Exploring the dialogism of academic discourse: Heteroglossic Engagement in medical research articles

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Abstract

In academic research writing, the way in which an author engages with and positions him/herself in relation to other voices in the discourse, e.g. with the literature and the putative reader, is an integral part of the social practice of communicating research. Understanding how this engagement is realized may have important implications for academic literacy programs, particularly in the development of academic writing skills. In this paper, I investigate engagement in written medical research discourse, by applying the systemic-functional framework of APPRAISAL, a model of evaluative language, to a corpus of English-language medical research articles. Specifically, I present how the corpus has been compiled and annotated according to part of the ENGAGEMENT system, a subsystem of APPRAISAL dealing with writer/speaker resources for intersubjective positioning. These engagement resources include what are generally dealt with under the headings of modality, hedging, and attribution, among others, but they are interpreted here in terms of their dialogic functionality; that is, the role they play in construing for the text a background of different voices (the literature, the putative reader) and different value positions. For instance, a modal Finite such as may *not only signals a speaker's/writer's degree of certainty or level of commitment, but, from a dialogic perspective, it also 'entertains' or allows for the possibility of alternative positions or viewpoints in the discourse. (Consider, for example,* Reducing LDL cholesterol may reduce the development of vascular disease*.) In this paper, I present the different types of engagement features and their interrelations as identified in the corpus, the probabilities of these features being selected, the frequencies of their occurrence, their distributions across the texts, and some of their typical realizations. The findings show that there is considerable variation in the types of engagement resources used as well as in their distributions, both across and within different sections of the medical research article.*

1. Introduction

All utterances occur against a "background of other […] utterances on the same theme, a background made up of contradictory opinions, points of view, and value judgments" (Bakhtin 1981: 281). All utterances are thus 'dialogic,' in that

to speak or write – to communicate – is always to reveal the influence of, to refer to, or to respond to what has been said or written – or communicated – before and to anticipate the responses of actual, potential, or imagined listeners or readers (Martin and White 2005: 92; Vološinov 1973: 95; White 2003: 261).

In academic research writing, the way in which an author engages with and positions him/herself in relation to alternative voices in the discourse, by referencing or responding to what has been said before and by anticipating the responses of putative readers, is an integral part of the social practice of communicating research. Understanding how this engagement or positioning within the discourse is realized, and the rhetorical functions it serves, can thus have important implications for academic literacy programs, particularly in the development of academic writing skills.

Medical research makes for an interesting case in point. Medicine as a discipline and practice occupies a prominent sociohistorical position in most societies, and is a highly influential field of discourse (Gotti and Salager-Meyer 2006: 10-11). Medical research has a vast and increasing annual research output (ibid.: 11-12), and the domination of English in international medical research and education (Maher 1986; Swales 1990: 96 ff.) has resulted in a growing number of specialized literacy programs, often referred to as English for Medical Purposes or, more generally, as English for Academic Purposes. Because of this, there has been growing interest in the study of medical research communications. Indeed, extensive linguistic and rhetorical analysis has focused on a variety of features in English-language medical research discourse, sometimes from a comparative and/or diachronic perspective, including modality, hedging, reporting verbs, first-person pronouns, amplifiers/intensifiers, and referencing (e.g. Biber and Finegan 1994; Breivega, Dahl and Fløttum 2002; Herrando-Rodrigo 2010; Salager-Meyer 1992, 1994; Thomas and Hawes 1994; Pahta 2006; Pérez-Llantada Auría 2011; Varttalav 1999). Some of these studies acknowledge the role that these resources play in construing for the text a background of different voices (the literature, the putative reader) and different value positions, e.g. that hedges not only indicate degrees of certainty but may also provide "room for disagreement" (Salager-Meyer 1994: 163) or that syntactic negation may be polyphonic, "implying that several voices or points of view are signaled in [the] discourse" (Breivega, Dahl and Fløttum 2002: 223).

Breivega, Dahl and Fløttum (2002), for example, investigate academic identities in a pilot study of research articles from three disciplines (medicine, economics, and linguistics) and three languages (English, French, and Norwegian). They examine author presence, stance, self-promotion, and the manifestation of other researchers' voices by analyzing the frequency and distribution of first-person pronouns, metacomments, "lexical promotion" (*new*, *recent(ly)*, and *result(s)/finding(s)*), and explicit and implicit referencing. They note that medical research articles are characterized as having comparatively few explicit references and metacomments, and they hypothesize that, relative to economists and linguists, "[m]edical researchers are non-expressive writers who do not let other researchers be heard in their texts" (ibid.: 232). The findings from

their pilot study are also supported by later works (e.g. Fløttum 2003; Dahl 2004; Fløttum, Dahl and Kinn 2006).[1]

In another study, Herrando-Rodrigo (2010) explores the way that authors of English-language urology research articles and online popularizations on similar themes modulate their identities in the text and engage with their potential audiences. Using a framework that includes Hyland's (2005) model of interaction, Herrando-Rodrigo (2010) analyzes the use of engagement markers (reader pronouns, imperatives, asides, questions, and "non-verbal metadiscourse signals" such as italics, color, and font size; ibid.: 260) and stance (self-mentions) in both text types. For the online popularizations, she found considerably different frequencies of engagement and stance markers (13.5/1000 words and 1.7/1000 words, respectively), but, for the urology research articles, these figures were similar (4.2/1000 words and 4.9/1000 words, respectively). One of Herrando-Rodrigo's (2010: 271) conclusions is that, unlike the authors of online popularizations, urology research article writers have to strike a balance between claiming authorship (and projecting their own voices) and engaging with their readers, and that this balance forms an important part of the disciplinary conventions or expectations associated with that text type.

