Articles

Abstracts of research articles: readers' expectations and guidelines for authors

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Abstract
This study aimed to investigate readers' expectations concerning the form and content of English scientific abstracts, and to formulate guidelines for authors and translators. The guidelines are based on results of an original questionnaire that analysed readers' expectations, and are presented in the context of data in linguistic publications or in handbooks for editors and authors. An international multidisciplinary group of 43 postgraduate students and lecturers answered the questionnaire. Its results are generally consistent with published data, but many of the comments made by respondents are interesting.

Introduction

The quality of the abstract of a research article determines whether the paper is going to circulate, ie, whether it was worth writing at all.[1] For the abstract to perform its crucial role in international scientific communication effectively, it is important to take into account the expectations of its readers. Surprisingly, no detailed data on readers' expectations of abstracts have been published.

The goals of this study were: (1) to investigate readers' expectations of the English abstracts of scientific research articles; (2) to compare their expectations with the advice given in linguistic publications and in handbooks for science editors and authors; and (3) to formulate guidelines for authors and translators of scientific abstracts on the basis of results of this study.

Methods

Questionnaire

The questionnaire consisted of three parts. In the first part, the aim of the questionnaire was explained (with special focus on English abstracts of papers written in uncommon languages) and demographic information about the respondents was collected, together with data on the number of their own publications, field(s) of interest, and a measure of how frequently the respondents read abstracts of the type being analysed.

In the second part of the questionnaire, respondents' expectations concerning the content and form of abstracts were queried. The main types of information included in abstracts were listed, but respondents could add to this list any other kinds of information if they regarded them as important. In addition, five qualities of the text were chosen: the structure and length of the abstract, use of correct English and of terminology, and understandability to non-specialists. (The questionnaire is available from the author.) Each kind of information and each quality were scored on a scale of 1 (irrelevant) to 5 (essential). Student's *t*-test was used to assess the significance of differences.

In the third part of the questionnaire, respondents were asked to evaluate four selected sample abstracts. These results will be the subject of another paper.

Participants

The questionnaire was completed by 43 postgraduate students and staff members of the Summer Program in Environmental Sciences and Policy at the Budapest College of the Central European University in 1994. The students came from central and eastern Europe, while the staff members were mainly from western Europe. All had a good command of English and held a degree (6 held doctorates or were professors, 33 held master's degrees, and 4 held bachelor's degrees). Most were aged between 25 and 35 years, and included biologists or ecologists (11), physicists (9), and engineers (7). Around 23% of the respondents had not published; 40% had 1-3 publications, and 37% had 4-100 (mean 10.2). Most of the respondents had read abstracts of the type to be analysed in this study: 4 very often, 16 often, 15 sometimes, and 7 rarely.

Results

General expectations of readers

The table shows that results and/or conclusions as well as the purpose of the study were regarded as the most important kinds of information included in the abstract (mean 4.60 and 4.37, respectively). Materials and methods also ranked high (mean 3.72), while the study period, type of study, geographical region, and the exact place of the study were considered as relatively unimportant (mean 2.81–2.44). Only five respondents said that additional details should be given: namely, references to previous research in the given field, an explanation of abbreviations, practical applications of the study, the main limitations of results, or a short description of conditions instead of the exact location of the area where the study was made.

Among the qualities analysed, the use of correct terminology ranked highest (mean 4.23), followed by clear abstract structure and correct English (mean 3.95 and 3.84, respectively). Brevity was graded slightly lower (mean 3.33), while understandability to non-specialists was regarded as rather unimportant (mean 2.51). The importance of brevity and understandability was the most controversial (SE 0.18

Table 1. Importance of various kinds of information found in abstracts and selected qualities of abstracts

