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## The rhetoric of research

Richard Horton

*Richard Horton criticises authors and editors for their increasing use of rhetoric in scientific papers. We invited Trisha Greenhalgh to take up his challenge to readers to decipher the encoded intentions in his article.*

A naturalist's life would be a happy one if he had only to observe and never to write.

(Charles Darwin)

Be careful while reading this article. My purpose is to persuade. To achieve this goal I must not only appeal to your intellect and seek your sympathy for my point of view but also diminish your natural reticence to believe all that you read. If I am successful you should remain unaware of my intention to penetrate your critical guard.

Medical journals—and grant awarding bodies for that matter—proudly adhere to the rigours of peer review despite the striking lack of research about either its efficacy or its reliability. But this system of collegiate accountability frequently ignores a factor that, to the doctor or scientist, may be thought too trivial to devote much attention to: the manipulation of language to convince the reader of the likely truth of a result.

The task of removing hyperbole from a paper is normally left to an editor. But just as qualitative review of research demands knowledge about the subject of that research, and just as statistical review requires mathematical skill, so the analysis of argument demands an understanding of the tools of persuasion available to the author. To interpret a result correctly reviewers, statisticians, editors, and readers should know the conscious and unconscious tricks of authorial rhetoric.

Although applied widely, peer review is by no means a secure discipline. For instance, Altman is critical of the entire notion of peer review, a term that he believes is jargon with no agreed meaning.<sup>1</sup> He has described good peer review as the equivalent of good technical editing.

This view is unreasonable. Qualitative and statistical analyses of a research paper frequently raise important issues that, when resolved, improve the manuscript substantially.<sup>2</sup> If peer review is simply good editing then journals, according to Altman, should return to a long past age of unaccountable decision making and attention to stylistic matters alone, which made them the idiosyncratic but elegant communicators that they were 50 or more years ago.

However, in one sense Altman's attempt to locate peer review within the sphere of language study is correct. A critical linguistic analysis of a research report, as a complementary process to other forms of peer review, offers a way of investigating the reasoning that underpins an author's point of view. Such a systematic analysis is an essential, but currently missing, part of the review procedure.

### Rules of discourse

A scientific article is carefully crafted by its authors.<sup>3,4</sup> A maxim taught to many editors is that, because a paper belongs to these authors, they alone should make the final decision about their article's content. The question I wish to pose is, should authors own their own words? Given that, for the time being, they do, does their freedom benefit or hinder medical research?

The format of research papers published in this and other journals conforms to classical ideas of rhetorical presentation. Aristotle distinguished four elements that make up successful oratory: introduction, narration, proof, and epilogue.<sup>5</sup> The historical link to the familiar "IMRAD" format of a scientific paper—introduction, methods, results, and discussion—is self evident.

To the extent that science is a search for the reason

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that lies behind an observation, the study of rhetoric is part of the scientific tradition. Indeed, the progress of linguistic thought during the past half century has been characterised by a move beyond simple descriptions of language towards interpretations of those descriptions. In making this move, 20th century linguists have developed a set of principles that has enabled systematic appraisal of language.

The aim of modern linguistic study is to investigate and, in some instances, to challenge the dominant belief running through a text. The premise of this investigation is that authors use their power as owners of their writing to emphasise one point of view more than another. The critical linguist analyses authors' attempts to use language to support their point of view. Such an analysis is part of the critical culture of science and would be a welcome third component of peer review, in addition to qualitative and statistical assessment.

The most important consequences of this approach would be to prise the text of an article away from the author. The need for this shift of ownership is that effective peer review will be achieved only when the language of a scientific paper is "owned" by the wider research community, through moderation of the "spin" that authors place on their own work.

### Levels of argument

The study of argumentation has a narrative methodology. Techniques of persuasion exist at both superficial and deep levels. At a surface level lie the types of argument used in each part of the text—the "archaeology of arguments"—for example, the quality and limitations of the methods, the clinical importance of the work, speculations about the meaning of the result, directions for future research, claims about the success of the original aim of the study, and the statistical arguments that support a particular viewpoint.

