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Review of James Hartley's research on structured abstracts

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Abstract
Structured abstracts have been employed in biomedical journals for more than 20 years. Professor James Hartley in the School of Psychology, Keele University, UK has published over 25 research papers and conducted systematic studies on structured abstracts. This paper reviews this research from five perspectives: the advantages of structured abstracts over traditional ones, the typographic layout of structured abstracts, the content of structure abstracts, the application of structured abstracts to medical, non-medical and social science journals, and evaluating the quality of structured abstracts. Our aim is to achieve a fuller understanding of what is known about structured abstracts in this field by summarizing James Hartley's research.

Keywords
James Hartley; structured abstracts

1. Introduction

Abstracts of published manuscripts were introduced in the 1950s [1]. The abstract is considered to be 'the most frequently read and most easily accessed portion of an article reporting original biomedical research' [2]; it is therefore very important for authors to convey the key information of the article. However, traditional abstracts have been detected to have deficiencies, such as 'reporting inaccurately study design, study variables, supporting data, and lacking of the statements of study limitations and study recommendations' [3]. In 1969, Ertl proposed to publish abstracts in a tabular form so that authors could write more informative abstracts [4]. In 1987, drafted by Dr Brian Haynes, the Ad Hoc Working Group for the Appraisal of the Medical Literature proposed the guidelines for providing more informative abstracts for clinical articles [5] and the editor-in-chief, Edward Huth, adopted the structured format for abstracts in his journal, *Annals of Internal Medicine*. In the past two decades, many researchers [6–12] have carried out a number of studies on structured abstracts from different perspectives, and have made great improvements to the quality of abstracts in biomedical journals and some social science journals. Of all these researchers, one of the most important scholars worthy of mention is Professor James Hartley in School of Psychology, Keele University, in the UK. He has carried out systematic research on structured abstracts since 1996 and has published over 25 research papers in the field. By analysing Professor Hartley's research papers, we can keep track of the developmental trend of what we have learned about structured abstracts.

2. A brief introduction to James Hartley

James Hartley was born in the UK in 1940. In 1964, he came to Keele University as an assistant lecturer, and later served as Head of Department of Psychology, and Research Professor. After taking early retirement in 1998, he gave the

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occasional lecture, taught third-year options students, and supervised third-year dissertations, as well as continuing with his research. He serves on the editorial boards of five academic journals, and is a Fellow of both the American Psychological Association, and the British Psychological Society. His research interests have been in student learning, the design of instructional text and academic writing. He has published over 350 research papers on these topics and several books, for instance, the one published in 2008 [13].

3. James Hartley's research on structured abstracts

We have divided James Hartley's publications into five aspects: the advantages of structured abstracts over traditional ones, the typographic layout of structured abstracts, the content of structure abstracts, the application of structured abstracts to medical, non-medical and social science journals, and evaluating the quality of structured abstracts.

3.1. The advantages of structured over traditional abstracts

Traditional abstracts, in terms of (ISO) 214-1976 (E), are categorized into three types: indicative abstracts, informative abstracts and informative–indicative abstracts. The indicative abstract is a guide to the contents of an article without telling readers the contents in detail. The informative abstract reports the details of the research, usually containing such contents as purpose, method, results, and conclusions. And informative–indicative ones confine informative statements to the primary elements of the document and present other aspects in the form of indicative statements.

The deficiencies in these traditional abstracts have become more and more apparent with the rapid increase in the number of scientific journals together with the developments in the use of electronic databases. The main deficiencies are: their inconsistent format and unclear levels of information may make abstractors (especially those who are not editors and those who do not write abstracts very often) confused in their abstract writing: often they do not reflect the main ideas of the article and leave out the key information from the text. What is worse, the traditional format makes it difficult for abstractors to process the abstracts.

