

Communicating scientific research: evidence-based writing



Ana Marušić
*University of Split
School of Medicine*
ana.marusic@mefst.hr

Why publish?

- Because you have something important to say
- To change practice
- To promote thought or debate
- To allow examination of your work
- Fame
- Money
- Career advancement
- To entertain/divert/amuse
- To educate
- To console



Tim Alberts, *Short Words*

Write with a reader in mind

Why do *you* want to write about your research?



Why does the *audience* want to listen to your research?

Write with a reader in mind



The more you write based on what you know about the audience (background, language, interests, priorities)

...the more effective your writing will be

Write with a reader in mind

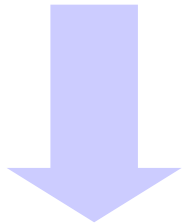


Two types of audience:
Homogenous (very captive and attentive)
Heterogenous (becoming more important)

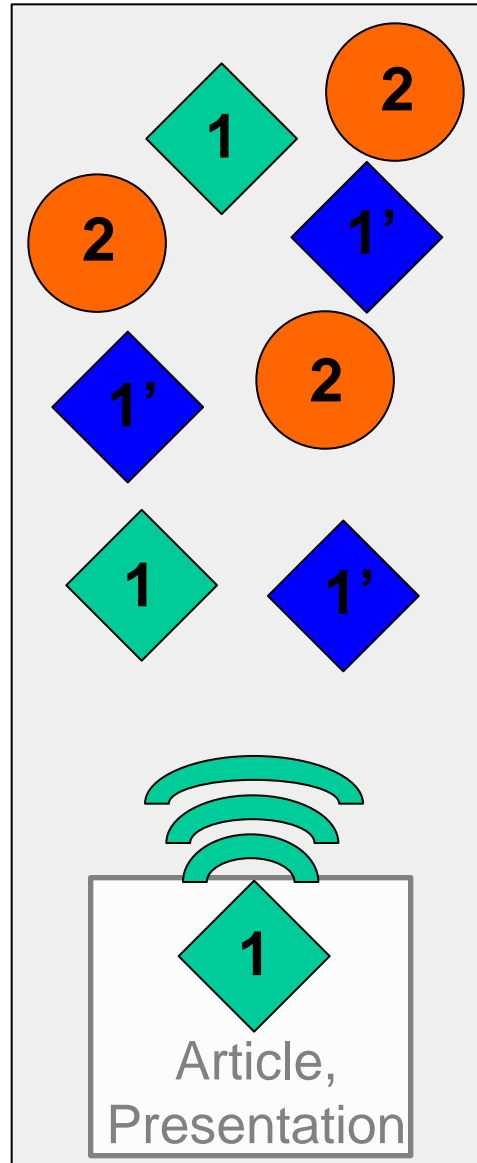
The 'two audiences' for your writing

Audience 1

- Experts in the same field as the researcher

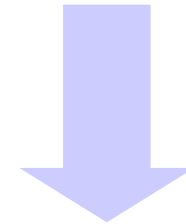


They're already convinced the research makes sense and is useful



Audience 2

- Experts in fields related to the researcher's
- Experts in different fields from the researcher's



Not yet convinced that the research makes sense and is useful

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

Sir Charles Darwin

The man of science appears to be the only man who has something to say just now, and the only man who does not know how to say it.

Sir James Barrie

PUBLICATION

new knowledge

for the first time

... it is only in attempts to explain his work to *somebody who has not done it* that he can acquire the discipline of clear and reasoned communication which too is part of scientific method.

Karl R. Popper

Attributes of scientific communication

clarity

simplicity



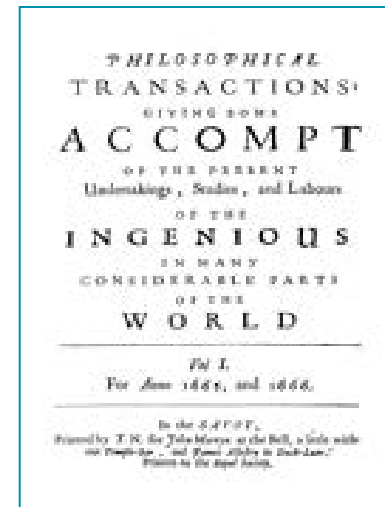
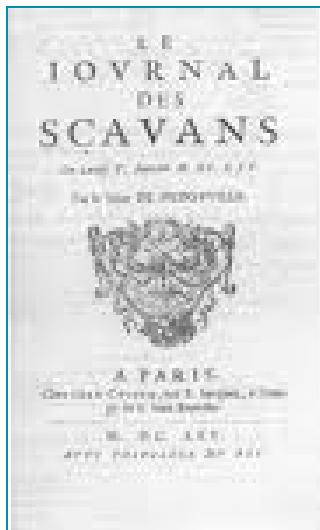
accuracy

understandability

1665

Journal des Scavans

*Philosophical Transactions of the
Royal Society of London*



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Table of Contents

1665; 1 (1-22)

Henry Oldenburg

Epistle Dedicatory

Phil. Trans. 1665 1 rstl.1665.0001; doi:10.1098/rstl.1665.0001

» [Full Text \(PDF\)](#)

The Introduction

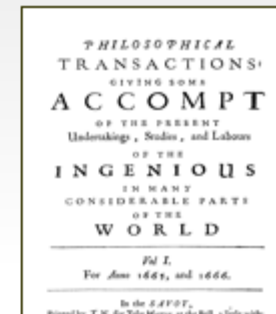
Phil. Trans. 1665 1 1-2; doi:10.1098/rstl.1665.0002

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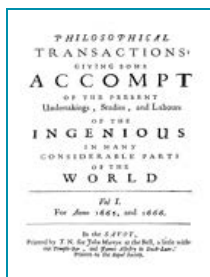
[Next Issue »](#)

This Issue

January 1, 1665; 1 (1-22)



<http://rstl.royalsocietypublishing.org/content/by/year>



1665

Some Anatomical Observations of Milk Found in Veins, Instead of Blood; And of Grass, Found in the Wind-Pipes of Some Animals

Of an Observation, not Long Since Made in England, of Saturn

Some Observations of the Effects of Touch and Friction

The Method Observed in Transfusing the Bloud out of One Animal into Another

An Account of Some Observations, Lately Made in Spain, by His Excellency the Earl of Sandwich

An Account of Some Books

Errata

Correction

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Note

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FACTOR
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Search

Home

Articles

Authors

Reviewers

About this journal

My BMC Medicine

Top

Abstract

Introduction

Methods

Results

Discussion

Conclusions

Abbreviations

Competing
interests

Authors'
contributions

Additional fi...

Acknowledgements

References

Correspondence

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Five-step authorship framework to improve transparency disclosing contributors to industry-sponsored clinical trial publications

Ana Maružić^{1*}, Darko Hren², Bernadette Mansi^{3,4}, Neil Lineberry^{4,5}, Ananya Bhattacharya^{4,6}, Maureen Garrity^{4,7}, Juli Clark^{4,8}, Thomas Gesell^{4,9}, Susan Glasser¹, John Gonzalez^{11,4}, Carolyn Hustad^{12,4}, Mary-Margaret Lannon^{13,4}, LaVerne A Moon and Teresa Peña^{15,4}

* Corresponding author: Ana Maružić? ana.marusic@mefst.hr Author Affiliations

1 Department of Research in Biomedicine and Health, University of Split School of Medicine, Šoltanska 2, Split, 21000, Croatia

2 University of Split School of Humanities and Social Sciences, Split, Croatia

3 GlaxoSmithKline, King of Prussia, PA, USA

4 Member of MPIP Initiative Steering Committee, Boston, MA, USA

5 Navigant Consulting, Boston, MA, USA

6 Bristol-Myers Squibb, Princeton, NJ, USA

7 Astellas, Northbrook, IL, USA

8 Amgen, Thousand Oaks, CA, USA

9 On behalf of the International Society for Medical Publication Professionals, Briarcliff NY, USA

10 Janssen Research &Development, LLC, Raritan, NJ, USA

11 AstraZeneca, Alderley Park, UK

12 Merck & Co, Inc, Whitehouse Station, NJ, USA

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Five-step authorship framework to improve transparency in disclosing contributors to industry-sponsored clinical trial publications

Ana Maruči?*, Darko Hren, Bernadette Mansi, Neil Lineberry, Ananya Bhattacharya, Maureen Garrity, Juli Clark, Thomas Gesell, Susan Glasser, John Gonzalez, Carolyn Hustad, Mary-Margaret Lannon, LaVerne A Mooney and Teresa Peña