	Characteristic	Sample size	Mean (SE)	NS*
a	Results and conclusions	43	4.60 (0.11)	b
b	Purpose of study	43	4.37 (0.14)	ac
c	Correct terms	43	4.23 (0.13)	b
d	Clear structure	41	3.95 (0.14)	ef
e	Correct English	43	3.84 (0.15)	df
f	Material and methods	43	3.72 (0.14)	de
g	Brevity	43	3.33 (0.18)	
h	Study period	43	2.81 (0.15)	ijk
i	Kind of study	43	2.74 (0.15)	hjkl
j	Region of study	43	2.56 (0.16)	hikl
k	Understandability to non-specialists	43	2.51 (0.17)	hijl
l	Exact place of study	43	2.44 (0.16)	ijk
m	Other kinds of information	43	1.47 (0.13)	

*Characteristics that do not differ significantly from this one ($P \leq 0.05$, Student's *t* test).

and 0.17, respectively), while the least controversial (SE 0.11) was the importance of results and/or conclusions of the study.

Comments of respondents

About a third of respondents contributed comments:

- Figures and tables should not be referred to in the abstract
- The most important kinds of information found in abstracts are: the object/aim of research, a brief description of methods, and a clear statement of conclusions, but sometimes also the study area, time, and practical applications
- Brief information on methods is important when discussing/deciding about methodology for one's own research
- The abstract should be very detailed but still not too long
- For those living in countries without easy access to journals, it is important that the abstract provides a detailed account of the article
- Only general ideas should be included in the abstract, because "if a reader is interested in general ideas of your article, then he would apply to you directly"
- The major function of abstracts is not to inform but to enable the readers to decide whether the paper is interesting to them
- A native speaker of English stated that abstracts are often very difficult to understand for people who do not know English very well
- Abstracts should be written in simple sentences, and avoid sophisticated vocabulary; they should be very concise but also easy to understand
- The scientific degree of the abstract should match the potential audience of the article and meet the demands of the journal's editors.

Discussion

Readers' expectations concerning the content of abstracts generally agree with data found in linguistic literature and in handbooks for science editors and authors: [2, 3] the main kinds of information to be presented briefly in the abstract are the results and conclusions, but also the purpose of the study and the methods used. A few respondents noted that in some fields of scientific investigation, the study period and geographic area are important and should therefore be mentioned in the abstract. If this is the case, study area can be described briefly or the exact place and/or region where the study was made can be indicated, depending on which will be of more use to the readers.

Other kinds of information suggested for inclusion in the abstract were practical applications of the research, and an explanation of uncommon abbreviations. The remaining kinds of information that were suggested for inclusion (references to previous research, main limitations of the results) are generally outside the scope of abstracts.

Exclusions

References to previous research should not be given, because abstracts function also as independent discourses, copied verbatim in information retrieval systems and current awareness publications. For the same reason, abstracts should not refer to tables, figures or any other parts of the main body of the article. This is not only the opinion of many respondents and linguists, but also is required by many renowned journals. Limitations of the results should be examined in the discussion section of the research article, and it is not advisable to include them in the abstract, for the reason that tentativeness may discourage the reader.[4] However, the abstract should not be misleading, so Bhatia maintains that discussion of methodology and experimental procedures is crucial in research abstracts.[5]

In any case, the abstract should be self-contained and present all of the data that are most likely to be important and useful to the reader. It must be also remembered, as noted by O'Connor, that the abstract should never refer to information that is not in the paper and should not repeat information given in the title, because abstract and title are always read together.[2] Weiner says that the abstract should include the internationally recognized scientific names of the species studied if they are not given in the title.[1]

What is valued

This study showed that readers appreciate a clear structure in abstracts. Swales observed that most abstracts follow the pattern typical of research articles, where an introduction precedes an account of methods, results, and conclusions.[6] Such ordering of information in abstracts is preferred by many medical journals and seems to be advisable in other fields of scientific research as well.