Shortly after the Ad Hoc Working Group for Critical Appraisal of the Medical Literature [5] proposed changes in the format and content for abstracts in order to provide 'more information' ('structured abstracts') [6], some famous medical journals followed suit. We searched the websites and found that *British Medical Journal* used the structured format in 1988. In the 1990s, more and more medical journals adopted structured abstracts: *New England Journal of Medicine* and *Canadian Medical Association Journal* in 1990, *Journal of American Medical Association* in 1991 and *The Lancet* in 1996.

What, then, are the advantages of structured abstracts over the conventional ones? Bearing this question in mind, Professor Hartley conducted several studies and drew the following conclusions: compared with traditional abstracts, structured abstracts are easier for readers to search [14], easier to read [15], report more accurately an article's contents [16] and contain more information [17]. One qualification, however, is that structured abstracts are longer and usually take up more space than do traditional ones [18]. For studies of this kind, Professor Hartley employed a comparative research method and selected abstracts from the following journals: *British Journal of Educational Psychology, British Journal of Psychiatry*, etc. Typically traditional abstracts were re-written to form structured ones and participants (undergraduates, postgraduates and scientific researchers) were asked to rate them based on questions given by the researchers, followed by statistical tests. In this context Professor Hartley has published the following articles: 'Obtaining Information Accurately and Quickly: Are Structured Abstracts More Efficient?' (answer: yes); 'Are Structured Abstracts More/or/Less Accurate Than Traditional Ones?' (answer: no difference); 'A Study in the Psychological Literature: Are Structured Abstracts Easier to Read Than Traditional Ones?'; (answer: yes); 'Do Structured Abstracts Take Up More Space? And Does It Matter?' (answers: yes and not often).

3.2. The typographic layout of structured abstracts

There is a great variety in the typographic setting of structured abstracts among journals and some of the differences are listed as follows:

1. The position of the abstract. Some journals put the abstracts at the beginning of the left-hand column of a double-column spread, whereas others 'centre them over a double-or a single-column setting' [19].
2. Different typefaces for the subheadings. Some subheadings are in italic, sometimes in bold; sometimes in capital letters, to name just a few.

3. Different spacing styles. In some journals, indented subheadings start on a new line, followed by the content of each section on the next line, whereas in other journals, the text runs on after each subheading. In addition, in some journals, there is a line-space between the subheadings, whereas in other journals, there is not.

It is thus interesting to investigate readers' preferences for different typographic settings of structured abstracts. Here are James Hartley's three publications in this aspect: 'Which Layout Do You Prefer? An Analysis of Readers' Preferences for Different Typographic Layouts of Structured Abstracts'; 'Which Do You Prefer? Some Observations on Preference Measures in Studies of Structured Abstracts'; and 'Typographic Settings for Structured Abstracts'. This last paper illustrates the effects of multiple differences in the typographic settings of structured abstracts.

Hartley and Sydes investigated 400 readers' preferences for different typographic settings of the subheadings and the overall position and layout of structured abstracts on a two-column A4 page. They found that 'most readers preferred the subheadings to start in bold capital letters, with a line-space above each of the main sub-headings and for the whole to be centred over the top of a subsequent two-column article' [19].

Some scientific and social science journals do not use structured abstracts because their editors consider the format to 'take up more space than traditional ones' [6, 20, 21]. However, Hartley et al. investigated this issue and provided convincing evidence to show that the extra space required was unlikely to affect the overall pagination of most journals. Here the researchers first chose 10 or more articles from 15 journals printed with large, medium, and small paper-sizes and checked to see whether or not increasing the size of their traditional abstracts would change the overall pagination of the journal articles. The results suggested that this would not affect the pagination of journals with large or medium page-sizes, even when new articles began on the next immediate left or right-hand page, but that using structured abstracts would cause some spatial problems with journals with small page sizes and when new articles followed directly on from each other, rather than starting on a new page [18].

In most cases, pagination is not a serious problem for skilled typesetters who can arrange appropriate page dimensions for articles, but two other features are considered by Hartley to provide other examples of 'wasted' space. These are:

- when authors and their addresses are placed on separate lines below each other; and
- when the abstracts are indented right and left rather than aligned with the width of the ensuing article.