In a contrastive study of English and Spanish medical research articles, Pérez-Llantada Auría (2011) uses White's (2003) model of engagement to examine how authors express intersubjective stance, through the use of a number of linguistic resources (*we*-subjects, anticipatory-*it* patterns, inanimate subjects, and passive constructions). Based on the frequencies and distributions of these resources, Pérez-Llantada Auría (2011) notes that native English-speaking authors of English-language medical research articles (ENG) are generally more likely to construe their readership as sharing similar values, beliefs, and attitudes, than are Spanish authors writing in English or Spanish. Different patterns of intersubjective stance are also observed across and within research article sections (Introductions, Methods, Results, and Discussions). For instance, in the Discussion sections of ENG articles, the use of "*we*-subject patterns help ENG writers show committed stances" and construe "the audience as potentially consenting towards the writers' views" (ibid.: 41).

In this pilot study, I examine how engagement is encoded in a corpus of medical research articles. In doing so, I take a systemic-functional approach, much like that of Pérez-Llantada Auría (2011), but I incorporate a wider range of linguistic resources. The aims of the study are to explore how these diverse resources are combined to construe for the text a background of prior and anticipated alternative voices, and to investigate possible patterns and variations in their use across the medical research article.

I begin with a brief presentation of the theoretical framework. This is followed by a detailed description of the material and methods, and a short discussion of important methodological considerations. I then present the different types of engagement features identified in the corpus, the probabilities of these features being selected, the frequencies of their occurrence, their

distributions across the texts, and some of their typical realizations. Interpretations of these findings in light of previous work are also provided.

2. Modeling (heteroglossic) engagement

The model used in this study is that developed by Martin and White (2005; White 1998, 2003), based on the social-semiotic theory of systemic-functional grammar (e.g. Halliday 1978; Halliday and Matthiessen 2004) and inspired by the work of Bahktin (1981) and Vološinov (1973).[2] Martin and White's (2005) ENGAGEMENT system is part of a wider tripartite system of APPRAISAL, a framework dealing with the resources of evaluative language, comprising ATTITUDE, ENGAGEMENT, and GRADUATION.[3] Specifically, the ENGAGEMENT system accounts for the "locutions which provide the means for the authorial voice to position itself with respect to, and hence to 'engage' with, the other voices and alternative positions construed as being in play in the current communicative context" (ibid.: 94). For the purposes of this study, I focus on the features of what Martin and White (2005: 102 ff.) term 'heteroglossic engagement,' i.e. utterances that invoke, allow for, or in some way challenge other voices or viewpoints in the discourse; I do not include utterances of a 'monoglossic' nature, i.e. those in which no overt reference is made to other voices or viewpoints (ibid.: 98-102).

By way of example, (1), below, is a heteroglossic utterance that construes for the text a background of alternative propositions.[4] The utterance is "but one among a number of propositions available in the current communicative context" (ibid.: 105), e.g. that 'full-thickness defects of articular cartilage in the knee may *not* progress to osteoarthritis.' In contrast, example (2) is monoglossic, a bare assertion. It does not invoke alternative propositions, at least not "for the brief textual moment taken up by the utterance" (ibid.: 99), and may be assumed to be either taken for granted or open for discussion, depending on the co-text.

(1) Full-thickness defects of articular cartilage in the knee <u>may</u> progress to osteoarthritis. ['heteroglossic']
(2) Electrocardiograms were collected at baseline and at follow-up years 3 and 6. ['monoglossic']

The resources of heteroglossic engagement are grouped into different functional categories that can be displayed in the form of a system network, as a system of choices or meaning potential (see Figure 1). At the broadest level (on the left of Figure 1), heteroglossic resources can be categorized according to whether they are 'dialogically contractive' or 'dialogically expansive'; that is, whether they act "to challenge, fend off or restrict the scope" (ibid.: 102) of alternative positions and voices in the discourse ('contract'), or whether they serve to make allowances for such external voices ('expand'). In (3), for example, the textual voice, through *show*, appears to fend off any actual or potentially contrary positions, by aligning itself with or by vouching for the validity of the claim attributed to and projected

by an external source (*recently published studies*). In contrast, in (4), the textual voice, through *suggest*, seems to allow for actual or potentially contrary positions or propositions, expanding or opening up what Martin and White (2005) call the 'dialogic space,' that is, the construed background of different prior and anticipated viewpoints on the same theme (cf. opening quote in section 1, from Bakhtin 1981).

(3) […] recently published studies <u>show</u> that the benefit of glycoprotein IIb/IIIa antagonists is maintained for at least six months. ['contract']

(4) Public opinion polls and consumers' association surveys <u>suggest</u> high prevalence rates throughout Europe and the United Kingdom. ['expand']

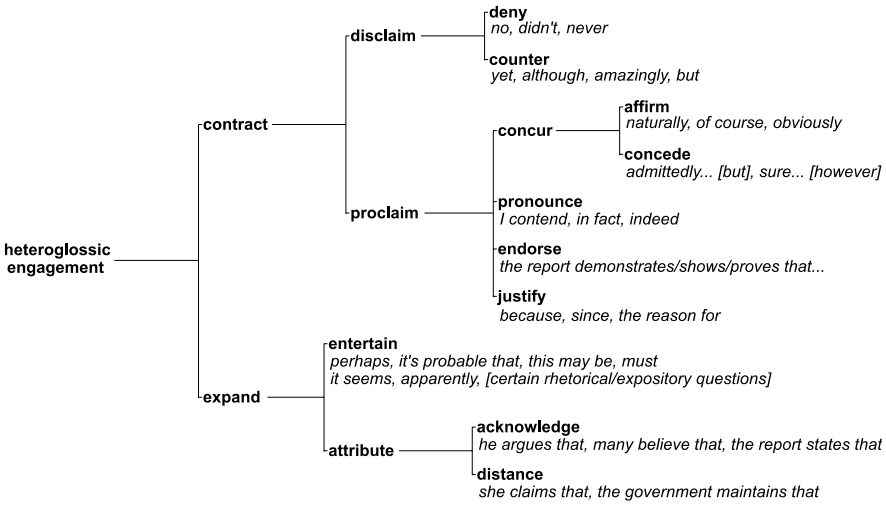

Figure 1. System network for heteroglossic engagement (adapted from Martin and White 2005: 134); features in bold, example realizations in italics

At further levels of delicacy (see Figure 1), distinctions can be made among different types of dialogic contraction, i.e. among resources that in some way act to close down the dialogic space. These distinctions are based on whether some dialogic alternative is rejected or supplanted ('disclaim') or whether, "through some authorial interpolation, emphasis or intervention, dialogic alternatives are confronted, challenged, overwhelmed or otherwise excluded" (Martin and White 2005: 117-118) ('proclaim').