* Corresponding author: Ana Maruči? ana.marusic@mefst.hr

BMC Medicine 2014, 12:197 doi:10.1186/s12916-014-0197-z

Pre-publication versions of this article and reviewers' reports

Original Submission - Version 1	Manuscript		16 Jul 2014
Reviewer's Report	T Lemmens		28 Aug 2014
Reviewer's Report	Davina Gherzi		28 Aug 2014
Reviewer's Report	David Moher		02 Sep 2014
Resubmission - Version 2	Manuscript	Author's comment	23 Sep 2014
Editorial acceptance			01 Oct 2014

11 AstaZeneca, Alderley Park, UK

12 Merck & Co, Inc, Whitehouse Station, NJ, USA

What has changed?

pico

Effect of tobacco smoking on survival of men and women by social position: a 28 year cohort study

Laurence Gruer,¹ Carole L Hart,² David S Gordon,¹ Graham C M Watt³

¹NHS Health Scotland, Eghisstone House, Glasgow G2 2HF

²Public Health and Health Policy, Division of Community-based Sciences, University of Glasgow, Glasgow G12 8RZ

³General Practice and Primary Care, Division of Community-based Sciences, University of Glasgow, Glasgow G12 9LX

Correspondence to: L Gruer
Laurence.Gruer@health.scot.nhs.uk

Cite this as: *BMJ* 2009;338:b480
doi:10.1136/bmj.b480

STUDY QUESTION How do smoking, sex, and social position affect the long term survival of middle aged men and women?

SUMMARY ANSWER Both male and female smokers in all social positions had poorer survival than those who had never smoked in even the lowest social positions. The differences in survival between smokers and never smokers were much greater than those between smokers in different social positions. Smoking nullified women's otherwise large survival advantage over men. Smoking itself was thus a greater source of health inequality than social position in this population. This suggests the scope for reducing health inequalities related to social position is probably limited, in this and similar populations, unless many smokers in lower social positions can be enabled to stop smoking.

Participants and setting

Men and women aged 45-64 years were recruited during 1972-6 in Renfrew and Paisley, two towns in west central Scotland.

Design, size, and duration

This was a prospective cohort observational study of 8353 women and 7049 men followed up for 28 years. Data obtained at recruitment included occupation, place of residence, and smoking status (current, former, or never smokers). The cohort was divided into 24 groups by sex, smoking status, and social class (classes I + II, III non-manual, III manual, and IV + V) or deprivation category of place of residence. The main outcome measure was death, reported as relative mortality (adjusted for age and other risk factors) and as Kaplan-Meier survival curves and survival at 28 years.

Main results and the role of chance

Of the 7988 women and 6967 men with complete data, 4387 women and 4891 men died over 28 years.

Compared with women in social classes I + II who had never smoked (the group with lowest mortality), the adjusted relative mortality of smoking groups ranged from 1.7 (95% confidence interval 1.3 to 2.3) to 4.2 (3.3 to 5.5). Former smokers' mortalities gradually fell towards those of never smokers. By social class (highest first), age adjusted survival after 28 years was 65%, 57%, 53%, and 56% for female never smokers; 41%, 42%, 33%, and 35% for female current smokers; 53%, 47%, 38%, and 36% for male never smokers; and 24%, 24%, 19%, and 18% for male current smokers (figure). Analysis by deprivation category gave similar results.

Bias, confounding, and other reasons for caution

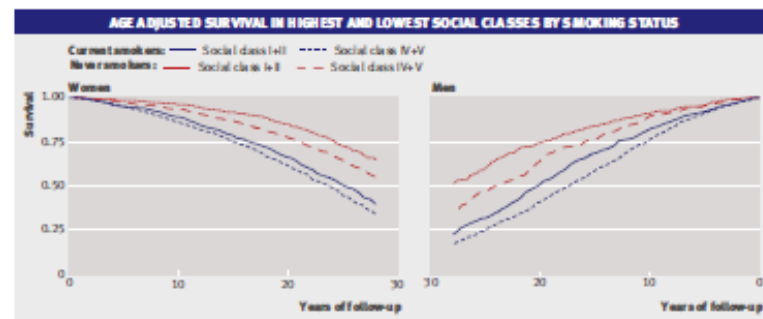
With a participation rate of almost 80%, complete records of social class and death of over 97% and 99% respectively for the cohort, and adjustment for age and other factors, the scope for bias and confounding was low. Because smoking status was taken at recruitment and many, especially the more affluent, smokers would have subsequently stopped and improved their health, the full impact of lifelong smoking on survival may have been understated.

Generalisability to other populations

Comparisons with similar post-industrial populations in Europe suggest the findings could be expected wherever smoking has been prevalent for many decades.

Study funding/potential competing interests

LG and DSG are employees of NHS Health Scotland. CLH and GCMW are employees of the University of Glasgow. The analyses conducted by CLH were funded by NHS Health Scotland.



This is a summary of a paper that was published on bmj.com as *BMJ* 2009;338:b480

• Not much change to the body of the article

JAN. 13, 1894.]

ACTINOMYCOSIS.

[THE BRITISH MEDICAL JOURNAL 61

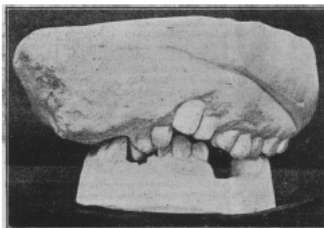
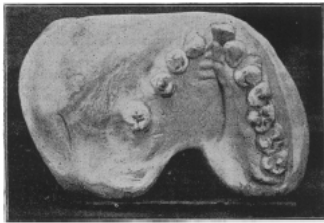
BMJ Case Reports 2011; doi:10.1136/bcr.10.2011.4886

OSTEOMA OF THE SUPERIOR MAXILLA: EPITHELIOMA OF THE TONGUE.

By H. T. DRESCHFELD, L.D.S.,

House Dental Surgeon to the Victoria Hospital, Manchester.

P. H., aged 52, a mechanic by trade, first came under my notice on August 23rd, 1893. At that time he was suffering from epithelioma of the inferior anterior surface of the tongue in a median position on either side of the frenum. The submaxillary lymphatic glands were only slightly affected. The right cheek was deformed by a rounded swelling extending over the whole of the superior maxilla, with



vertical elevation of at least 1½ inch. This was found to be a solid bony tumour, which, according to the patient's history, had been caused by a fall from a ladder about twenty

years ago. The epithelioma was removed by the usual method, the angle of the mouth being difficult, an incision was made from the two-thirds of the tongue and the greater part of the floor of the mouth being cut away. No ill-effects were noticed in the patient, who was upon home.

The accompanying figures are taken from plaster casts.

THE PROGNOSIS AND TREATMENT OF ACTINOMYCOSIS

By W. B. RANSOM, M.A.,
Physician to the General Hospital

On November 10th, 1891, I reported to the Anatomical Society the case of a man who had been free from all signs of disease for two years have elapsed and the patient's health, such a claim may fairly be made for his recovery that I wish to draw attention to. When the patient first came under my notice in 1871—he was suffering from distens alternating diarrhoea and constipation, alternating stony and blood-streaked, and an abscess of actinomyces were found in them. He was relieved by turpentine enemata, and after a course of calomel and β-naphthol, continued to show the same reason to believe, came from an inflamed prostate gland. During July and August 1871, iodide of potassium and liquor hydn during September and October took 10 grains of a drachm daily. Under this treatment improved, so that after October 15th the fungus were found. Since November 1871 the urine have been made, result, and the patient had been free from disease, stout, and able to walk twenty miles a day. In the paper read at the Royal Society, speaking of iodide of potassium drug has done no harm, and may be used to the suppression of the disease. Thomassen and Nocard in Europe, I have extensively used the iodide in and other forms of actinomyces of the face, in which incision complete cure, with 30 grains daily for months, and Natter's observed health abscess of the chest wall take place dose of iodide of potassium average nomyces inflammations in man, the

this lesion's behaviour in the jaws.

CASE PRESENTATION

A 14-year-old male reported to the oral diagnosis and radiology department with a complaint of facial and extraoral swelling on the inferior aspect of the left angle of mandible. He had been aware of the slow but steady increase in the size of the lesion over the past 4 years. The lesion was associated with occasional pain at night, and there was no difficulty in opening of mouth or chewing. He had facial trauma about 5 years back, and his medical history was



Figure 1 Clinical presentation.

mandible (figures 2 and 3). No similar lesions were found in maxilla, mandible, ribs and long bones.