Hartley [18] also disapproved of the following five ways of saving space:

1. Making the typefaces of the abstract smaller than that of the main body of the text.
2. Using smaller typefaces for the Method sections in empirical papers.
3. Using numbering systems for indicating references in the text because readers have to turn to the references section to find the names of the cited authors.
4. Using footnotes at the end of the journal articles or chapters because these make it difficult for readers to find their way back to where they were before they read the footnote.
5. Using extra narrow margins because these lead to a less spacious appearance.

3.3. The content of structured abstracts

Cognitive psychology and discourse analysis have shown that the reading process is altered and comprehension hindered with poorly structured text [22]. The content of structured abstracts for articles in medical/clinical journals normally consists of eight sub-headings: Objective, Design, Setting, Patients or Other Participants, Intervention(s), Measurements, and Main Results, Conclusion(s) [5]. The standardized guidelines for review articles proposed by Mulrow et al. [23] suggest six sub-headings: Purpose, Data Identification, Study Selection, Data Extraction, Results of Data Synthesis and Conclusions. Bilie-Zulle et al. [24] reported that about one-third of the structured abstracts published in medical journals at that time adopted eight sub-headings, and that about two-thirds provided variations on these main six sub-headings. Hartley's studies on the content of structured abstracts are embodied in his three papers: 'Headings in Structured Abstracts'; 'Clarifying the Sub-headings of Structured Abstracts'; and 'Readers Prefer Structured Abstracts to End with the Conclusions'.

Hartley [25] examined 100 abstracts, published in *British Journal of Psychiatry* in 1997, each of which was written using *one* of two sub-headings, 'Background', or 'Background and Aims' before the 'Method', 'Results' and 'Conclusions' – thus giving only four sub-headings for each abstract. The findings showed that the most of the authors involved failed to supply sufficient information for the abstract when only these four headings were used. Consequently, Hartley proposed adding 'Aims' to the sub-headings of the abstracts in *British Journal of Psychiatry* for the reason that

a single sub-heading 'Background' or 'Background and Aims' did not distinguish well between the background and the aims of a particular study. This suggestion was approved by the editor, and 'Aims' and 'Background' (along with 'Method', 'Results' and 'Conclusions') have been used by the *British Journal of Psychiatry* since January, 1999.

Hartley now argues that structured abstracts in journals should contain at least five sub-headings – 'Background', 'Aims', 'Methods', 'Results', and 'Conclusions', partly because these sub-headings match the standard format of traditional IMRAD research articles.

In 2010 Hartley specifically discussed the location of the 'Conclusion' section for structured abstracts. This 'Conclusion' section is typically placed at the end of an abstract. However, in recent years, some scholars, such as Shashok, wrote to the European Association of Science Editors Forum, discussing the idea of 'presenting the conclusions first as opposed to last in structured abstracts' [26]. Some of Shashok's colleagues supported this idea and they suggested that the conclusions should be 'put up front' where they could be clearly seen [27].

A study by Hartley and Betts [28] took this to extremes and presented the conclusions *before* the title, as an indicator to readers as to what the study showed. However, they found that 78 per cent of their 36 participants preferred structured abstracts to be set in the traditional manner and only 22 per cent voted for abstracts in which the conclusions came before the title. This difference was statistically significant ($\chi^2 = 11.11$, df = 1, $p < 0.001$). They concluded, therefore, that most readers would prefer the conclusions of a study to be placed at the end of the abstract, rather than before the title of the article. The main reasons for their preferences given by those who favoured the traditional structured abstracts were: (1) their dislike of change and preference for the status quo; (2) that it was not possible to judge the validity of a conclusion before reading the Method and Result sections; and (3) that it was illogical to start a text with the conclusions.

