

## How to write a good abstract for a scientific paper or conference presentation

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### ABSTRACT

Abstracts of scientific papers are sometimes poorly written, often lack important information, and occasionally convey a biased picture. This paper provides detailed suggestions, with examples, for writing the background, methods, results, and conclusions sections of a good abstract. The primary target of this paper is the young researcher; however, authors with all levels of experience may find useful ideas in the paper.

**Key words:** Abstract, preparing a manuscript, writing skills

### INTRODUCTION

This paper is the third in a series on manuscript writing skills, published in the *Indian Journal of Psychiatry*. Earlier articles offered suggestions on how to write a good case report,<sup>[1]</sup> and how to read, write, or review a paper on randomized controlled trials.<sup>[2,3]</sup> The present paper examines how authors may write a good abstract when preparing their manuscript for a scientific journal or conference presentation. Although the primary target of this paper is the young researcher, it is likely that authors with all levels of experience will find at least a few ideas that may be useful in their future efforts.

The abstract of a paper is the only part of the paper that is published in conference proceedings. The abstract is the only part of the paper that a potential referee sees when he is invited by an editor to review a manuscript. The abstract is the only part of the paper that readers see when they search through electronic databases such as PubMed. Finally, most readers will acknowledge, with a chuckle, that when they leaf through the hard copy of a journal, they look at only the titles of the contained papers. If a title interests them, they

glance through the abstract of that paper. Only a dedicated reader will peruse the contents of the paper, and then, most often only the introduction and discussion sections. Only a reader with a very specific interest in the subject of the paper, and a need to understand it thoroughly, will read the entire paper.

Thus, for the vast majority of readers, the paper does not exist beyond its abstract. For the referees, and the few readers who wish to read beyond the abstract, the abstract sets the tone for the rest of the paper. It is therefore the duty of the author to ensure that the abstract is properly representative of the entire paper. For this, the abstract must have some general qualities. These are listed in Table 1.

### SECTIONS OF AN ABSTRACT

Although some journals still publish abstracts that are written as free-flowing paragraphs, most journals require abstracts to conform to a formal structure within a word count of, usually, 200–250 words. The usual sections defined in a structured abstract are the Background,

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Methods, Results, and Conclusions; other headings with similar meanings may be used (eg, Introduction in place of Background or Findings in place of Results). Some journals include additional sections, such as Objectives (between Background and Methods) and Limitations (at the end of the abstract). In the rest of this paper, issues related to the contents of each section will be examined in turn.

### Background

This section should be the shortest part of the abstract and should very briefly outline the following information:

1. What is already known about the subject, related to the paper in question
2. What is not known about the subject and hence what the study intended to examine (or what the paper seeks to present)

In most cases, the background can be framed in just 2–3 sentences, with each sentence describing a different aspect of the information referred to above; sometimes, even a single sentence may suffice. The purpose of the background, as the word itself indicates, is to provide the reader with a background to the study, and hence to smoothly lead into a description of the methods employed in the investigation.

Some authors publish papers the abstracts of which contain a lengthy background section. There are some situations, perhaps, where this may be justified. In most cases, however, a longer background section means that less space remains for the presentation of the results. This is unfortunate because the reader is interested in the paper because of its findings, and not because of its background.

A wide variety of acceptably composed backgrounds is provided in Table 2; most of these have been adapted from actual papers.<sup>[4-9]</sup> Readers may wish to compare the content in Table 2 with the original abstracts to see how the adaptations possibly improve on the originals. Note that, in the interest of brevity, unnecessary content is avoided. For instance, in Example 1 there is no need to state “The antidepressant efficacy of desvenlafaxine (DV), *a dual-acting antidepressant drug*, has been established...” (the unnecessary content is italicized).

### Methods

The methods section is usually the second-longest section in the abstract. It should contain enough information to enable the reader to understand what was done, and how. Table 3 lists important questions to which the methods section should provide brief answers.

Carelessly written methods sections lack information about important issues such as sample size, numbers of patients in different groups, doses of medications, and duration of the study. Readers have only to flip through the pages of

**Table 1: General qualities of a good abstract**

The abstract is a condensed and concentrated version of the full text of the research manuscript. It should be sufficiently representative of the paper if read as a standalone document.

The abstract must be as detailed as possible within the word count limits specified by the journal to which the paper is intended to be submitted. This will require good precis writing skills, as well as a fine judgment about what information is necessary and what is not.

The abstract must contain as much information as possible on the analyses related to the primary and secondary outcome measures.

The abstract should not present a biased picture, such as only favorable outcomes with the study drug, or findings that support the authors’ hypotheses; important nonsignificant and adverse findings should also receive mention. Thus, to the extent possible, the reader should be able to independently evaluate the authors’ conclusions.

**Table 2: Examples of the background section of an abstract**

The antidepressant efficacy of desvenlafaxine (DV) has been established in 8-week, randomized controlled trials. The present study examined the continued efficacy of DV across 6 months of maintenance treatment.