According to Martin and White (ibid.: 118), there are two subtypes of 'disclaim': one in which the textual voice appears to reject some contrary position ('deny'), and one in which it seems to replace or supplant some contrary position ('counter').

The 'deny' feature is typically signaled by *not*, *no*, *none*, *nothing*, and similar forms of negation. In (5), for example, the negation implies

acknowledgment and rejection or denial of the alternative positive position. Martin and White (ibid.) argue that, in dialogic terms, negation "necessarily carries with it the positive," but that "the positive does not [typically] carry the negative" (cf. quote in section 1 from Breivega, Dahl and Fløttum 2002: 223). It is this property of negation that encodes the utterance as heteroglossic, rather than monoglossic, as might be the case for the alternative polar-positive position, 'treatment for up to 5.2 years is beneficial overall.'[5]

(5) […] treatment for up to 5.2 years is <u>not</u> beneficial overall. ['deny']

'Counter' features are commonly realized by Adjuncts and conjunctions such as *although*, *however*, and *but*. For example, in (6), the conjunctive Adjunct *however* signals that the formulation somehow replaces or supplants an otherwise expected or actual proposition, e.g. that there was, or would be, a difference by group.[6]

(6) <u>However</u>, there was no difference by group […] ['counter']

There are four main subtypes of the 'proclaim' feature. Their categorization depends on whether the textual voice appears to limit the scope of dialogic alternatives by overtly agreeing with certain projected voices ('concur'), by construing those projected voices as correct, undeniable, or highly warrantable ('endorse'), by explicit author intervention ('pronounce'), or by marking an utterance as contentious and in need of justification ('justify').

The 'concur' feature is subcategorized as either 'affirming' or 'conceding,' with the former typically realized by locutions such as *of course*, *naturally*, and *obviously*, and the latter by wordings such as *admittedly* and *granted*, often paired with 'counter' and 'deny' resources. In (7), the comment Adjunct *clearly* construes for the text an audience that shares the writer's view, affirming the validity of the proposition and thus limiting the scope for alternatives. In (8), the text construes a reader who is actually or potentially resistant to the author's position. This potential resistance is first acknowledged or validated by a concession, signaled by the comment Adjunct *admittedly*, and is then countered, as signaled by the conjunction *but*.

(7) <u>Clearly</u>, such regimens are not used today, but the result could have implications for other disease sites […] ['affirm']
(8) <u>Admittedly</u>, we did not include a control group […] but […] ['concede'][7]

The 'endorse' feature is typically realized by reporting verbs such as *show*, *prove*, and *demonstrate*. In (9), the textual voice endorses a proposition attributed to and projected by an external source (*epidemiological studies*). By construing the proposition as being in some way maximally warrantable (through *show*, *prove*, or *demonstrate*), the textual voice limits the scope for alternative viewpoints.

(9) […] epidemiological studies showed an association between high plasma insulin concentrations and myocardial infarction. ['endorse']

The 'pronounce' feature can be encoded by a diverse range of formulations, including constructions such as *I contend that* and *The fact is that*, as well as intensifiers such as *indeed* and *really* (see Martin and White 2005: 127, 130-132). In example (10), the textual voice overtly emphasizes, through its use of *indeed*, the warrantability of a formulation that responds to either an assumed or directly referenced counter-position.

(10) Indeed, the high-risk group defined according to the NIH criteria included many patients who had a good-prognosis signature and a good outcome. ['pronounce']

The 'justify' category is not discussed in Martin and White (2005), but it is a part of the system of heteroglossic engagement proposed by White (2003). Justification is typically encoded through connectives and conjunctions such as *therefore*, *because*, and *since*, as in (11). In this example, *because* signals that the immediately prior (in this case, monoglossic) proposition needs to be substantiated, since the putative reader may find the claim in some way contentious and in need of further explanation. The textual voice thus acknowledges and, at the same time, limits the scope of dialogic alternatives by providing a specific reason or argument as to why this particular issue is of importance.

(11) This issue is of importance because the large majority of patients with coronary disease have cholesterol levels that are […] in the average, not the elevated, range. ['justify']

Dialogic expansion (see Figure 1) can be subcategorized according to whether the textual voice indicates that its position is but one of a number of possible alternative positions in the discourse, thereby allowing dialogic space for those alternatives ('entertain'), or whether the textual voice appears to disassociate itself from a particular proposition by ascribing it to some external source ('attribute') in either a relatively neutral fashion ('acknowledge') or by explicitly declining to take responsibility for the proposition ('distance').

The 'entertain' category is typically realized by resources that are elsewhere dealt with under the headings of modality, hedging, and evidentiality (e.g. Halliday and Matthiessen 2004: 143–150, 613–625; Hyland 1996; Chafe 1986), including modal Finites and Adjuncts (e.g. *may*, *probably*) and certain "evidentials" (e.g. *seems*, *suggests*, *apparently*) (see Martin and White 2005: 104-111). In (12), *may* encodes, from a dialogic perspective, the proposition as being but one among a number of possible alternative propositions, for example that 'the administration of activated protein C may not improve the outcome of severe sepsis.'

(12) […] the administration of activated protein C may improve the outcome of severe sepsis. ['entertain']

Attribution is divided into two subcategories: 'acknowledge' and 'distance.' As noted above, the basic distinction between these two categories is the position adopted by the textual voice. In (13), for example, the textual voice acknowledges the findings of a previous study, but makes no overt indication as to the authors' position regarding the proposition. In (14), on the other hand, the textual voice appears to disassociate itself from the attributed material.[8] 'Acknowledge' is typically signaled by reporting verbs such as *say*, *report*, and *state*, and 'distance' by *claim* and *maintain*.