These clinical and radiographic features were supportive of the working diagnosis of peripheral osteoma.

INVESTIGATIONS

- ▶ Complete haemogram and routine urine
- ▶ Serum calcium
- ▶ Serum alkaline phosphatase
- ▶ Serum prostaglandin estimation
- ▶ Liver function test
- ▶ Kidney function test
- ▶ Orthopantomograph
- ▶ Postero-anterior view of mandible.

DIFFERENTIAL DIAGNOSIS

- ▶ Garre's osteomyelitis
- ▶ Eosinophilic granuloma
- ▶ Osteosarcoma (early detection)
- ▶ Osteoblastoma
- ▶ Complex odontoma.

TREATMENT

Under local anesthesia with controlled intravenous sedation, the lesion was completely excised using oscillating saw and chisels via an extraoral approach. Curettage and fulguration of the inferior border of mandible (near the point of origin of tumour) was accomplished (figure 4). Standard protocol of perioperative antibiotic

but to pieces around it.

The basics of writing a paper: The importance of structure

Introduction What did I want to do?

Method How did I do it?

Results What did I find?

And

Discussion What might it mean?

Evidence-based writing

Draws on research in:

- cognitive psychology
- graphic design and typography
- instructional design
- linguistics
- reading research
- rhetoric

The basics of writing a paper: Still structure

- Make sure that readers know where they are, where they are going, and why.

Evidence-based writing

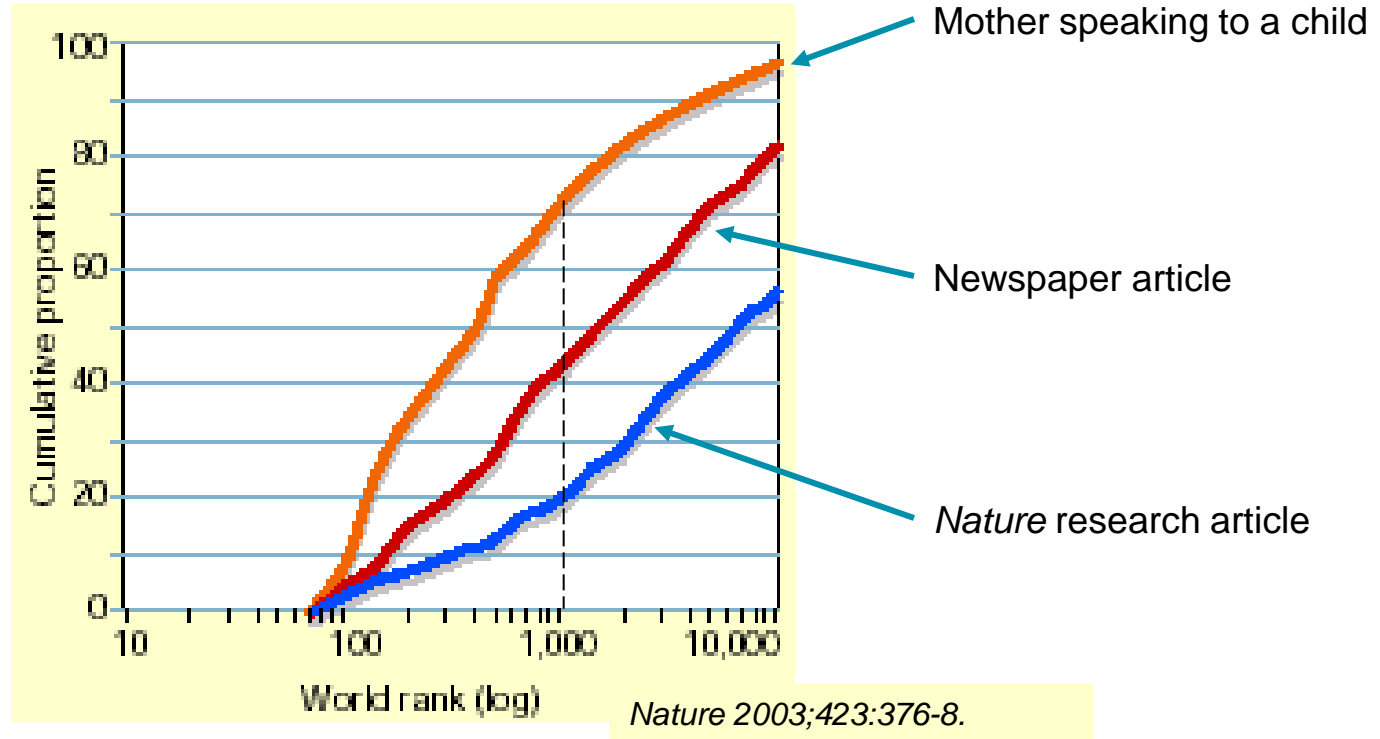
Gunning Fog Index: a measure of the readability of textual material

- Robert Gunning. *The Techniques of Clear Writing*. New York: McGraw-Hill, 1968.

Interpretation:

- Easy reading range is 6-10.
 - The average person reads at the level 9.
 - Anything above 17th level is difficult for university students.
- | | |
|--------------------|-------|
| childrens' books | 6-10 |
| regular newspapers | 12-14 |
| medical journals | 14-16 |
| law journals | 16-18 |
| insurance policies | 18-20 |

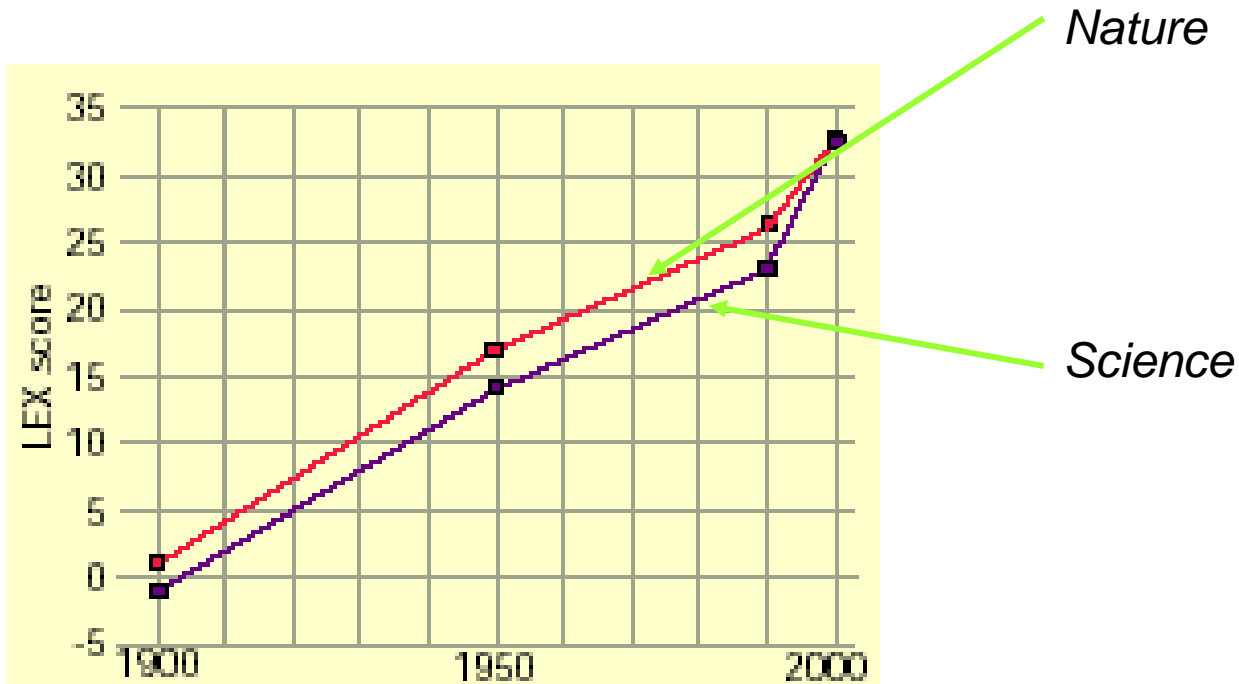
Evidence-based writing



Lexical difficulty index: Donald Hayes ranked 87000 words by their frequency of use in textbooks, novels, magazines, and encyclopedias.

1st: “the”; 10,000th: “whooping”; neuron – 23,595th

Evidence-based writing



Nature 2003;423:376-8.

Lex ratings:

Nature	+35
New Scientist	+7
Time	+2
US/UK newspapers	0
Ranger Rick	-18
TV (prime show)	-36
Farmer talking to cows	-56

Writing a paper: Structure is everything

Introduction

What did I want to do?