The healing powers of prayer have been examined in randomized, double-blind, appropriately controlled trials. However, no study has considered the philosophical pitfalls inherent in such studies.

Few studies have prospectively examined the musculoskeletal complications of unmodified electroconvulsive therapy (ECT)

The putative hypnotic benefits of melatonin have not been examined in patients with insomnia arising from medical causes.

Several tests are available to assess logical verbal memory. However, those standardized for use in India are short and simple; the result is a ceiling effect in young and highly educated samples.

The Eysenck Personality Inventory (EPI) was standardized for use in India, nearly 2 decades ago, in a linguistically and occupationally heterogeneous sample. The present study reassessed the findings of the original study in a purposive sample comprising urban, female, college students.

Women in India are traditionally housewives; however, in modern urban India, women are increasingly seeking jobs. Employment notwithstanding, women continue to be expected to discharge their traditional domestic duties. The likely result is role strain and impaired subjective well-being.

**Table 3: Questions regarding which information should ideally be available in the methods section of an abstract**

What was the research design?

What was the clinical diagnosis of the patients recruited?

What was the setting of the study (if relevant)?

How were the patients sampled?

What was the sample size in the whole sample and/or in the different groups?

What treatments did patients in different groups receive, and at what doses?

What was the duration of the study?

On what research instruments were patients rated?

What was the primary outcome measure and how was it defined?

a randomly selected journal to realize how common such carelessness is.

Table 4 presents examples of the contents of acceptably written methods sections, modified from actual publications.

<sup>[10,11]</sup> Readers are invited to take special note of the first sentence of each example in Table 4; each is packed with detail, illustrating how to convey the maximum quantity of information with maximum economy of word count.

**Table 4: Examples of the methods section of an abstract**

Consecutive consenting male inpatients in moderately severe, uncomplicated alcohol withdrawal at screening were randomized to receive either lorazepam (8 mg/day;  $n=50$ ) or chlordiazepoxide (80 mg/day;  $n=50$ ) with dosing down-titrated to zero in a fixed-dose schedule across 8 treatment days. Double-blind assessments of withdrawal symptom severity and impairing adverse events were obtained during treatment and for 4 further days using the Clinical Institute Withdrawal Assessment for Alcohol revised scale (CIWA-Ar) and other instruments. The primary outcome was the trajectory of improvement in CIWA-Ar ratings.

Consenting adults ( $n=20$ ) with severe, chronic, CBT- and antidepressant-refractory posttraumatic stress disorder (PTSD) were prospectively treated with a fixed course of 6 bilateral, twice-weekly, ambulatory ECT. The primary outcome measure was improvement on the Clinician-Administered Posttraumatic Stress Disorder Scale (CAPS). Response to ECT was defined as at least 30% attenuation of CAPS ratings, and remission as an endpoint CAPS score of 20 or less.

**Table 6: Examples of the results section of an abstract**

Three patients withdrew consent during week 1; all the rest completed the 6-ECT course. An intent-to-treat analysis ( $n=20$ ) showed a significant fall in Clinician-Administered Posttraumatic Stress Disorder Scale (CAPS) and HAM-D scores by a mean of 34.4% and 51.1%, respectively. Most of the improvement developed by the third ECT (day 10). The CAPS improvement was independent of the HAM-D improvement; and improvement in CAPS did not differ significantly between patients with less vs more severe baseline depression. The CAPS response rate was 70%; no patient remitted. In the complete analysis ( $n=17$ ), mean improvements were 40% and 57% on CAPS and HAM-D, respectively, and the response rate was 82%. Treatment gains were maintained at a 6-month follow-up. No unexpected adverse effects were associated with treatment.

At the 7-year follow-up, 52,500 (74.9%) mother-child pairs were re-examined. Attention-deficit hyperactivity disorder (ADHD) was identified in 945 (1.8%) children. Maternal [odds ratio (OR), 5.2; 95% confidence interval (CI), 3.4–9.1] and paternal (OR, 3.3; 95% CI, 2.0–5.8) ADHD were each associated with increased risk of ADHD in the offspring. ADHD was more common in male than in female children (OR, 4.8; 95% CI, 2.6–8.5). Maternal age, prematurity, low birth weight, fetal distress, and neonatal asphyxia were not associated with an increased 7-year risk of ADHD. After adjusting for maternal ADHD, intranatal exposure to psychotropic medication did not predict the 7-year risk of ADHD (OR, 1.2; 95% CI, 0.6–2.8).

**Table 8: Examples of unnecessary content in a abstract**

Bibliographic references

Details about the laboratory and other assessments conducted as part of safety assessments (this is because such tests are routinely performed in clinical studies), unless there is a specific need to highlight these in the abstract.

Details about the statistical methods employed and the software used, unless there is a specific reason why these details are necessary in the abstract.

Sociodemographic details, unless these are necessary for the proper interpretation or generalization of the findings.