(13) Increased blood pressure has been reported with chlorpropamide. ['acknowledge']
(14) They claim that the report uses extrapolations and projections based on the Bangui and other unreliable registrations. It does no such thing. ['distance'][9]

3. Material and methods

Material was selected from five of the world's leading general medical journals, chosen according to their impact-factor rankings in the 2009 Journal Citations Report (Thomson Reuters 2010): the *New England Journal of Medicine* (impact factor 47.050), the *Lancet* (30.758), *JAMA: Journal of the American Medical Association* (28.899), the *Annals of Internal Medicine* (16.225), and the *British Medical Journal* (13.660). The 100 most highly cited original research articles (RAs) published in these five periodicals during the period 1990–2010 were selected, providing a corpus of approximately 700,000 words.[10] This paper reports on a subsample of that corpus: 23 RAs, c. 164,000 words (see Appendix for details).

The corpus was annotated for its heteroglossic features according to the model of Martin and White (2005), by manual and semi-automated techniques, using UAM CorpusTool software.[11] I read through each RA and, using the descriptors summarized in section 2, I identified and labeled the various heteroglossic features encoded in the text. Wordings were manually annotated, as illustrated in the screenshot in Figure 2. In this particular example, the highlighted word, *may*, is marked in the bottom left column, under 'Assigned,' as signaling 'entertain.' When matching wordings were identified, the software automatically suggested tags. Before being approved, these suggestions were checked by examining the co-text, so as to avoid inappropriate annotations (e.g. *Article accepted May 12, 2009*). A predetermined list of feature realizations was not used.

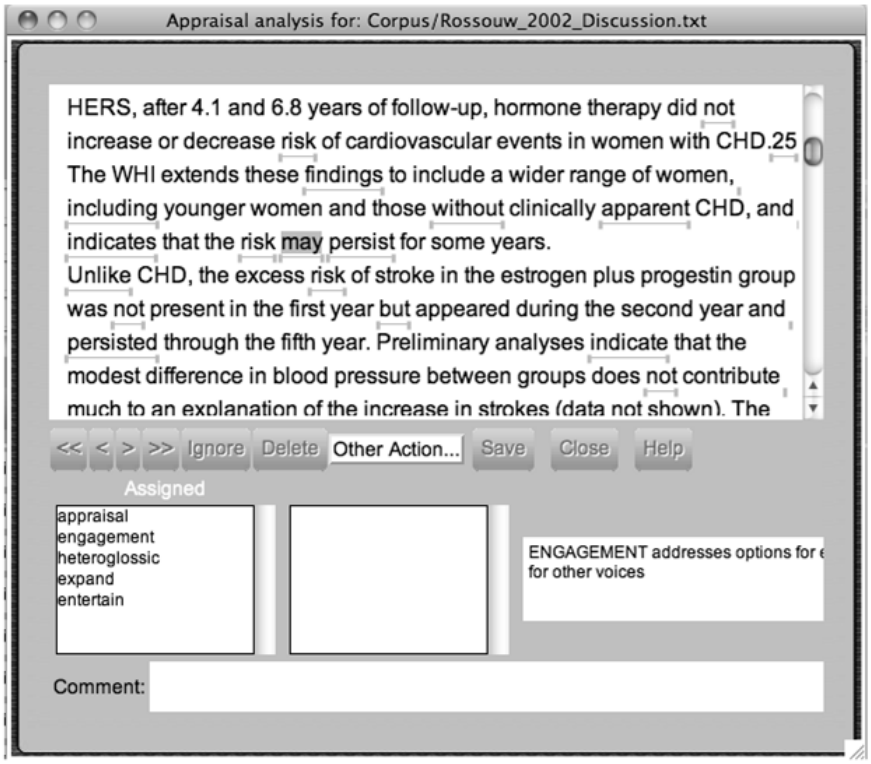

Figure 2. Screenshot from UAM CorpusTool annotation window, showing *may* (highlighted in gray) annotated as encoding the 'entertain' feature

In addition to heteroglossic features, the corpus was automatically annotated for part of speech (using the Stanford Parser) and manually annotated for source journal, RA section (i.e. Title, Abstract, Introduction, Methods, Results, Discussion, Acknowledgments, Appendix), first-author affiliation, and medical subject heading (MeSH) keyword.[12]

Using the software, I extracted frequency and selection-probability lists for the heteroglossic features marked in the texts, both across the corpus as a whole and across different RA sections. I also extracted word lists, ordered by selection probabilities, frequencies, and parts of speech, for each feature, filtering for different RA sections or for the corpus as a whole. In addition, the software allows visualization of the distribution of features across a text or text segment, known as a 'text stream,' an example of which will be presented in section 5. Statistical analysis (the chi-square test) was done within the UAM CorpusTool environment, using the software's native scripts.

The concepts and terminology used in this paper follow the model of Martin and White (2005) and the theoretical framework of Halliday and Matthiessen (2004), unless stated otherwise.

4. Methodological considerations

In a study such as this, it is worth acknowledging the challenges of annotating heteroglossic features using the descriptors summarized in section 2. The linguistic resources identified herein are polysemous, and categorization requires careful consideration of the co-text. For example, in (15), *included* signals 'entertain,' but in (16) the proposition is a monoglossic bare assertion. This makes automated annotation difficult (at least without the use of relatively complex identification algorithms), and categorization needs to be considered in relation to the co-text. There are, of course, a number of ways to simplify this procedure. In his study of ATTITUDE, Kaltenbacher (2006: 274-275) suggests three: trying to predict *a priori* what items to search for; qualitatively analyzing a limited set of sample texts in order to create a list of search items; or using automatically generated frequency lists and identifying relevant items among the most frequently occurring words. While a combination of these approaches might be fruitful, items that are low frequency and that may be specific to the register or to individual texts could be missed (ibid.: 275). I therefore chose to annotate the corpus manually, which limited the size of the overall data set, but reduced the risk of missing potentially important, low-frequency items.