Method

How did I do it?

Results

What did I find?

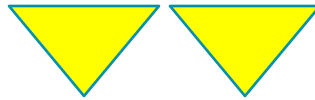
And

Discussion

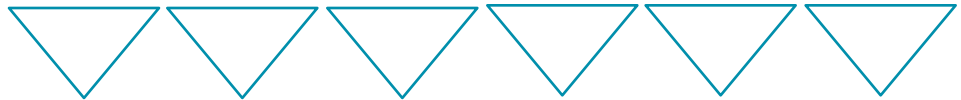
What might it mean?

Structure again!!

Introduction



Method

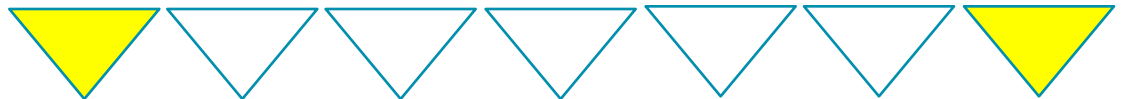


Results



And

Discussion



Organizing to show the structure: Make connections with a relevant title

- Readers bring their prior experience and knowledge
- Relevant title helps to make appropriate associations

Washing clothes

The process is actually quite simple. First you arrange things into different groups depending on their makeup. Of course one pile may be sufficient depending on

Title

Why whip egg whites in copper bowls?

Nature 1984;308



Effect of colour coordination of attire with poster presentation on poster popularity

David A. Keegan, Susan L. Bannister

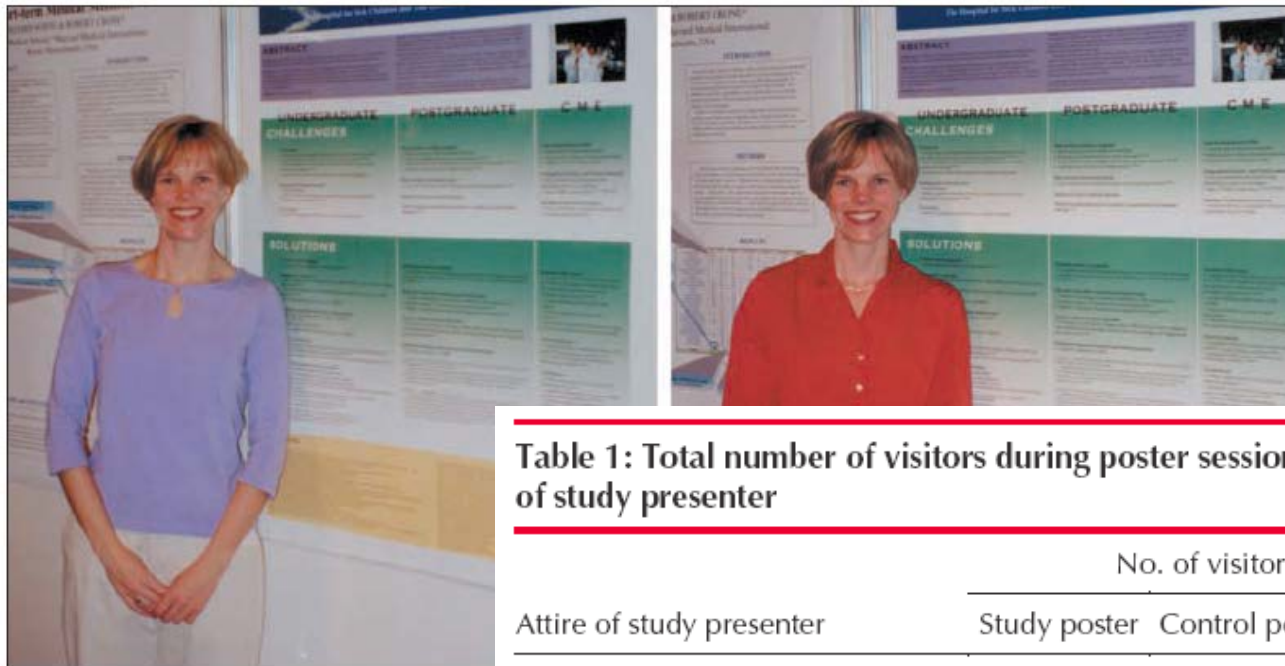
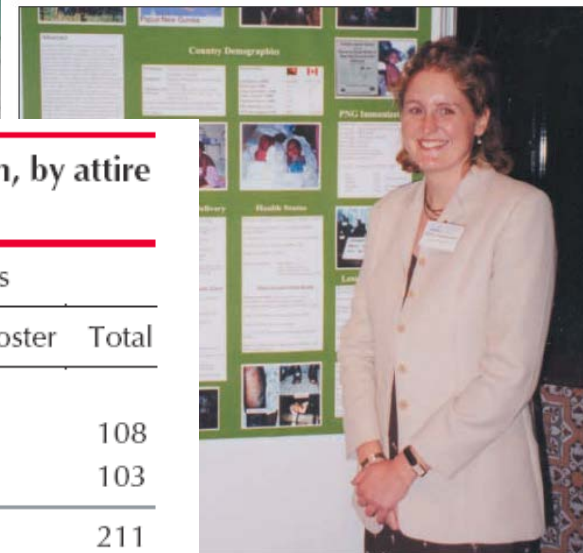


Fig. 1: Study presenter in lavender-coloured blouse (chosen to clash)

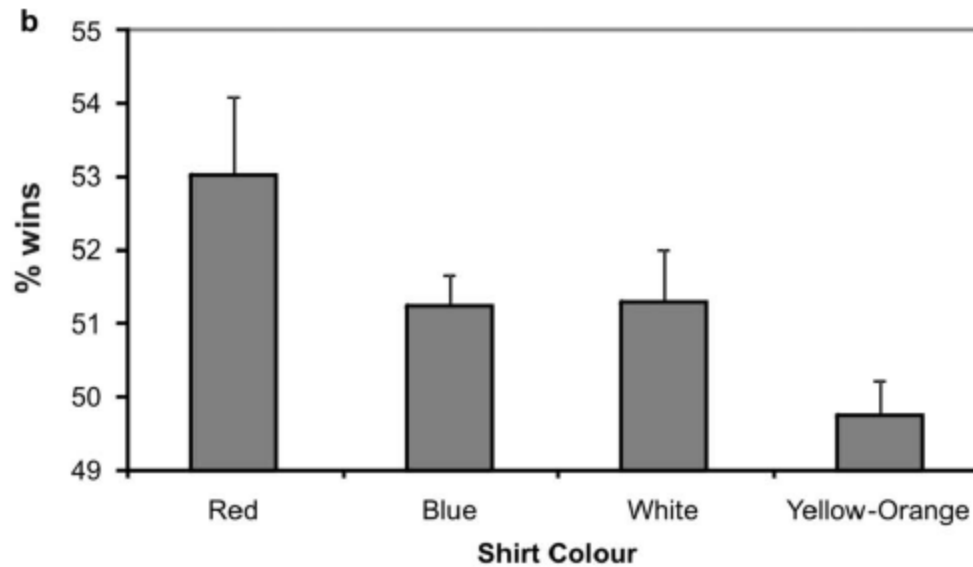
Table 1: Total number of visitors during poster session, by attire of study presenter

Attire of study presenter	No. of visitors		
	Study poster	Control poster	Total
Coordinated (lavender-coloured blouse)	68	40	108
Clashing (rust-coloured blouse)	32	71	103
Total	100	111	211



Study presenter, in neutral-coloured attire.