Respondents valued highly the proper use of specialized terms, as well as correct grammar and spelling. In addition, brevity was considered important, which is in

agreement with linguistic literature and handbooks for editors and authors.[3, 7] On the other hand, respondents regarded understandability to non-specialists as relatively unimportant, and one respondent noted that in this respect authors should adjust their texts to their potential audience. Linguists share this view.[4, 8, 9] As the abstracts of research articles are generally intended to be read by specialists, it is not necessary for them to be understandable to a lay person. However, Gopen and Swan provide useful suggestions on how the scientific texts can be written more clearly.[10]

The analysis of readers' expectations and of recommendations found in literature has enabled me to formulate some guidelines.

Guidelines for authors and translators

- Follow the journal's instructions to authors
- Do not repeat the information given in the title
- Identify which of the data will be the most interesting for prospective readers (most often readers want to know the purpose, results, and conclusions of the research)
- Preferably, first explain the purpose of the research reported. Next, briefly describe the methods (eg, experimental design) and summarize the results and conclusions, providing specific data and their statistical significance if plausible. Emphasize new and important aspects of the study
- The study area and period should be mentioned if relevant; you must then decide whether it is more sensible to give the exact location, the region, or a brief description of the study area
- If you regard it as important, include information on practical applications of the results of your research, major limitations of the results, and whether this was a single study or part of a research programme.
- Instead of listing the contents of the article, explain what was done and found. This does not apply to review articles and similar wide-scope articles, the abstracts of which can be indicative (summarising the covered topics but not conclusions)
- Do not refer to the body of the article (eg, to tables, figures, and cited literature)
- Use past tense, except in those statements where present tense is more appropriate (eg, when drawing conclusions)
- Write in third person, passive, unless the editors prefer first person
- Make sure you use correct English terms and phrases: do not translate word for word
- Use internationally recognized scientific names of organisms (eg, those found in British or American literature, which may be different from the Latin synonyms preferred in your country)
- Remember that the abstract will be read by foreigners, who may not be aware of the specific conditions, regulations, classifications, or concepts that are widely known in your country. Consequently, you may need to add some explanatory information
- Try to make the abstract easily understandable: avoid sophisticated vocabulary, complicated sentences, and tentativeness. Minimize the number of abbreviations; define them if they are not commonly known among the expected audience
- Avoid "repetition, meaningless expressions, superlatives, adjectives, illustrations, preliminaries, descriptive details, examples, footnotes"[7]
- Be consistent in spelling (follow either British or American rules)
- Make sure that your abstract is an interesting and succinct condensation of the abstracted article and is not longer than permitted by editors of the journal (usually 100–500 words)

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Ethical implications of an emerging discipline: biometrics

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Abstract
We map the development of modern biometrics, an identification technique relying on morphological, behavioural, and genetic data and then consider the collection of biometric data for aims that concern security in its wider sense, and also for biomedical research. The ethical consequences of biometrics are described in connection with the notion of ''identity'', the right to identity, and the right to privacy. We present the main findings of a European research project on biometrics called Biometric Identification Technology Ethics and conclude with open questions on the future challenges in biometrics.

Recently the term biometrics has been broadened from meaning "biological statistics" to encompass the study of "techniques that allow a person to be identified on the basis of one or more biological or behavioural traits".[1] It is used to describe identification methods and technologies that cope with personal and collective security.

This article thus concerns state-of-the-art identification techniques that rely on morphological traits (such as iris recognition, retina recognition with blood vessels, hand geometry, finger and arm veins), behavioural traits (voice and gait recognition), and genetic data (DNA analysis). We consider some general themes, including the place of biometrics in scientific literature.