(15) Secondary outcomes <u>included</u> death from any cause, the need for revascularization, hospitalization for unstable angina or heart failure, and complications related to diabetes. ['entertain']
(16) Patients were included in the relevant category of heart failure beginning with the date of the first occurrence of heart failure. ['monoglossic']

As Thompson and Hunston (2006: 3) note, "[o]ne aspect of [systemic-functional linguistics] that can appear unappealing [to corpus linguists] is the feeling that analyses have to be 'shoehorned' into existing categories." In (17), for example, *indicate* could potentially construe 'entertain' (≈ *suggest*) or 'endorse' (≈ *show*) (see section 3). Categorizing this item as construing one or the other obviously overlooks this polysemy. I therefore annotated the example as having the ability to construe both 'entertain' and 'endorse,' at least "for the brief textual moment" (Martin and White 2005: 99), rather than selecting one or the other, or creating a new category. However, as (18) demonstrates, and as noted above, this does not presume that all instances of *indicate* encode either or both of these heteroglossic features.

(17) Results from WHI indicate that the combined postmenopausal hormones CEE, 0.625 mg/d, plus MPA, 2.5 mg/d, should not be initiated or continued for the primary prevention of CHD. ['entertain' / 'endorse']
(18) […] asterisks indicate principal investigators, and daggers program coordinators. ['monoglossic']

In general, if there were cases in which I was uncertain about categorization, I consulted colleagues (some of whom were familiar with the ENGAGEMENT system) before annotating the relevant item(s). No test of inter-rater reliability was conducted (see Fuoli, this volume).

Another challenge involved in the annotation and analysis of the corpus is illustrated by example (19). Like many of the examples presented above, (19) encodes a cluster or syndrome of heteroglossic features (i.e. 'counter,' 'deny' ×2 'affirm,' 'entertain' ×2). In the corpus, these are annotated as six individual encodings of heteroglossic engagement. However, this does not account for the scope of those features across the clause complex. Some, for example *however*, extend over the entire clause complex, while others, e.g. *can* and *not* (in *patients who do not have hypercholesterolemia*), have a more limited scope, extending over a dependent clause and nominal group, respectively. Considered in terms of "the brief textual moment" (Martin and White 2005: 99), as this particular clause complex unfolds, it expands and contracts, dialogically, to greater and lesser degrees. Over longer stretches of text, however, such as part of an RA section, the overall effect may be one of general expansion or general contraction, with certain features predominating and others playing no or lesser roles. It is this latter perspective that the present study attempts to account for.

(19) However, it has not been clear whether coronary events can be prevented by cholestoerol-lowering therapy in patients who do not have hypercholesterolemia. ['counter,' 'deny,' 'affirm,' 'entertain,' 'entertain,' and 'deny,' respectively]

A final methodological consideration regards the interrelation of the ATTITUDE, ENGAGEMENT, and GRADUATION systems. Although this study concentrates on ENGAGEMENT, many of the resources described in section 2 are gradable according to speaker/writer intensity or their degree of investment in the utterance (Martin and White 2005: 135-136). For example, there is a cline of gradability, from low to high, in *it is possible/probable/certain that […]* and a similar cline in *a few/some/most studies suggest that […]*, both of which construe different degrees of 'entertain.' GRADUATION is mentioned here because of the important role it plays in construing for the text a heteroglossic background of alternative propositions (Hood 2010: 185-188).

5. Findings

Figure 3 shows the selection probabilities and frequencies of occurrence for heteroglossic features for the corpus as a whole (in italics) as well as for each of the four main RA sections (Introduction, Methods, Results, Discussion; IMRD).[13] Across the corpus, heteroglossic features occurred at a frequency of approximately 37 per 1000 words, and the majority of these features were dialogically expansive (66.51%; contractive 33.49%).

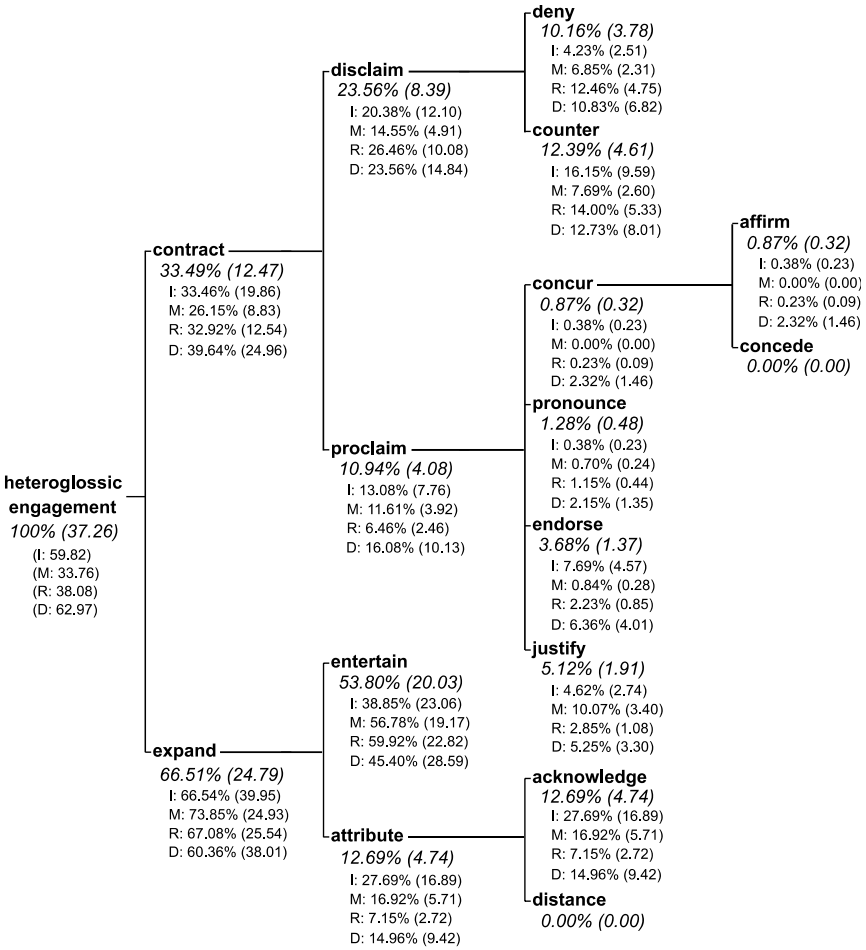

Figure 3. Selection probabilities for heteroglossic engagement in corpus as a whole (in italics) and per RA section (I, M, R, D); feature occurrence per 1000 words in parentheses

The Introduction and Discussion sections had a higher density (occurrences/1000 words) of heteroglossic features than the Methods and Results sections (chi-square, $p < 0.05$ for I vs. M and R, and D vs. M and R), with the highest number of occurrences found in the Discussion section (approx. 63 per 1000 words).