Aristotle provides some insight into the rules of this style of composition as applied to the scientific paper. He groups proofs into one of three types: firstly, the argument itself, which is equivalent to the statement of results and associated claims derived from these data; secondly, the character of the author, who should be seen as fair minded and balanced in outlook; and thirdly, the emotional state of the reader, which can be appealed to by speculations about the clinical importance of the results and their implications for future research.

Deep arguments lie within sentences. For example, the persuasive power of each sentence depends on elements such as the use of the active or passive form, positioning of adverbs and adjectives, the choice of first person or third person narrative, and referencing patterns (including the author's own previously published work).

### Critical linguistics in action

To illustrate my argument I ought to begin with an unpublished manuscript. Naturally, editorial ethics prevent such an approach. I will therefore take an example of a published paper to show how an understanding of the persuasive elements of a text contribute to an understanding of the meaning that the authors wish to convey.

Each part of a published paper is open to rhetorical manipulation by the author. For example, an unstructured abstract gives authors more freedom to include or exclude information of their own choosing. Figures and tables may enhance the persuasive power of one result over that of another. The discussion, however, offers the most useful starting point for a

critical linguistic analysis as it is this section of a paper that most obviously seeks to cajole and convince.<sup>6</sup> I have chosen a paper published in the *Lancet* in 1993 as an example.

The Eurogast study group correlated the prevalence of *Helicobacter pylori* in 13 countries with incidence of gastric cancer.<sup>7</sup> The summary reported an approximately sixfold increased risk of gastric cancer in populations with 100% *H pylori* infection compared with populations that have no infection. The discussion in the paper consisted of eight paragraphs. The box shows the types of surface arguments that were adopted. Several points about this scheme are worth noting, and these are grouped according to the three Aristotelian rules of composition.

#### ARGUMENT

The discussion presents an active rather than a passive argument structure—that is, it begins with a statement of the positive result rather than, for example, a review of previously published work. The statement of result is reinforced by repetition in the second sentence of the first paragraph and again in the final paragraph.

#### CHARACTER OF AUTHORS

The appropriateness or security of the methodology is emphasised in five of the eight paragraphs. The authors clearly see this aspect of their paper as potentially vulnerable. The limitations are discussed in detail, and extensive reassurances are provided. The strongest being that the drawbacks noted are largely unavoidable in this type of investigation. Previous studies are quoted to place this work in context; in the second paragraph, two supportive studies and one negative study are cited.

#### EMOTIONAL APPEAL TO READERS

A speculation about the clinical importance of the work is made in paragraph 6. The statement goes beyond an epidemiological association—strong as it may be—to suggest a causal link between gastric cancer and *H pylori* infection. Most surprisingly, this speculation survived into the summary.

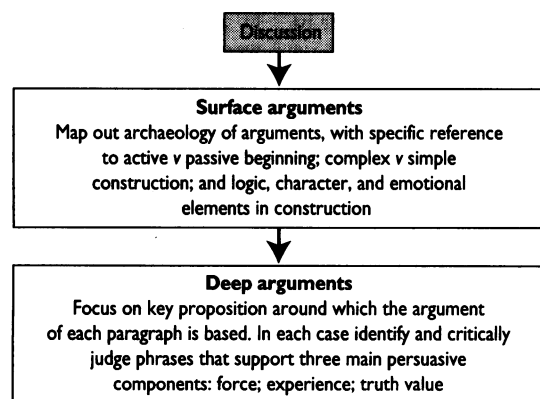
The box shows the complex pattern of these arguments in the published text. The statement of result is given three times, and reassurances about the study's limitations and strengths are found throughout. A simpler, and perhaps fairer, arrangement would be to group each part of the discussion in a logical order—for example, statement of result, context, strengths and limitations, and, finally, the conclusion.

