* (Progress Rep. No. 5). Seattle: University of Washington, Office of Engineering Research.
- Siliakus, H. (1989). 25 years on. Another close look at the frequency criterion. In C. Laurén & M. Nordman (Eds.), *From office to school: Special language and internationalisation* (pp. 78-86). Multilingual Matters. Philadelphia: Clevedon.
- Skelton, J. (1988). The care and maintenance of hedges. *ELT Journal*, 42(1), 37-43.

- Swales, J. (1981). *Aspects of article introductions* (Aston ESP Research Project No. 1). Birmingham, UK: The University of Aston.
- Swales, J. (1990). *Genre analysis. English in academic and research setting*. Cambridge, UK: Cambridge University Press.
- Trelease, S. F. (1982). *How to write scientific and technical papers*. Cambridge, MA: The MIT Press.
- Trimble, L. (1985). *English for science and technology. A discourse approach*. Cambridge, UK: Cambridge Language Teaching Library.
- Ulijn, J. M. (1985). A present state of LSP reading research as reflected by a recent symposium. In J. M. Ulijn & A. K. Pugh (Eds.), *Reading for professional purposes: Methods and materials for teaching languages* (pp. 12-25). Leuven, Belgium: Acco.
- van Dijk, T. (1980). *Macrostructures*. Hillsdale, NJ: Erlbaum.
- Vasquez, F. (1987). *A comparative study of the rhetorical structure of the discussions sections in English and Spanish medical articles*. MSc. Dissertation, Aston University, Birmingham, UK.
- Voracek, J. (1987). Superstructure and microlanguage. *English for Specific Purposes*, 6, 53-56.
- Walker, R. H. (1967). Teaching the present perfect tenses. *TESOL Quarterly*, 1, 17-30.
- Wingard, P. (1981). Some verbs forms and functions in six medical texts. In L. Selinker, E. Tarone, & V. Hanzelli (Eds.), *English for academic and technical purposes* (pp. 53-65). Rowley, MA: Newbury House.
- Woodford, F. P. (Ed.). (1983). *Scientific writing for graduate students. A manual on the teaching of scientific writing*. Bethesda, MD: Council of Biology Editors.

Appendix 1

Rhetorical Function of the Different Moves of Medical English Abstracts

Move	Communicative function
Statement	Brief statement that introduces the topic of the problem and/or the relevant literature.
Purpose^a	Primary objective. Central question of the study. Question addressed by the article.
Corpus/Methods^a	Study subjects or experimental animals and observational and analytical methods. Manner of selection and number of patients and participants who entered and completed the study. Exact treatment or intervention.
Results^a	Summarizes briefly but clearly the <i>principal</i> key/new results.
Conclusions^a	Key conclusions indicating direct clinical applications. Final statements of the principal conclusions, especially all new information likely to be of interest to the readers who are not specialists in the field.

Appendix 1 (Continued)

Move	Communicative function
Recommendations	Statement of potential applications and further research needs.
Data Synthesis (in RV)	Statement of key conclusions of previous research.
Case Presentation (in CR)	Brief statement about the patient's age, sex, ailments, symptoms, and signs.

^a These four moves constitute the conventional core structure of abstracts required by most biomedical journals.

Appendix 2

Rhetorical Function of the Three Medical English Text Types Considered in This Study

ME text type	Communicative function
Reviews	Summarize knowledge in a particular segment of the field. Selective and timely analysis of present state research, existing problems, and future directions of research. State-of-the-art presentations on a given topic. Detailed critical surveys of concepts and experience relevant to clinical problems. <i>Clinical review</i> : analytic review integrating case data with analysis of previously published case material. <i>Basic review</i> : analytic and critical review of basic science topics with present or potential clinical relevance.
Case Reports	Clinical observations of single (or a few) case studies with educational value.
Research Papers	Reports of new investigation into mechanisms of disease. Descriptions of clinical experience. Reports of drug trials. Articles that bring together important information on a topic of general interest. Studies in human subjects, experimental animals, and/or in vitro experiments.