Overall, 'entertain' was the most frequently construed feature (approx. 20 per 1000 words), accounting for 53.80% of all heteroglossic features (80.92% of all dialogic expansion; data not shown). The 'entertain' category was most commonly signaled by the modal Finites *may* (4.35% of all 'entertain' realizations) and *would* (3.69%), and the conjunctions *whether* (2.53%) and *if* (2.48%).[14] Examples are given in (16)–(19), below. The RA section in which they appear is also indicated.

(16) Close monitoring for bleeding and treatment of hyperplasia may contribute to the absence of increased risk of endometrial cancer. ['entertain,' from Discussion]
(17) Over a longer period, more typical of the duration of treatment that would be needed to prevent chronic disease, the absolute numbers of excess outcomes would increase proportionately. ['entertain,' from Discussion]
(18) Whether this latter association was due to chance, to the reduction in cholesterol itself, or to an adverse effect of the drugs is not clear. ['entertain,' from Introduction]
(19) If marked hyperglycaemia or symptoms occurred, patients were secondarily randomised to treatment with sulphonylurea or insulin therapy. ['entertain,' from Methods]

The selection probabilities and frequencies of occurrence of the 'entertain' feature and its realizations differed across each RA section (see Figure 3 and Table 1), with the highest frequency of 'entertain' features occurring in the Discussion (approx. 29 per 1000 words) and the lowest in the Methods (approx. 19 per 1000 words). The modal Finite *may*, for example, which was the most common encoding of 'entertain' in the corpus as a whole, had selection probabilities and frequencies per 1000 words of 6.93%/1.60, 0.49%/0.09, 1.67%/0.38, and 10.04%/2.87 in the Introduction, Methods, Results, and Discussion sections, respectively.

Table 1. Five most common realizations of 'entertain' per RA section

RA section (feature selection probability, occurrence/1000 words)	**Realization, lemmatized**	**Selection probability of realization, occurrence/1000 words (in each RA section)**
Introduction (38.85%, 23.06)	*whether*	10.89%, 2.97
	may	6.93%, 1.60
	some	4.95%, 1.37
	most	4.95%, 1.14
	if	3.96%, 0.91
Methods (56.78%, 19.17)	*if*	10.84%, 2.31
	include	6.65%, 1.32
	require	3.20%, 0.90
	whether	2.38%, 0.80
	would	2.24%, 0.76
Results* (59.92%, 22.82)	*p* (as in *p* value)	30.55%, 6.97
	confidence interval	12.19%, 2.87
	hazard ratio	3.98%, 0.91
	standard error	2.82%, 0.64
	relative hazard	2.31%, 0.53
Discussion (45.40%, 28.59)	*may*	10.04%, 2.87
	would	7.58%, 2.17
	will	3.98%, 1.19
	might	3.98%, 1.14
	likely	3.79%, 1.08

* The five most common "non-mathematical" expressions of 'entertain' in the Results section are *include* (2.06%, 0.56), *may* (1.67%, 0.38), *would* (1.41%, 0.32), *could* (1.16%, 0.26), and *apparent(ly)* (1.16%, 0.26).

Dialogic contraction was generally of the 'disclaim' subtype (67.32% of all dialogic contraction; data not shown), with similar amounts of 'counter' and 'deny' features across the corpus as a whole (4.61 and 3.78 per 1000 words, respectively), but this varied according to RA section. For example, the Introduction had a far greater occurrence of 'counter' features than 'deny' features (9.59 and 2.51 per 1000 words, respectively), which, in the case of the 'counter' feature, were most commonly realized by *however* (23.80% of all 'counter' realizations in Introduction), *although* (19.04%), and *but* (16.67%). Examples are given in (20)–(22), below.

(20) However, it has not been clear whether coronary events can be prevented by cholesterol-lowering therapy in patients who do not have hypercholesterolemia. ['counter,' from Introduction]
(21) For instance, although long term antiplatelet therapy was shown to be of substantial benefit after ischaemic stroke, it was not known whether antiplatelet drugs were of net benefit as an immediate treatment in the acute phase of such strokes. ['counter,' from Introduction]
(22) A meta-analysis of the trials provided support for the likelihood that therapy lowered the risk of death from coronary heart disease, but it also aroused concern that the risk of death from noncardiovascular causes might be increased by treatment. [REFS] ['counter,' from Introduction][15]

At the other end of the frequency scale, there were no instances of the 'distance' and 'concede' features (see Figure 3). There were also no instances of 'affirm' in the Methods section, and generally few examples of 'concur' across the corpus as a whole.

In addition to differences observed *across* RA sections (see Figure 3 and Table 1), different distributions of features were also discernible *within* RA sections. For example, Discussion sections seemed to start with approximately equal amounts of dialogically contractive and dialogically expansive features, before gradually becoming more expansive as the Discussion unfolded (see Figure 4). At a further level of delicacy within the Discussion, a distribution pattern of 'proclaim' features was also noted, in which 'justify' and 'concur' were generally seen at the beginning of the section (see examples (23) and (24)), and 'pronounce' toward the end (as in (25)).