3.4. The application of structured abstracts in non-medical and social science journals

Structured abstracts were initially designed for biomedical journals reporting clinical articles [5] and review articles [23]. In 1997, journals in other disciplines began to adopt this format, such as psychiatry (*British Journal of Psychiatry*), psychology (*British Journal of Clinical Psychology*, *British Journal of Educational Psychology*, *British Journal of Health Psychology*, *Legal and Criminological Psychology*) and other non-medical science journals (*Bioinformatics*, *Fruits*, *Pharmaceutical Research*) [29].

Hartley endeavoured to explore the appropriateness of structured abstracts for journals in other disciplines, like the social sciences, and a range of non-medical journals. He tried to recommend structured abstracts to the editors of these journals. Furthermore, he illustrated the format in his articles that were published on the topic in, for example, *Journal of Information Science*, and *Applied Ergonomics.* In addition, he applied the structured format to the teaching of how to write laboratory reports with the first-year psychology students at Keele University [30]. These particular studies were taken up and extended by colleagues in the Department of Computing at Keele to the writing of abstracts in both first-year and final-year reports [31, 32]. Here are the titles of Hartley's five research papers in this regard: 'Is It Appropriate to Use Structured Abstracts in Social Science Journals?'; 'Is It Appropriate to Use Structured Abstracts in Non-medical Science Journals?'; 'Applying Ergonomics to Applied Ergonomics: Using Structured Abstracts'; 'Teaching Psychology Students to Write Structured Abstracts'; and 'Writing a Structured Abstract for the Thesis'.

Hartley's studies have indicated that, compared with traditional abstracts, structured abstracts contain more information, are easier to read and to search [33], and are appropriate for journals of social sciences, psychology [34] and non-medical journals [17]. Furthermore, teaching students how to write structured abstracts is conducive to improved abstracts [30–32].

3.5. Assessing the effectiveness of structured abstracts

After introducing structured abstracts, scholars began to pay attention to their effectiveness. There was no exception with Hartley. He explored how to evaluate the quality of structured abstracts, and published seven articles on the topic from 1998 to 2010: 'An Evaluation Of Structured Abstracts in Journals Published by the British Psychological Society'; 'Improving the Clarity of Journal Abstracts in Psychology: The Case for Structure'; 'The Effects of Spacing and Titles on Judgments of the Effectiveness of Structured Abstracts'; 'Revising and Polishing a Structured Abstract: Is It Worth the Time and Effort?'; 'Common Weaknesses in Traditional Abstracts in the Social Sciences'; 'How Can We Evaluate the Quality of Abstracts?'; and 'Making the Journal Abstract More Concrete'.

3.5.1. The necessity of assessing the effectiveness of structured abstracts. By comparing original structured abstracts with revised and re-written versions in one particular study, Hartley et al. [35] gave a clear answer to the question, 'Is it worth the time and effort to revise and polish structured abstracts?'. In this study the participants (over 400 academics and

researchers of different disciplines) were connected by e-mail. Using an 11-point rating scale that went from 0 (*unclear*) to 10 (*clear*), half of them were invited to rate the clarity of each of the five sections (title, background, aims, methods, results and conclusions) of the initial original structured abstracts, as well as the abstract overall, and the other half were asked to do the same for edited and revised versions of the same abstracts. The results indicated that the revised versions of the original structured abstracts were judged to be significantly clearer than the original ones ($p < 0.008$) – indicating that even structured abstracts can be improved.

3.5.2. The basis and standards for assessing the effectiveness of structured abstracts. Hartley [36, 37] has adopted in his articles the following bases and standards for assessing the effectiveness of structured abstracts.