The nature and subtlety of deep arguments become clearer by examining the final paragraph of the

#### Archaeology of surface arguments in discussion of Eurogast study<sup>7</sup>

Paragraph	Argument
1	Statement of result Restatement of result Limitations of study
2	Supportive previous studies Conflicting previous study
3	Context of other risk factors
4	Limitations
5	Security of methodology Reliability of result
6	Security of methodology Speculation about clinical importance
7	Strength of study Unavoidable limitations
8	Restatement of result Conclusion

Eurogast study: "Our results show a statistically significant relation between *H pylori* infection, as determined by serum antibody positivity, and gastric cancer mortality and incidence. This finding adds further weight to the hypothesis that *H pylori* infection is a risk factor for gastric cancer." In the first sentence the proposition, in its simplest form, is that *H pylori* infection is related to gastric cancer. The authors can use any of three techniques to convey this proposition to the reader: the force with which the proposition is made (what linguists call modality), the experience of the writer in making this proposition (transitivity), and how the truth of the proposition is encoded in the sentence (semantics) (figure).<sup>8</sup>



*Scheme for linguistic analysis of discussion section of research paper*

In this instance force is conveyed by the verb "to show," since show implies a visual clarity in the results that should be apparent to the reader without need for additional explanation; moreover, no qualifying phrases, such as may, might, or probably, are used. Experience is transmitted by use of the first person as narrator: the results were discovered by and belong to the authors. The authors send a strong message about the truth value of the sentence by emphasising the methodology chosen in the study—positivity for *H pylori* antibody—and that the relation is significant.

The second sentence in this same paragraph can be examined in the same way. In particular, readers might consider the persuasive effects of a switch to the third person narrative, the use of an adjective, a metaphor, and the verb "to add," and the causal implications of the phrase "risk factor."

## Conclusion

The text of a scientific paper is not an atlas that offers readers several equally appealing routes through terrain mapped out by the authors. Rather, the text

describes a specific path, carefully carved by the authors, through a complex undergrowth of competing arguments. By examining this path more closely, we come to see the authors' intention and the means by which they convey this intention. Such textual criticism of scientific discourse is a crucial and largely missing component of peer review.

The time in science when an observation could be held to speak for itself has long past. Interpretation is a key part of research as scientists now deal less with demonstrable facts than with probabilities. Hence the writings of researchers are increasingly decorated by their own values and biases. In the humanities the practice of textual interpretation is called hermeneutics. Although in medicine we talk of "critical appraisal" when evaluating evidence, the importance of a linguistic perspective when discovering meaning in a paper convinces me that a clinical hermeneutic approach would be a step forward in the peer review process.<sup>9</sup> Should authors have unrestrained freedom in their use of language when interpreting their results? Such freedom fosters an adversarial trend in research communication, which may make good journalism but which may also diminish the practice of science.

So should authors own their own words? Clearly, there are dangers in this freedom. Whether editors should enforce an idealised form of scientific presentation—for example, a simple rather than a complex, structured discussion—is worthy of debate. This issue is perhaps even more important in evaluation of the arguments and opinions presented in review articles that give no indication of how primary data were selected for inclusion. Even if authors retain their proprietary rights over their text the reader should at least be equipped with the basic tools to decipher the often unconsciously encoded intentions of the author. You could begin with this article.

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## Commentary: Scientific heads are not turned by rhetoric

Trisha Greenhalgh

Dear Dr Horton,

When I read a scientific paper, either for its own sake or when wearing an editorial hat, I usually drink in the introduction (to whet my appetite for the subject matter), skim the methods, eyeball the figures and tables, and then read every word of the discussion. Then I go back to the methods and results sections and weigh the rhetoric of the authors' conclusions against my own assessment of the objectivity and general value of their work. Why do I do it that way? Because if I

concentrated on the structured and measurable bits to the exclusion of the rest, I would be flat out, dead, under the table from boredom.

The reason that your paper worries me is that, having drawn attention to the "spin" that authors place on their work," you then entice the reader into the unjustified assumption that this spin is necessarily evil, insidious, and the last remaining bastion of caprice in the otherwise objective terrain of scientific publication. What sort of a word is "spin"? What