Appendix 3

Rhetorical Function of the Three Most Frequent Verb Tenses in Medical English Abstracts (as Compared With Other EST Researchers' Findings)

Past	Used to/conveys meaning of
Basic Meaning	1. A specific event, action that occurred in the past. 2. A habitual or repeated action or event that occurred over a period of time prior to the moment of utterance.

Appendix 3 (Continued)

Past	Used to/conveys meaning of
Medical English Abstracts	<ol style="list-style-type: none"> 1. The sequence of procedures in the actual research being reported (methods, purpose, case presentation moves) 2. The likely significance of the (timebound) results being reported (results move) 3. Discrete results of previous research (statement-of-the-problem move). 4. History-like discourse (research papers and case reports)
Other Researchers	<ol style="list-style-type: none"> 1. <i>Report past literature</i> (Hanania & Akhtar, 1985) <ol style="list-style-type: none"> 1.1. Nongeneralizability of past literature (Heslot, 1985; Oster, 1981) 1.2. Previous research that does not bear directly in terms of importance on the work described in the report (Lackstrom et al., 1973) 2. <i>Results being reported</i> <ol style="list-style-type: none"> 2.1. Likely significance of the results being reported (Wingard, 1986) 2.2. Questioning of previous research (Malcolm, 1986) 2.3. Reference to a specific event, action, process that occurred during an experiment (Malcolm, 1986; Wingard, 1981)

Present	Used to/conveys meaning of
Basic Meaning	<ol style="list-style-type: none"> 1. A situation that includes or coincides with the moment of utterance. 2. Generic or omnitemporal assertions (e.g., physical laws or customs)
Medical English Abstracts	<ol style="list-style-type: none"> 1. Emphasize the relevance of the study and enhance its generalizability (conclusion move) 2. Implications of the study and needs for future research (recommendation move). 3. Make reference to established knowledge regarded as unarguable by the scientific community (statement of the problem move). 4. State the purpose of the paper when making reference to the report itself (purpose move) 5. State generic and omnitemporal generalizations (data synthesis move). 6. Express pretension to generalization and universality (review articles).
Other Researchers	<ol style="list-style-type: none"> 1. Make generalizations about past literature (Lackstrom et al., 1970) without researcher agents (Heslot, 1985; Malcolm, 1986). 2. Refer to generic, timeless and omnitemporal situations (Malcolm, 1986). 3. Describe procedures habitually used (Wingard, 1986). 4. State generally accepted facts in background material (Selinker et al., 1973; Heslot, 1985) 5. Emphasize relevance of the study and enhance its generalizability (Heslot, 1985; Lackstrom, 1978; Vasquez, 1987)

Present perfect	Used to/conveys meaning of
Basic Meaning	<ol style="list-style-type: none"> 1. Continuing relevance of a previous situation to the present moment.

Appendix 3 (Continued)

Present perfect	Used to/conveys meaning of
Medical English Abstracts	<ol style="list-style-type: none"> 1. Report past literature emphasizing upon a certain degree of disagreement with (questioning of) previous research findings (statement of the problem move).
Other Researchers	<ol style="list-style-type: none"> 1. <i>Report past research</i> (Hanania & Akhtar, 1985) <ol style="list-style-type: none"> 1.1. Greater generality of findings than the past (Gunawardena, 1989; Lackstrom et al., 1970; Oster, 1981; Swales, 1981). 1.2. Past experiments with direct relevance to the study being described (Gunawardena, 1989; Lackstrom et al., 1973). 1.3. Established knowledge with mention of authors' names (Heslot, 1981; Malcolm, 1986). 2. <i>Other functions</i> <ol style="list-style-type: none"> 2.1. Summarize what has been presented in the report (Malcolm, 1986). 2.2. Introduces a topic of discourse (Oster, 1981).

Note. Sections on "Basic Meaning" are from *The Grammar Book: An ESL-EFL Teacher's Course* by M. Celce-Murcia and D. Larsen-Freeman, 1983, Rowley, MA: Newbury House. Copyright 1983 by Newbury House Publishers, Inc.

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