1. Information content. This considers whether or not the abstract reflects the key information of the original text. *The APA Publication Manual* says, 'A well-prepared abstract can be the most important paragraph in your article . . . The abstract needs to be dense with information but also readable, well organized, brief and self-contained' [38]. (The characteristics of good abstracts are specified in more detail in this *Manual*, but structured abstracts are not discussed.)
2. Abstract length. The *APA Publication Manual* specified 120 words as the word limit for an abstract in the 2001 edition, but this was modified in the 2010 *Manual* to read, 'Word limits vary from journal to journal and typically range from 150–250 words' [38]. Word limits for abstracts appear to be increasing, but they are still typically shorter for traditional abstracts than they are for structured ones.
3. Abstract readability. The readability of text can be measured in various ways [39]. Abstracts are typically denser in content than are the Introduction and Methods sections of articles and are thus hard to read [37]. It is likely that structured abstracts are more readable than traditional ones [15].
4. Abstract clarity. Hartley [34] defines 'clarity' as text that is 'readable', 'well-organized', 'clear', and 'informative'. Words, like 'clarify', 'clarity' and 'clear' appear frequently in Hartley's articles, and are even used in the title of three of his articles.
5. Abstract microstructure. Hartley [36] cited a study conducted by Dos Santos [40], an applied linguist, that said, 'A move analysis reveals that abstracts (in applied linguistics) follow a five-move pattern'. 'Move', a term in linguistics, is a discourse unit employed by the author (speaker) to realize a specific purpose in the discourse [41]. Each subheading in an abstract can be regarded as a 'Move', and each 'Move' has its own purpose in the abstract [11]. We quite agree with Hartley when he says: 'With structured abstracts it is difficult to leave any of these ''moves'' out or to vary their order' [36].

3.5.3. Evaluation instruments and methods of assessing effectiveness of structured abstracts. In his article, Hartley [42] employed three research instruments:

1. A rating scale. Participants (experienced scientists who were native-speakers of English, and postgraduate students who were non-native speakers of English) were invited to rate three different kinds of abstracts based on items in a checklist. There were seven items in the list, including understandability, grammar, spelling, structure, selection of information, brevity, and suitability for international readership. And there were five levels in the rating scales: 1 = very poor; 2 = poor; 3 = average; 4 = very good; 5 = excellent. Abstract 1 and Abstract 2 were published abstracts, and Abstract 3 was an unpublished abstract.
2. An evaluation checklist. This checklist presented several questions about each section of the abstracts. For example, for Background, the question might be: Is there any mention of previous research or research findings on this topic?. The participants are asked to answer 'Yes' or 'No' to such questions. The checklist used by Hartley in 2009 was based on one first published by Narine et al. [4], then developed further by Taddio et al. [43], before being shortened and adapted for the study by Hartley.
3. A text readability score – in this case The Flesch Reading Ease Score. This readability test is named after its originator, Dr Rudolf Flesch [44], and used mainly for assessing the difficulty of reading passages written in English. The Flesch Reading Ease Score for a passage relies on a combination of three statistics, namely the total number of sentences, words and syllables, in the passage. The actual formula is:

$$\text{R.E.} = 206.835 - (1.015 \times \text{ASL}) - (84.6 \times \text{ASW})$$

where ASL = average sentence length and ASW = average number of syllables per word, but today the Flesch measure is usually applied by computer.

4. The R.E. scores ranges from 0 to 100, and the higher the score, the easier it is to read the passage. Passages scoring 50–59 are best suitable for 10–12 graders; 30–49 for 13–16 graders; and 0–29 for college graduates (and journal articles).

Hartley typically employs variations on all three of these methods – rating scales, checklists and readability measures – in any one study and compares scores obtained on all three measures for structured and traditional abstracts.

4. Conclusion

Professor James Hartley is a diligent researcher, who has kept writing for many years and who has published a great number of research papers on structured abstracts. Our paper characterizes his studies in five ways: the advantages of structured abstracts over traditional ones, the typographic layout of structured abstracts, the content of structured abstracts, the application of structured abstracts to medical, non-medical and social science journals, and the evaluation of the quality of structured abstracts. Hartley typically combines qualitative methods with quantitative ones and his research is systematic, scientific, reliable and convincing. On the one hand his papers are independent of each other but, on the other, they are interrelated and complementary. James Hartley's fruitful products provide researchers with plentiful resources and specific instructional methods for continuing his research on the importance of journal abstracts.

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