Personal identification and security

Personal identification has been warranted for centuries by local communities through direct witness. Societies developed the means to control the individual's provenance and affiliation, especially during periods of increased movement and migration. For example, the second half of the 15th century saw a dramatic increase in the exchange of goods and written correspondence within Europe, and consequently in the number of envoys. These envoys carried crucial military and economic information and needed proper identification. By the end of the 15th century, Nordman says, a complex system of documents had been developed based on physical traits (height, scars, etc) to allow envoys' movement; these were the forerunners of passports and identity cards.[2]

Many of these traits, however, are variable and transitory, as are the criteria underlying "Bertillonage", a technique developed by Alphonse Bertillon in the second half of the 19th century and adopted by the law enforcement agencies of many countries. Bertillonage relied on anthropometrical measurements that were coded in 11-digit numbers corresponding to body measurements and aimed to "capture" a person's identity. However, it was not viable because of changes in the body over time, and the difficulty in making exact measurements. A Scottish missionary doctor, Henry Faulds, and a scientist, Francis Galton, recognised that fingerprints are unique,[3] revolutionising investigative recognition techniques. Today fingerprinting is supported by modern biometric techniques.[4]

The reasons for collecting biometric data are increasing: for security generally (judicial systems, police inspections, criminals identification); document management (passports, identity cards); national health systems (management and processing of health-related data); control of physical (places) access or virtual (electronic databases) access, both individual (private property) and collective (staff inspections in the workplace, for example). Moreover, biometric data are used in scientific research, especially biomedical research.

Biometry both hampers the right to privacy and protects it. Huge amounts of information are collected, stored, and exchanged for research purposes, such as epidemiological analysis and production of biomedical applications. However, electronic patient records and "smart cards" containing medical information increasingly challenge the right to privacy. Biometry is also used to limit consultation of medical data and to restrict physical access to human tissues and DNA banks and to laboratories that produce biotechnologies with possible military applications. Many institutions are thus being equipped with biometric identifiers to control the electronic flow of data.

The ethics of biometrics

There are many definitions of "identity" in psychology, sociology, and philosophy. "Personal identity" deals with questions about ourselves, many of the which are familiar ones: What am I? When did I begin? What will happen to me when I die?[5] Every person needs to acknowledge to attain a unitary view of himself or herself – a biographical narrative – to give sense to his or her life.[6] Although the protection of each individual's personal identity is a fundamental human right, this right has been addressed only in the International Convention on the Rights of the Child[7]:

> The child shall be registered immediately after birth and shall have the right from birth to a name, the right to acquire a nationality and, as far as possible, the right to know and be cared for by his or her parents (Article 7)

> States Parties undertake to respect the right of the child to preserve his or her identity, including nationality, name and family relations as recognized by law without unlawful interference (Article 8)

Some scholars have interpreted Articles 6 and 12 of the Universal Declaration of Human Rights[8] as referring to the right to an identity:

> Everyone has the right to recognition everywhere as a person before the law (Article 6)

> No one shall be subjected to arbitrary interference with his privacy, family, home or correspondence, nor to attacks upon his honour and reputation. Everyone has the right to the protection of the law against such interference or attacks (Article 12)

Although Article 12 is often cited as the foundation of the right to privacy, its reference to honour and reputation can also be interpreted as an appeal to respect personal identity. Indeed, personal identity is linked to personal life and to privacy: personal choices strongly contribute to a person's identity. The right to a personal identity and the concept of using a biometric measurement in this context is not new; what is relatively new is electronic verification of identity.

Biometric data pose difficult ethical questions, some of which concern any collection and retention of personal data. One of the main problems applies to informed consent and to transparency in data processing. In every country that explicitly allows use of biometric data, it is generally governed by specific laws that establish the obligation to acquire a person's informed consent, except in cases of emergency or in circumstances that justify breaches of the principle of respect for autonomy. Other problems relate to the management and retention of information (data access, use, and disclosure), to compliance with the aims for which biometric data were collected, or to social discrimination. Questions also arise regarding the balance between the goals of biometric identification and the means used to achieve it and their risks, including direct and indirect risks of biometrics; the former associated with the use of equipment for reading biometric data and the latter associated with the use of biometric information for discriminatory purposes.