Details about the value of the statistical criterion for a test and its degrees of freedom (eg, Chi-square=7.49,  $df=1$ ,  $P<0.001$ ); it is sufficient to merely indicate significance in the sentence or state the  $P$  value in parentheses after describing the finding.

**Results**

The results section is the most important part of the abstract and nothing should compromise its range and quality. This is because readers who peruse an abstract

**Table 5: Information that the results section of the abstract should ideally present**

The number of patients who completed the study; drop out rates in the different groups in the study; in treatment studies, drop out rates specifically related to adverse events in each treatment arm.

The results of the analysis of the primary objectives, expressed in words along with  $P$  values in parentheses.

The results of the analysis of the more important secondary objectives, expressed in words along with  $P$  values in parentheses.

Numerical information about the above analyses, such as in terms of means and standard deviations, and response and remission rates. Wherever possible, effect sizes, relative risks, numbers needed to treat, and similar statistics should be provided along with confidence intervals for each.

Important negative findings, if any, should also be presented; that is, findings that fail to support the authors' hypotheses

Data on important adverse events should be included in addition to the data on efficacy

**Table 7: Examples of the conclusions section of an abstract**

Desvenlafaxine (100–200 mg/day) is effective and well-tolerated in the attenuation of the number and severity of hot flashes in menopausal women; benefits are apparent within the first week of therapy and are maintained for at least 6 months of treatment.

Olanzapine (5–10 mg/day) augmentation improves illness and quality-of-life outcomes in selective serotonin reuptake inhibitor (SSRI)-refractory OCD; however, short-term weight gain and metabolic dysregulation in treated patients remain an important concern.

The 9.3% prevalence of bipolar spectrum disorders in students at an arts university is substantially higher than general population estimates. These findings strengthen the oft-expressed hypothesis linking creativity with affective psychopathology.

In contrast with previous research, our study found that lorazepam was as effective as diazepam on all outcome measures in patients with uncomplicated alcohol withdrawal. A likely explanation is that we used higher doses of lorazepam, and a longer treatment duration with a slower taper. We conclude that lorazepam can and should be preferred over diazepam in alcoholics with known or suspected liver disease.

do so to learn about the findings of the study. The results section should therefore be the longest part of the abstract and should contain as much detail about the findings as the journal word count permits. For example, it is bad writing to state "Response rates differed significantly between diabetic and nondiabetic patients." A better sentence is "The response rate was higher in nondiabetic than in diabetic patients (49% vs 30%, respectively;  $P<0.01$ )."

Important information that the results should present is indicated in Table 5. Examples of acceptably written abstracts are presented in Table 6; one of these has been modified from an actual publication.<sup>[11]</sup> Note that the first example is rather narrative in style, whereas the second example is packed with data.

**CONCLUSIONS**

This section should contain the most important take-home message of the study, expressed in a few precisely worded sentences. Usually, the finding highlighted here relates to

the primary outcome measure; however, other important or unexpected findings should also be mentioned. It is also customary, but not essential, for the authors to express an opinion about the theoretical or practical implications of the findings, or the importance of their findings for the field. Thus, the conclusions may contain three elements:

1. The primary take-home message
2. The additional findings of importance
3. The perspective

Despite its necessary brevity, this section has the most impact on the average reader because readers generally trust authors and take their assertions at face value. For this reason, the conclusions should also be scrupulously honest; and authors should not claim more than their data demonstrate. Hypothetical examples of the conclusions section of an abstract are presented in Table 7.

### MISCELLANEOUS OBSERVATIONS

Citation of references anywhere within an abstract is almost invariably inappropriate. Other examples of unnecessary content in an abstract are listed in Table 8.

It goes without saying that whatever is present in the abstract must also be present in the text. Likewise, whatever errors should not be made in the text should not appear in the abstract (eg, mistaking association for causality).

As already mentioned, the abstract is the only part of the paper that the vast majority of readers see. Therefore, it is critically important for authors to ensure that their enthusiasm or bias does not deceive the reader; unjustified speculations could be even more harmful. Misleading readers could harm the cause of science and have an adverse impact on patient care.<sup>[12]</sup> A recent study,<sup>[13]</sup> for example, concluded that venlafaxine use during the second trimester of pregnancy may increase the risk of neonates born small for gestational age. However, nowhere in the abstract did the authors mention that these conclusions were based on just 5 cases and 12 controls out of the total sample of 126 cases and 806 controls. There were several other serious limitations that rendered the authors' conclusions tentative, at best; yet, nowhere in the abstract were these

other limitations expressed.

*As a parting note:* Most journals provide clear instructions to authors on the formatting and contents of different parts of the manuscript. These instructions often include details on what the sections of an abstract should contain. Authors should tailor their abstracts to the specific requirements of the journal to which they plan to submit their manuscript. It could also be an excellent idea to model the abstract of the paper, sentence for sentence, on the abstract of an important paper on a similar subject and with similar methodology, published in the same journal for which the manuscript is slated.

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