Red shirt colour is associated with long-term team success in English football

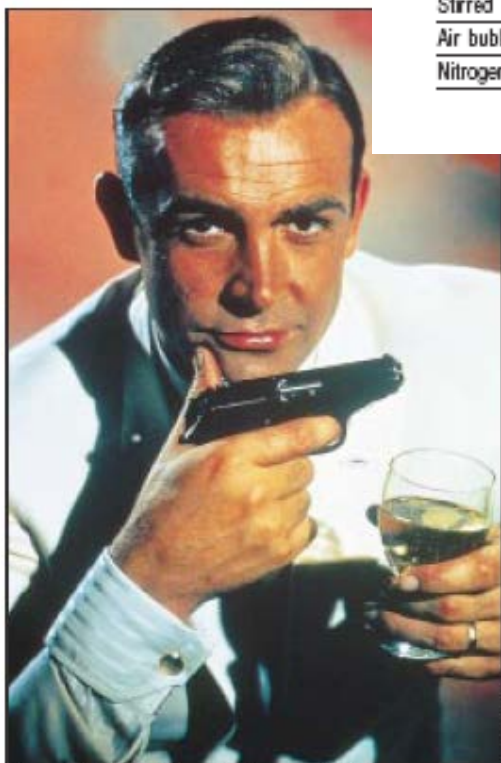


Shaken, not stirred: bioanalytical study of the antioxidant activities of martinis

C C Trevithick, M M Chartrand, J Wahlman, F Rahman, M Hirst, J R Trevithick

Table 1 Remaining luminescence after addition of martinis to the luminescent assay containing peroxide

Manoeuvre	No of samples	Percentage of peroxide control value			Significance (shaken v stirred)
		Mean	SE	95% CI	
Shaken	7	0.072	0.020	0.023 to 0.121	t=3.418(df=11)P=0.0057
Stirred	6	0.157	0.016	0.113 to 0.201	
Air bubbled through mix	5	0.061	0.007	0.044 to 0.077	t=0.126 (df=8)P=0.904
Nitrogen bubbled through mix	5	0.057	0.030	-0.027 to 0.140	



THE GLOBAL COLLECTION

Is it martinis that help James Bond stay so healthy?

Discussion

Although the reason for the superior antioxidant activity of shaken martinis is not clear, is it possible that James Bond chose shaken (not stirred) martinis because of the improved antioxidant potential? This added antioxidant effect could result, of course, in a healthier beverage. There is no indication in the literature that 007 suffered from cataracts or cardiovascular disease, hence he must be considered a moderate consumer of alcoholic drinks. The authors have not examined any antioxidant contributions from olives.

Title – Definition

A highly condensed version of your abstract

Irreducible number of terms needed to accurately describe the content of the paper

Title – Types

Indicative

Maintenance treatment of major depression in old age: randomized controlled trial

Informative

Two-year maintenance therapy with paroxetine prevents recurrent depression in old age: randomized control trial

Abstract

Classical form

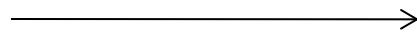
Structured

Aim

Method

Results

Conclusions



Objective

Setting

Participants

Design

Intervention

Main outcome measures

Results

Conclusions

Randomised trials of secondary prevention programmes in coronary heart disease: systematic review

Finlay A McAlister, Fiona M E Lawson, Koon K Teo, Paul W Armstrong

Authors

Byline

Phys Rev Lett. 2001 Mar 19;86(12):2515-22.

Measurement of CP-violating asymmetries in B0 decays to CP eigenstates.

Aubert B, Boutigny D, De Bonis I, Gaillard JM, Jeremie A, Karyotakis Y, Lees JP, Robbe P, Tisserand V, Palano A, Chen GP, Chen JC, Qi ND, Rong G, Wang P, Zhu YS, Eigen G, Reinertsen PL, Stugu B, Abbott B, Abrams GS, Borgland AW, Breon AB, Brown DN, Button-Shafer J, Cahn RN, Clark AR, Dardin S, Day C, Dow SF, Elioff T, Fan Q, Gaponenko I, Gill MS, Goozen FR, Gowdy SJ, Gritsan A, Groysman Y, Jacobsen RG, Jared RC, Kadel RW, Kadyk J, Karcher A, Kerth LT, Kipnis I, Kluth S, Kolomensky YG, Kral JF, Lafever R, LeClerc C, Levi ME, Lewis SA, Lionberger C, Liu T, Long M, Lynch G, Marino M, Marks K, Meyer AB, Mokhtarani A, Momayezi M, Nyman M, Oddone PJ, Ohnemus J, Oshatz D, Patton S, Perazzo A, Peters C, Pope W, Pripstein M, Quarrie DR, Rassin JE, Roe NA, Romosan A, Ronan MT, Shelkov VG, Stone R, Telnov AV, von der Lippe H, Weber T, Wenzel WA, Zisman MS, Bright-Thomas PG, Harrison TJ, Hawkes CM, Kirk A, Knowles DJ, O'Neale SW, Watson AT, Watson NK, Deppermann T, Koch H, Krug J, Kunze M, 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Laboratoire de Physique des Particules, Annecy-le-Vieux, France.

Abstract

We present measurements of time-dependent CP-violating asymmetries in neutral B decays to several CP eigenstates. The measurement uses a data sample of 23×10^6 $Upsilon(4S) \rightarrow B\bar{B}$ decays collected by the BABAR detector at the PEP-II asymmetric B Factory at SLAC. In this sample, we find events in which one neutral B meson is fully reconstructed in a CP eigenstate containing charmonium and the flavor of the other neutral B meson is determined from its decay products. The amplitude of the CP-violating asymmetry, which in the standard model is proportional to $\sin 2\beta$, is derived from the decay time distributions in such events. The result is $\sin 2\beta = 0.34 \pm 0.20$ (stat) ± 0.05 (syst).

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Fakultät für Mathematik und Physik, Albert-Ludwigs-Universität, Freiburg i.Br., Germany.

Abstract

A search is reported for the pair production of a new quark b' with at least one b' decaying to a Z boson and a bottom quark. The data, corresponding to 2.0 fb⁻¹ of integrated luminosity, were collected from pp collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector at the CERN Large Hadron Collider. Using events with a b-tagged jet and a Z boson reconstructed from opposite-charge electrons, the mass distribution of large transverse momentum b' candidates is tested for an enhancement. No evidence for a b' signal is detected in the observed mass distribution, resulting in the exclusion at a 95% confidence level of b' quarks with masses $m(b') < 400$ GeV that decay entirely via $b' \rightarrow Z+b$. In the case of a vectorlike singlet b' mixing solely with the third standard model generation, masses $m(b') < 358$ GeV are excluded.

PMID: 23006356 [PubMed]

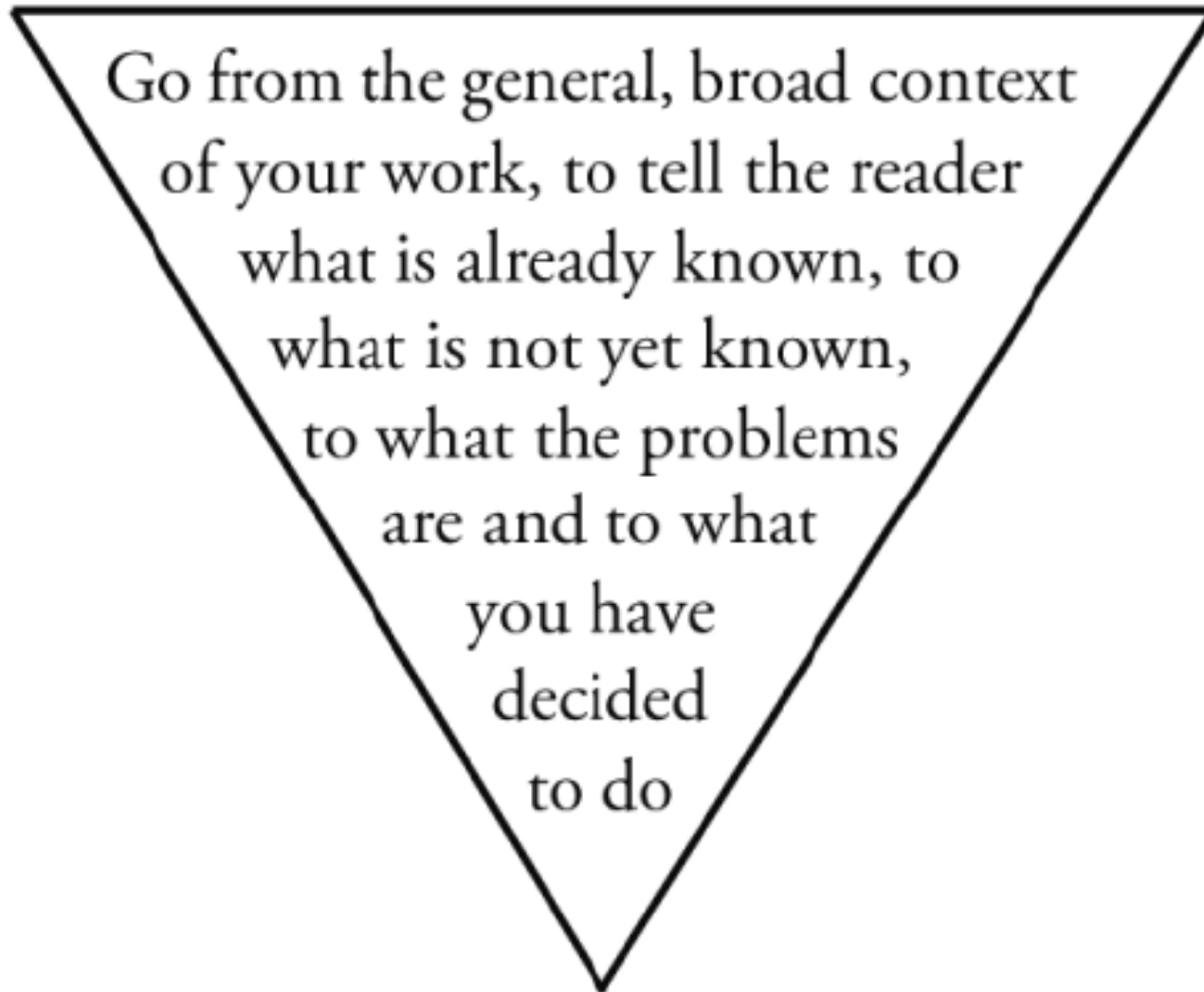
 [LinkOut - more resources](#)