Laws can partly deal with some of these problems by, for example, establishing rules that apply to specific circumstances and constraints on how long data can be kept, compliance with the purposes for which data were collected, and limitations on the uses of data. Usually the laws concern other methodological aspects, including validation of procedures to ensure quality and standardisation of data collection, control of access, and responsibilities for data registration and use.[9]

Biometrics and the person

Biometric techniques are associated with more profound questions, since the notions of "person" and "individual" are involved. For instance, one may wonder if data collected through modern biometric techniques are an expression of a person's identity or if they contribute to the dehumanisation of the individual, thus reducing a person to a series of numerical codes stored in electronic memories. To quote Michael Foucault, the risk is that "an individual may be created by regulatory powers".[10]

Paul Ricoeur differentiated two aspects of human "identity".[7] The first concerns the objective body, which endures in time and space despite its alterations, ageing, and diseases. Ricoeur defines this aspect of identity as "mêmeté". The second element consists of experiences involving conscience and reasoning of every human being. The former is called "ipséité" (from the Latin "ipse"), while the latter can be rendered in English with "self". Many Latin-based languages, such as French and Italian, use a single word ("identité", "identità") to indicate both meanings.

Modern biometrics seems to blur this philosophical distinction. Multimodal and behavioural biometrics aim to monitor behaviours and mental states. Biometrics lies at a complex crossroad of various philosophical, political, and social issues.

Biometrics, security, and individual freedom

Biometrics poses questions that are relative to individual identity (involving the dividing line between individual and collective values) and also to the conflicts that may be triggered among them.

The increase in bioterrorism has made people around the world more familiar with the collection and storage of biometric information for security reasons. Collective security is also pursued through highly sophisticated individual controls. Individual freedoms and the right to the respect for anonymity may be encroached upon even further as we move from vigilance to surveillance – that is, always towards more far-reaching forms of control. Consequently, Article 8 of the Universal Declaration on Human Rights,[8] which established that "everyone has the right to respect for his private and family life", may be infringed.

It seems that there is a paradox between the protection of privacy and the safeguarding of every citizen's integrity – to protect the latter, the former is encroached upon.

The BITE Project

The ethical aspects of biometrics, as mentioned above, have been the subject of a huge, integrated European research project called Biometric Identification Technology Ethics (BITE; www.biteproject.org). Coordinated by the Rome-based Centre for Science, Society and Citizenship and involving leading EU experts and US scholars, BITE was the first global multicentre research project focused on the social impact of biometrics. Its documents, conference proceedings, and public e-consultations will prove useful for scientists, experts, decision-makers, universities, industries, and other social and cultural stakeholders in dealing with the ethical issues raised by biometrics, as well as intensifying the public debate on the implications of biometrics.[11]

A fundamental understanding of biometric technologies, applications, and issues is needed for discussion and reaching consensus. Because scientific and technological developments in biometrics are rapid and numerous, good dissemination of information and of scientific results about biometrics is important, not only to increase public

knowledge but also to inform scientists, overcoming the barriers which separate their different fields. All scientists are part of the general public when something that lies outside of their field is discussed.

Trends and issues

Two important trends – technology convergence and interoperatility – are affecting future ethical issues in the development and deployment of biometric technologies.

Technology convergence

The first trend is the convergence of technology. For example, radio frequency identification (RFID) uses electromagnetic waves to collect information contained in devices (TAGs) that are physically linked with the item to be identified by an RFID terminal (reading system). The information provided by the TAG can be continuously updated and the TAG can be passive (without its own feed) or active (with its own feed). In the former, readings should be made at regular intervals[12].

Developments in nanotechnology and biotechnology have created new opportunities for surveillance and have stimulated new applications in the fusion of RFID, biometrics, and micro electro-mechanical systems. Cheap, reliable, and low power micro-electronics have allowed cameras, processors, and power supplies to be used in a wide array of security-related applications, such as video surveillance and monitoring) In addition the fusion of biotechnological sensors with nano devices has given rise to technologies such as ZigBee which, by coordinating communication between thousands of tiny sensors, can detect and transmit information about motion, heat, chemical composition, and particle content. Another example is "Smart Dust", which allows the construction of a reliable and affordable network backbone that uses much less power and bandwidth than average sensors, and that has a longer battery life and lower cost than older technologies.