(23) A 25% further reduction in stroke with losartan is important since stroke is a major cause of death and disability and was more frequent than myocardial infarction in our study and others during the past decade. [REFS] ['justify,' from Discussion]
(24) Reductions in death and disease were clearly linked to the increasing use of combination antiretroviral therapy, with the most dramatic reductions coinciding with increases in the use of protease inhibitors. ['concur,' from Discussion]
(25) Indeed, in this study the combination of ventricular enlargement and elevated plasma levels of neurohormones at base line was associated with a higher risk of death than that found for either of these adverse prognostic indicators alone. ['pronounce,' from Discussion]

Figure 4. 'Text stream' showing distribution of heteroglossic features across Discussion section (*x*-axis, left to right = beginning to end of text segment; *y*-axis, selection probability, 100% in total)

6. Discussion

Firstly, with regard to the above findings, it seems interesting that dialogic expansion and the 'entertain' feature should be so highly represented; of all heteroglossic features identified, 66.51% were of the 'expand' type and 53.80% were 'entertain.' Could it be that the textual voices in these medical RAs generally allow for, and open up the dialogic space for, alternative positions and voices in the discourse; that they entertain these alternative external positions rather than challenge or restrict their scope? In a sense, this interpretation might fit the general perception of (medical) science writing as cautious, modest, or lacking assertion (e.g. Hyland 1996; Salager-Meyer 1992, 1994). On the other hand, it could be that the 'entertain' and 'attribute' features, traditionally associated with modality, hedging, evidentiality, and attribution (e.g. Halliday and Matthiessen 2004: 143–150, 613–625; Hyland 1996; Chafe 1986; Thomas and Hawes 1994, respectively), are more easily recognized (and annotated) for their dialogically expansive functionality than those features that construe dialogic contraction, and that they are therefore recorded as occurring more often. The extent to which frequency alone determines the dialogic expansion or contraction of a text is obviously debatable, and a detailed analysis of the variation in scope and gradability of these features might be fruitful (see Methodological considerations, section 4).

Secondly, there appear to be distinctions and parallels between certain sections of the medical RA in terms of the construal of heteroglossic engagement. As noted above, in section 5, heteroglossic features were more common in the Introduction and Discussion (60 and 63 per 1000 words, respectively) than in the Methods and Results (34 and 38 per 1000 words, respectively). Does this mean, then, that the Introduction and Discussion sections generally invoke or allow for dialogic alternatives, while the Methods and Results tend to be more monoglossic? It does seem to corroborate certain observations and claims in the literature (e.g. Adams Smith 1984; Fryer 2012; Gosden 1992; Salager-Meyer 1994; Swales 1990) and textbooks on academic writing (e.g. Swales and Feak 2004: 223) that there is a close rhetorical relationship between the Introduction

and Discussion, on the one hand, and between the Methods and Results, on the other. MacDonald (2002: 453), for example, states that, in medical research articles, "[t]he Introduction and Discussion sections are the zones in which the writer(s) negotiate with their peers for 'research space' […] for their findings," while in "the Methods and Results section, argumentation is elided and the writer appears to assume that he/she can take understanding of a range of shared meanings for granted." However, as noted by Hyland (2005: 190), "the division of research papers into rhetorically simple and detached Methods and Results, and complex, subjective and author-centred Introductions and Discussions might be unwise. Even the most rhetorically innocent sections reveal writers' efforts to persuade their audience of their claims, so that stance and engagement are likely to figure, in different ways, across the research paper."

Thirdly, there is not only variability in which features are construed, where, and how often, but also how these features are encoded in the text. As the example of 'entertain' shows (see Table 1), the choice of resource differs across RA sections and includes modal Finites (e.g. *may*, *might*), modal Adjuncts (e.g. *likely*, *apparently*), Predicators (e.g. *include*, *require*), conjunctions (e.g. *if*, *whether*), and nominal groups (e.g. *confidence interval*, *hazard ratio*) of differing function (Subject, Complement, part of Adjunct, or parenthetical addition). In the case of the Results section, the most common resource for expressing 'entertain' is the mathematical construction *p*, accounting for over 30% of all encodings of 'entertain' in that section. *P* values express the chance of achieving a particular observed result if no real effect exists, and it is this function that 'entertains,' mathematically, the possibility of the effect being one of chance (see (26), and the potential modulating effect it has on the otherwise monoglossic proposition). The other mathematical expressions listed in Table 1 all encode, in different ways, the notion of chance or probability, and are thus categorized as 'entertain.'

(26) The effect of pravastatin was greater among women than among men (P = 0.05 for the interaction between the patient's sex and treatment). ['entertain,' from Results]

In terms of dialogic contraction, 'counter' and 'deny' occurred with similar frequencies across the Methods, Results, and Discussion sections, often observed as pairings, as in example (27). However, in the Introduction, 'counter' was considerably more frequent than 'deny' (9.59/1000 words and 2.51/1000 words, respectively; see Figure 3). These 'counter' resources are often used to initiate what Swales (1990: 141, 154) refers to as "establishing a niche," by indicating a gap in the current research territory. Hood (2010: 184), in an appraisal study of research article introductions, also notes that such resources are frequently encountered in academic research warrants. 'Counter' resources signal a shift from alignment with the reader to disalignment, as the author creates space for his/her own study (ibid.). This pattern can be seen in (28).

(27) In the present study, however, there was no difference between the treatment groups in reports of muscle symptoms […] ['counter' and 'deny,' from Discussion]

(28) The plasma levels of total cholesterol and low-density lipoprotein (LDL) cholesterol are important risk factors for coronary heart disease. [REFS] However, the relation between plasma cholesterol and coronary events appears to be stronger if levels are at elevated, rather than average, values. [REFS] ['counter,' from Introduction]

Another intriguing observation from section 5 is the presence of distributional patterns of features within RA sections. In Discussion sections, there seems to be a pattern of decreasing probability of dialogic contraction and increasing probability of dialogic expansion as this part of the text unfolds (see Figure 4), perhaps as authors speculate on the implications of their research and 'entertain' alternative interpretations of their data. This finding, however, seems to contradict Pérez-Llantada Auría's (2011: 41) finding that the Discussion sections of native speakers' English-language medical RAs do not demonstrate a noticeable shift in the use of dialogically contractive or expansive resources as the Discussion progresses. Moreover, rather than being predominantly expansive, as noted herein (see Figure 3), Discussion sections tend to be "heteroglossically disengaged" (ibid.), that is, dialogically contractive, in Pérez-Llantada Auría's (2011) study. These differences might be due in part to differing methodologies, such as a focus on different linguistic resources and alternative categorizations. For example, Pérez-Llantada Auría (2011: 28) categorizes the construction *It is likely that* as dialogically contractive, whereas in this study it would be considered dialogically expansive ('entertain'). Otherwise, the differences noted above may also reflect differences in the material studied.