3040 authors on the byline

– particle physics experiment at the Large Hadron Collider at CERN, European Organization for Nuclear Research (Medline article record available at

<http://www.ncbi.nlm.nih.gov/pubmed/23006356>).

Writing a paper: Introduction



Writing a paper: Methods

- Like a recipe
- For informed readers this is the most important section
- Describe how subjects were selected and excluded
- Don't describe standard methods in detail - use references
- Statistics
- Ethics

Writing a paper: Methods

“Our readers would be amazed to learn how often we have to remind authors to simply mention where and when their study was conducted.”

Alfredo Morabia, Editor, *Preventive Medicine*

Material and Methods

Pediat Res 1972;6:26

Blood for analysis was taken from 48 informed and consenting subjects; their age was 6 months to 22 years.

Writing a paper: Results

Figures and Tables should:

- Add information
- Save space
- Be self-explanatory
- Not be overloaded with numbers or ink

Results: Give numbers in ways that readers understand best

Evidence-based guidelines:

- Keep numbers to to significant digits (except where absolutely necessary).
- Give fractions as well as percents; give raw numbers for small samples.
- Be aware that people don't appreciate the magnitude of large numbers (greater than a million).
- Avoid Roman numerals, except for cranial nerves, clotting factors, and world wars.

Rossner M, Yamada KM. What's in a picture? The temptation of image manipulation. *J Cell Biol* 2004;166:11-15

Journal Policy:

- No specific feature within an image may be enhanced, obscured, moved, removed, or introduced.
- Adjustments of brightness, contrast, or color balance are acceptable if they are applied to the whole image and as long as they do not obscure or eliminate any information present in the original. Nonlinear adjustments must be disclosed in the figure legend.

Image manipulation: gross manipulation of blots

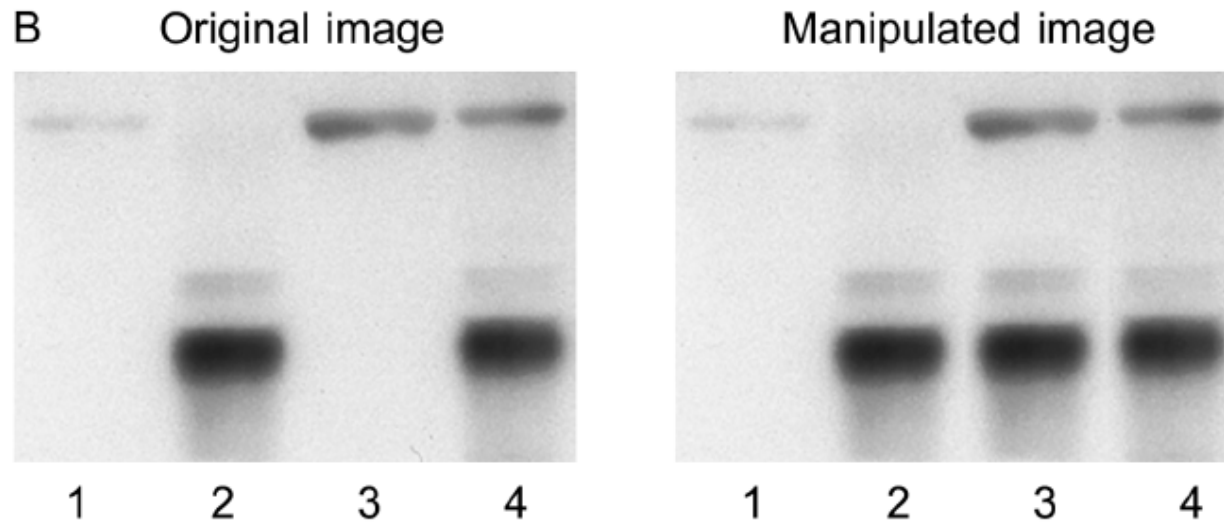
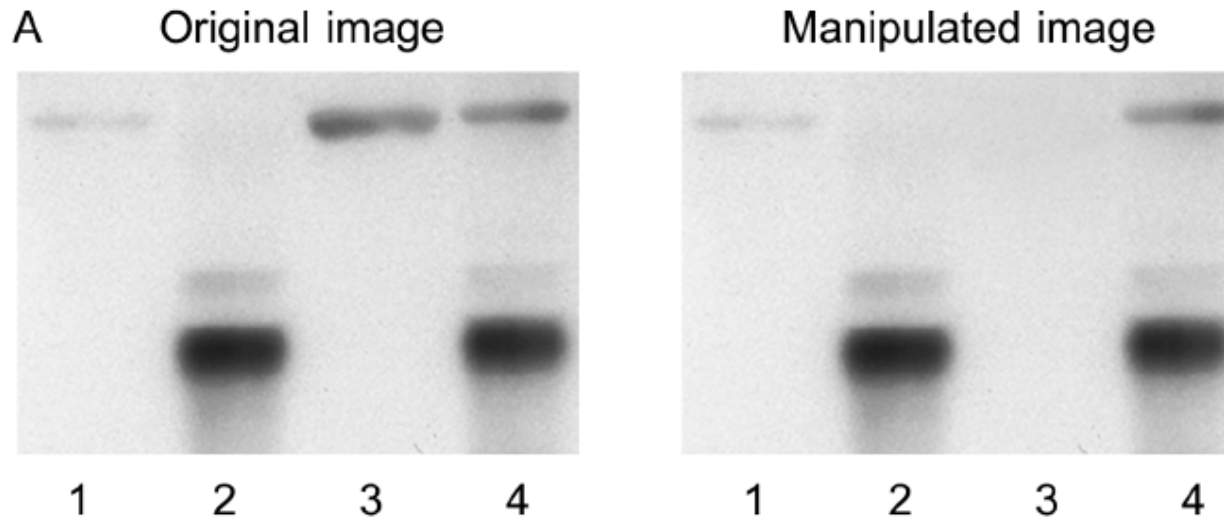
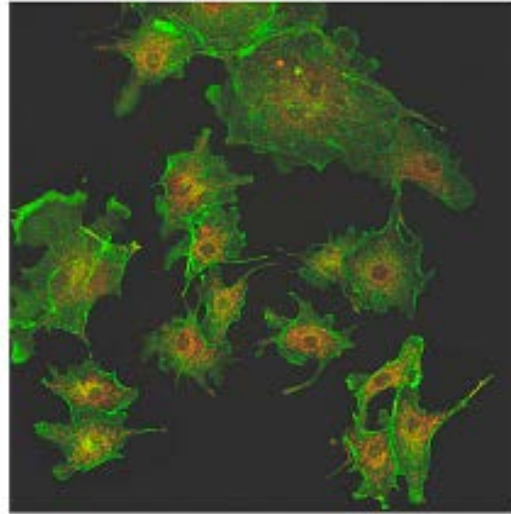
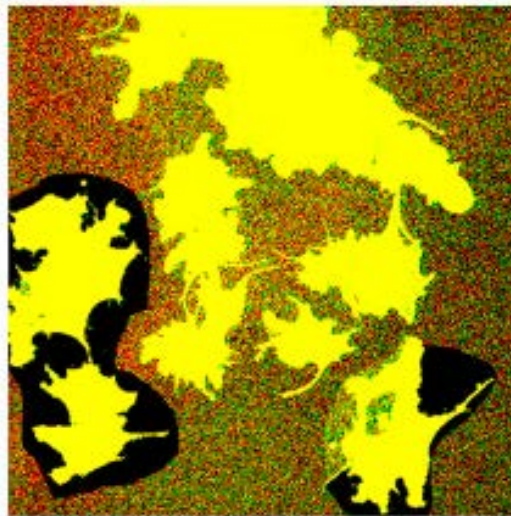
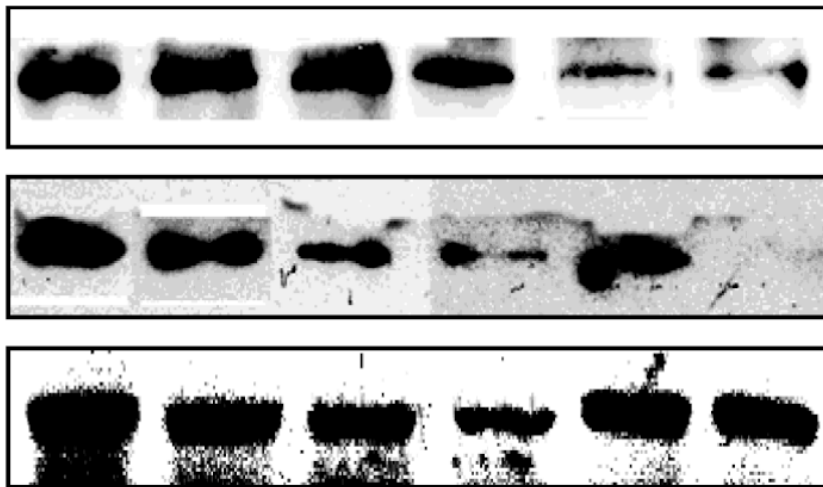