Technology convergence is the key to evolution of future surveillance. Being able to covertly detect not only individuals but also their "intentions" is a dramatic breakthrough that could overturn any standard approach to prevention of crime and terrorism. But the potential for misuse is enormous and poses a basic ethical and political question about the legitimacy of developing such technologies: "Measures against terrorism should not and need not reduce standards of protection of fundamental rights which characterise democratic societies. A key element of the fight against terrorism involves ensuring that we preserve the fundamental values which are the basis of our democratic societies and the very values that those advocating the use of violence seek to destroy."[13]

Interoperability

A second critical technology trend is related to system interoperability – the ability of two or more systems or components to exchange and use information. Interoperability trends are motivated partly by the desire to create economies of scale and may also concern questions of market dominance. For instance, in 2004, the European Commission found that Microsoft had abused its market power by deliberately restricting interoperability between Windows PCs and non-Microsoft workgroup servers. By doing so, Microsoft was able to acquire a dominant market position for workgroup server operating systems, the heart of corporate IT networks. Microsoft was ordered to disclose complete and accurate interface documentation, which will enable rival vendors to compete on an equal footing ("the interoperability remedy").

Interoperability is an essential component of security systems and surveillance programmes. This is evident in areas such as border security, which is a priority for most of the world's governments. In 2004 the International Civil Aviation Organization agreed on an international standard for passports with globally interoperable face recognition systems and RDIF chips in which biometrics (including fingerprints) are to be stored.

The US VISIT system provides the foundations for screening everyone entering and leaving the country and retaining their profiles for up to 40 years. This system relies on biometric identifiers, and everyone entering the US (including Canadians and returning Americans) will be required to have biometric identifiers on passports, smartcards, or visas. Canada is preparing to implement a parallel but interoperable system and began field trials of electronic visas with biometric features in October 2006. The European Commission is developing an "automated fingerprint identification system" and an "entry–exit" system to record all travel into and out of the EU. Police and intelligence services across Europe will have access to the fingerprint data, and linked EU visa information and border control systems will send automatic EU-wide alerts on all illegal aliens.

The increase of interoperability and the proliferation of public and private databases are generating an increasing demand to pool data from diverse technologies (RFID, biometrics, global positioning systems, smart identity cards, etc) and from diverse applications and systems (signals intelligence, automatic number plate recognition, electronic patient records, DNA databases, etc). This raises many concerns, not least of which is the ability of sophisticated "data-mining" techniques to discover unknown and non-obvious relationships within sets of information. Privacy can be breached.

At the same time, interoperability is an effective way to fight terrorism and crime. Cities are organised through a myriad of electronic passage points, negotiated through a widening number of electronic identities, code words, pass words, PIN numbers, user names, access controls, electronic cards, or biometric scans. This vast network of sensors and communications devices is currently used almost exclusively for traffic management, safety, and emergency response – but it could be used for security, crime prevention, and antiterrorism. This is a reason for serious concern. The growing proliferation of interconnected identification technologies should not mean the indefinite growth of an indistinct "security area".

Conclusions

New technologies for identification and verification of identities (authentication) are radically changing the relationship between citizen and state. The globalisation of identity management could reassure or seriously concern us, depending upon our understanding of the use of science and technology in society. While identity management concepts are by no means new, the scale of empowerment that technology, and especially biometrics, now provides certainly is. Can this power be managed and regulated on a global scale? This is the ethical and political challenge that scientists and policy makers have to face.

Publications from the BITE project are included in volume 43, number 1 of the Annali dell'Istituto Superiore di Sanità (the official journal of the National Institute of Health), and online.[11]

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