In this study, at a further level of delicacy in terms of dialogic contraction and the 'proclaim' subcategory, 'justify' and 'concur' are generally seen at the beginning of the Discussion, as authors reiterate what they did and why (see example (23)) and affirm the validity of their claims (see (24)). Later contractive features, at least of the 'proclaim' type, signal intervention by the authorial voice ('pronounce'), perhaps to assert or insist upon the value or warrantability of the research findings (as in (25)). That the Discussion ends with a much greater probability of dialogic expansion than dialogic contraction is likely a reflection of the convention of recommending future possible avenues of research, as illustrated in example (29), below.

(29) These questions should be addressed by continued follow-up of the study participants […] ['entertain,' from Discussion]

Finally, that the 'concede' and 'distance' features were not identified in this study (see Figure 3) indicates either that the authors did not employ such strategies or that they use more subtle means of doing so (Mall Stålhammar, personal communication). The example of 'concede' used earlier in this paper (see (8),

section 3), and repeated here as (30), is in fact from a Letter to the Editor in direct response to a criticism regarding the authors' choice of methods in a previous paper. It may be that such conceding statements are reserved for more confrontational elements of the discourse (such as the more direct 'one-on-one' communication of Letters to the Editor), but this needs to be investigated further. Similarly, with regard to 'distance,' it may generally be considered too face-threatening to use *claim* as a means of explicitly declining to take responsibility for a proposition, as illustrated in (14) and repeated here as (31). This example is also from a Letter to the Editor, in response to a negative criticism of the authors' work, and the overall effect is perhaps more confrontational than one might expect in a research article.

(30) Admittedly, we did not include a control group […] but […]
(31) They claim that the report uses extrapolations and projections based on the Bangui and other unreliable registrations. It does no such thing.

7. Concluding remarks

The findings presented in this pilot study suggest a variety of heteroglossic engagement patterns across and within medical RAs, patterns that may be more easily discerned using a corpus-based approach than by the analysis of individual texts or text segments alone (see comments in Martin and White 2005: 260). These possible patterns and their relations with the rhetorical purposes of the medical RA need to be explored further, as do the effects of variations in the scope of heteroglossic features (see comments in section 4).

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Notes

[1] All these studies (Breivega, Dahl and Fløttum 2002; Fløttum 2003; Dahl 2004; Fløttum, Dahl and Kinn 2006) are part of the KIAP (Cultural Identity in Academic Prose) project. For more information and a comprehensive list of publications associated with the project, see http://kiap.uib.no/index-e.htm (accessed May 10, 2012).

[2] For alternative models of stance and engagement, see Biber and Finegan (1989), Hyland (2005), and contributions in Hunston and Thompson (1999), *inter alia*.

[3] See Fuoli (this volume) for description and analyses of the ATTITUDE system.

[4] The examples used in this section to illustrate the resources of ENGAGEMENT are taken from the study corpus, unless stated otherwise. For details of the content, collation, annotation, and analysis of the corpus, see section 3.

[5] While it is likely that this example would be monoglossic, it could signal 'pronounce,' depending on stress, e.g. 'treatment for up to 5.2 years *IS* beneficial overall' (see Martin and White 2005: 127).

[6] Note that, in this particular example, 'counter' and 'deny' features operate in conjunction, with the denying proposition, 'there was no difference by group,' explicitly signaled as being in direct contradistinction to the expected proposition arising from a prior or subsequent proposition (Martin and White 2005: 120).

[7] Example (8) is not from the corpus, although it is taken from one of the source journals (*New England Journal of Medicine*, 1998, vol. 338, pp. 1546-1547; see section 3).

[8] Martin and White (2005: 103-104) note that *claim* does not always function as a signal of 'distance,' but varies according to different co-textual conditions, a point that generally applies to other dialogistic resources (see discussion in section 4, and Martin and White 2005: 104). Indeed, in (14), *claim* might also signal 'entertain' (≈ *suggest*) or 'acknowledge' (≈ *state*), at least for the brief textual moment, even though subsequent wordings might suggest otherwise.

[9] Example (14) is not from the corpus, although it is taken from one of the source journals (*Lancet*, 2002, vol. 360, p. 1177; see section 3).

[10] RAs were selected based on citation data from the Thomson Reuters Web of Knowledge (http://webofknowledge.com; accessed January 15, 2012). At the time of selection, the most highly cited RA in the corpus had been cited over 9,000 times by other publications in the database. A list of the corpus RAs is available on request.

[11] UAM CorpusTool: http://www.wagsoft.com/CorpusTool/index.html (accessed January 15, 2012)

[12] The Medical Subject Headings (MeSH) catalog is maintained by the U.S. National Library of Medicine (http://www.nlm.nih.gov/mesh/; last accessed January 15, 2012). It comprises a list of approximately 26,000 standardized descriptors that are used to index the content of medical research articles and other publications, including material published in the five source journals in this study.

[13] All RAs in the corpus followed the standard IMRD structure (Sollaci and Pereira 2004). Findings for other RA sections, i.e. Title, Abstract,

Acknowledgments, and Appendix, as well as first-author affiliation and MeSH keyword are not reported in this paper.

[14] Martin and White (2005) do not discuss the potential dialogic functionality of the conjunctions *if* and *whether*. However, they have been annotated here, in certain instances, as encoding 'entertain,' since they can signal conditions that may or may not be met, and doubt or choice between alternatives (see White 2003: 273).

[15] '[REFS]' indicates that one or more superscript numbers referring to a numerical reference list appeared in the original text. The reference numbers have been removed from this and subsequent examples so as to avoid confusion with the numbered endnote system used in this paper. However, they play an important role in construing for the text a background of alternative voices, and are generally categorized in the corpus as construing 'acknowledge.'

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Appendix: RAs analyzed

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