Image manipulation: Misrepresentation of image data



Manipulation
revealed
by contrast
adjustment



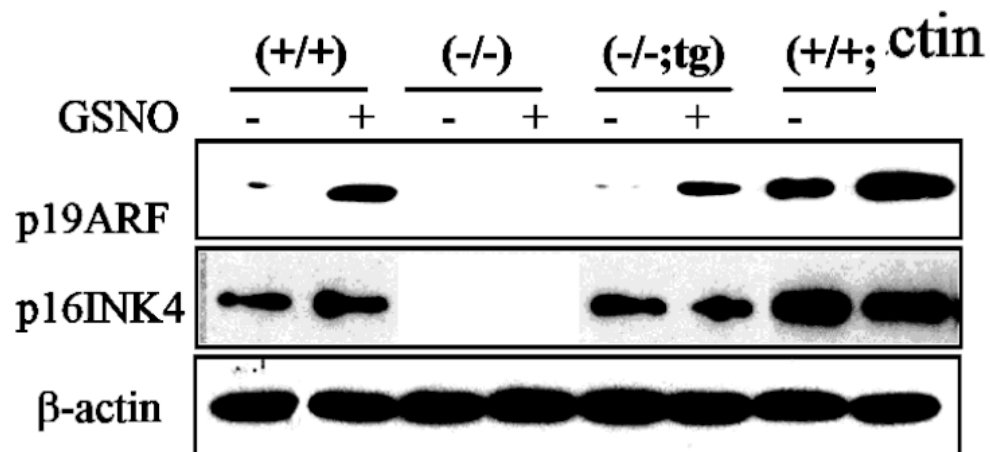


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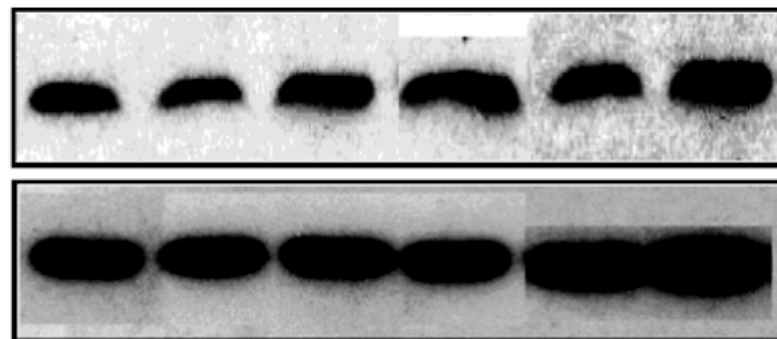
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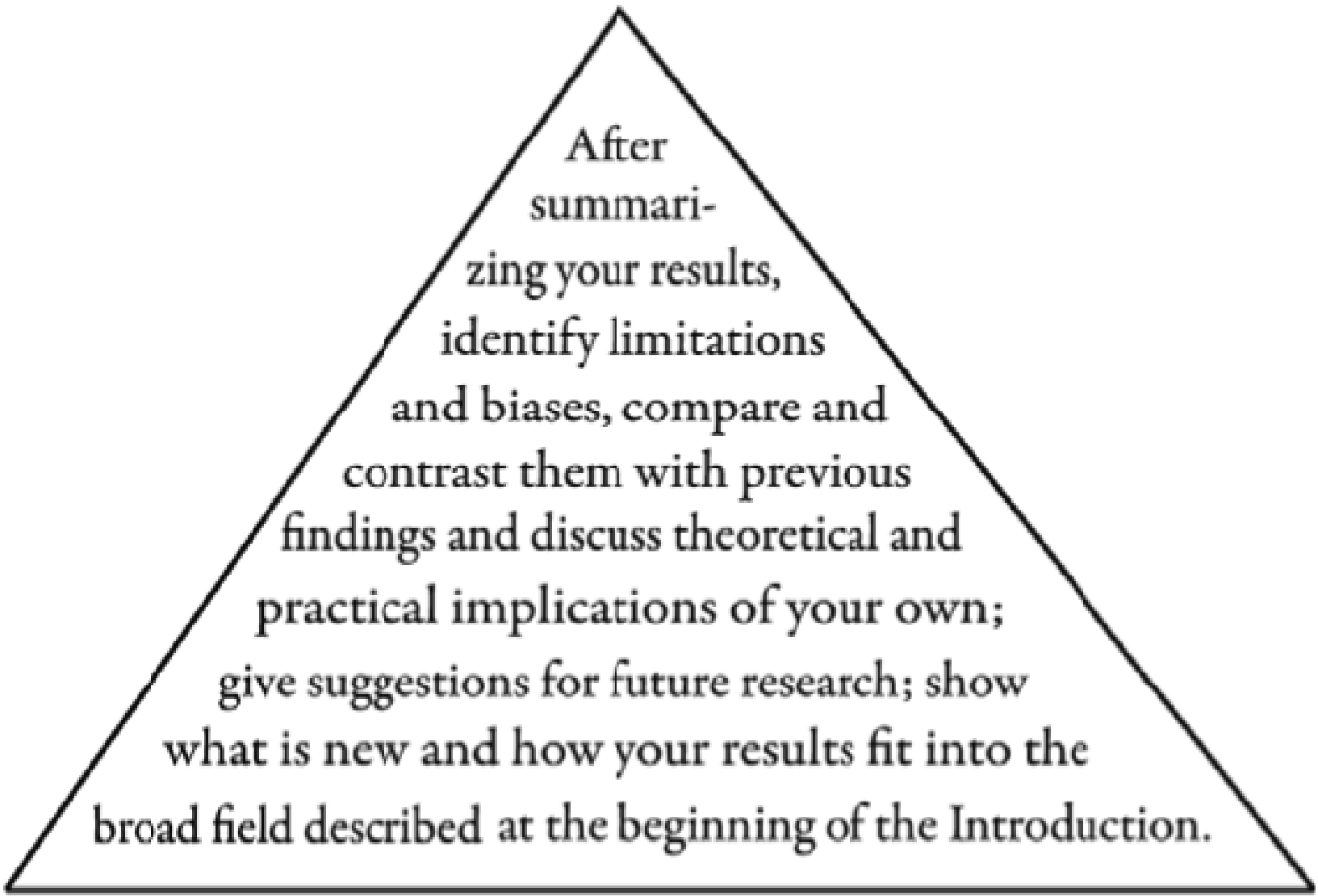


WT		p53 ^{-/-}		ARF ^{-/-}	
-	+	-	+	-	+



Thanks to David Vaux, International Council for Science

Writing a paper: Discussion



After summarizing your results, identify limitations and biases, compare and contrast them with previous findings and discuss theoretical and practical implications of your own; give suggestions for future research; show what is new and how your results fit into the broad field described at the beginning of the Introduction.

BMJ – Style I

- Short words, short sentences, short paragraphs
- No jargon
- No abbreviations
- Prefer Anglo Saxon over the Latin
- Prefer nouns and verbs to adjectives and adverbs
- Cut all cliches

My advice: Watch your tenses!

BMJ – Style II

- Avoid figures of speech and idioms
- Prefer active to passive
- Prefer the concrete to the abstract
- Avoid the “not unblack cat crossed the not unwide road”
- Don’t hector
- Be unstuffy

BMJ – Style III

- Don't be too chatty
- Don't be pleased with yourself
- Be careful with slang
- Use the scalpel not the sword
- Too many notes - Mozart
- Add a dash of colour, just a dash

Scientific jargon:

From the time immemorial, it has been known that the ingestion of an “apple” (i.e., the pomme fruit of any tree of the genus *Malus*, said fruit being usually round in shape and red, yellow, or greenish in color) on a diurnal basis will with absolute certainty keep a primary member of the health care establishment absent from one’s local environment.

An apple a day keeps doctor away.



The Six Honest Serving Men

R. Kipling

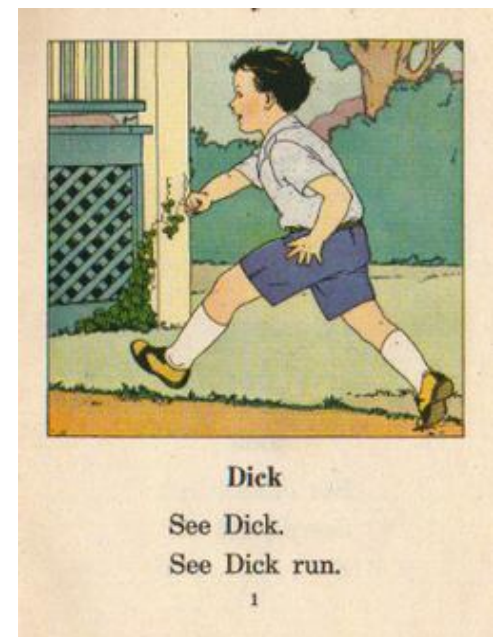
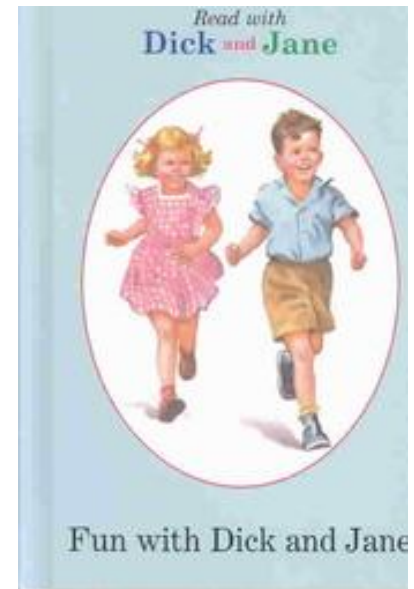
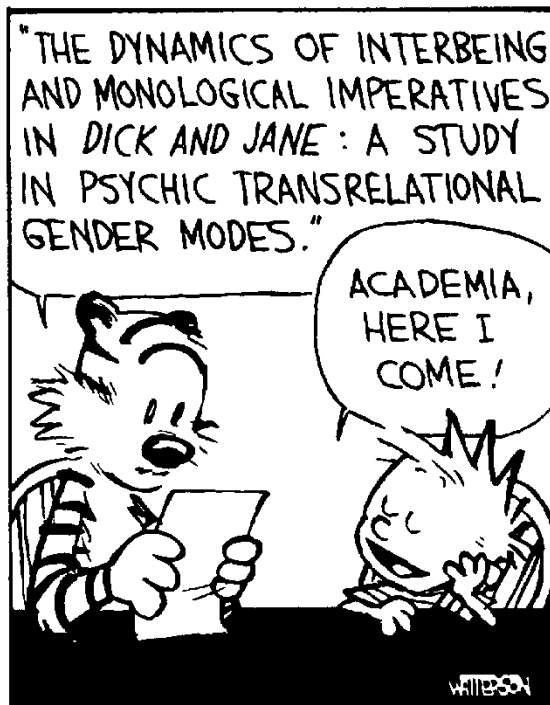
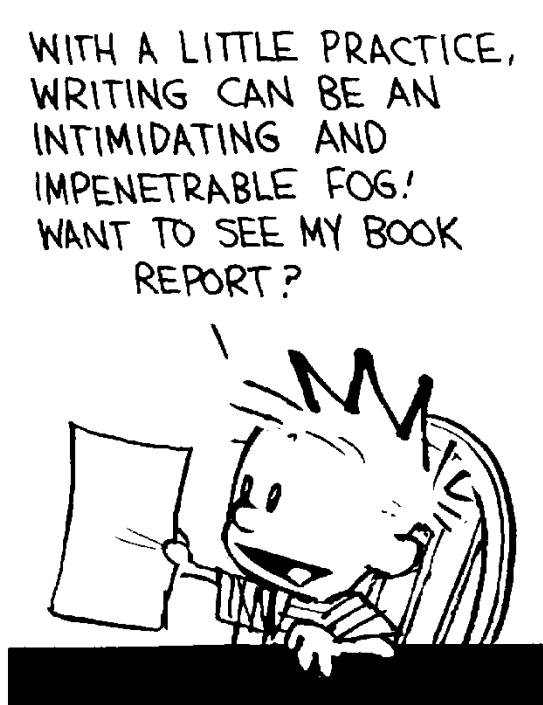
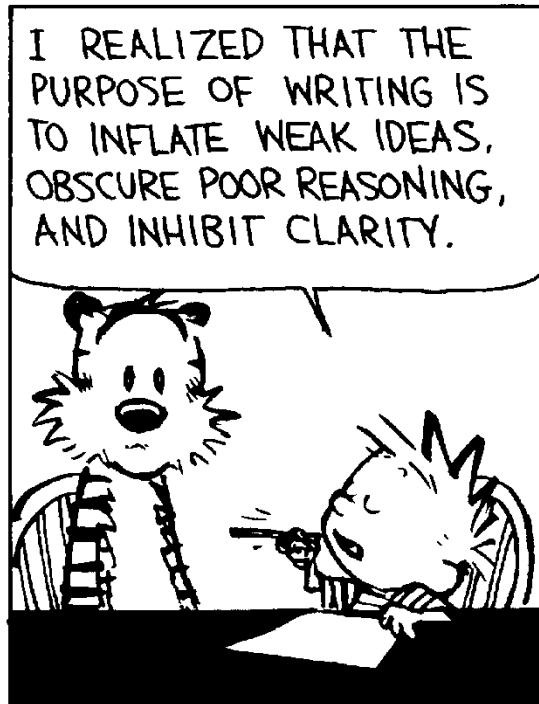
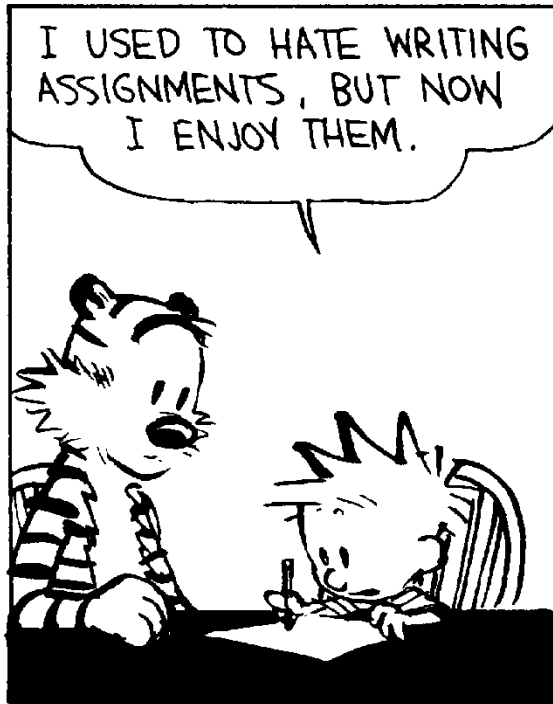
A survey of the writer's personal methodology in general inquiry has been carried out, and the results analyzed to determine components of the interrogatory technique. Six distinct forms of question were isolated, as tabulated below. It is claimed that responses evoked by these were responsible for the total quantity of knowledge acquired by the author (3).

I keep six honest serving men

(They taught me all I know):

Their names are What and Why and When

And How and Where and Who.





Karl Popper

Objective Knowledge, 1972

Aiming at simplicity and lucidity is a moral duty of all intellectuals.