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Introduction to Evidence-Based Research

Name of presenter

Date of presentation

Outline

1. Definition of Evidence-Based Research (EBR)
2. The Scientific Ideal
3. The Assumption
4. The Evidence
5. The Suggested Solution
6. The Impact

Evidence-Based Research can be defined as:

*“The use of prior research in a
systematic and transparent way to inform
a new study so that it is answering
questions that matter in a valid,
efficient and accessible manner”*

The scientific ideal (1)

*"If I have seen farther it is by
standing on the
shoulders of giants"*

- Sir Isaac Newton wrote these famous words in a letter to Robert Hooke on 15th February 1676.
- He was referring to influential scientists before him such as Copernicus, Galilei and Kepler.
- The ideal: **Science is cumulative with each new discovery dependent on previous knowledge**



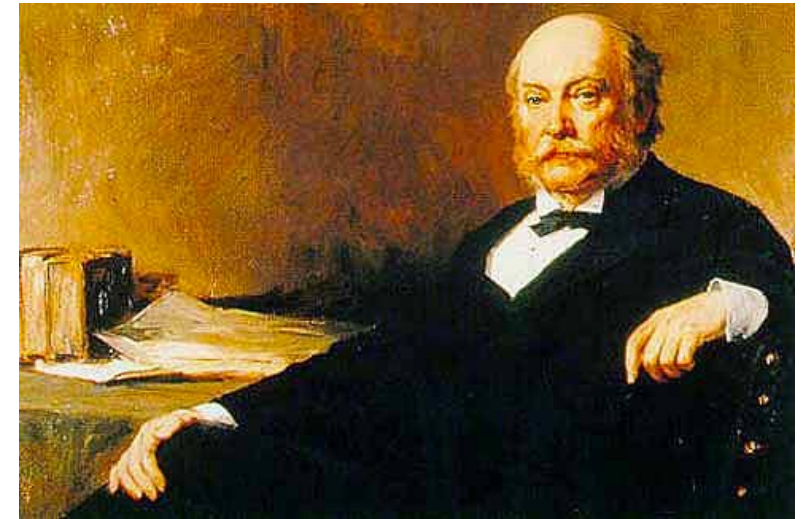
'Newton', Sculpture by Sir Eduardo Paolozzi

The scientific ideal (2)

“If, as is sometimes supposed, science consisted in nothing but the laborious accumulation of facts, it would soon come to a standstill, crushed, as it were, under its own weight.....

The work which deserves, but I am afraid does not always receive, the most credit is that in which discovery and explanation go hand in hand, in which not only are new facts presented, but their relation to old ones is pointed out.”

- The ideal: **Each new result needs to be interpreted in the context of earlier research**

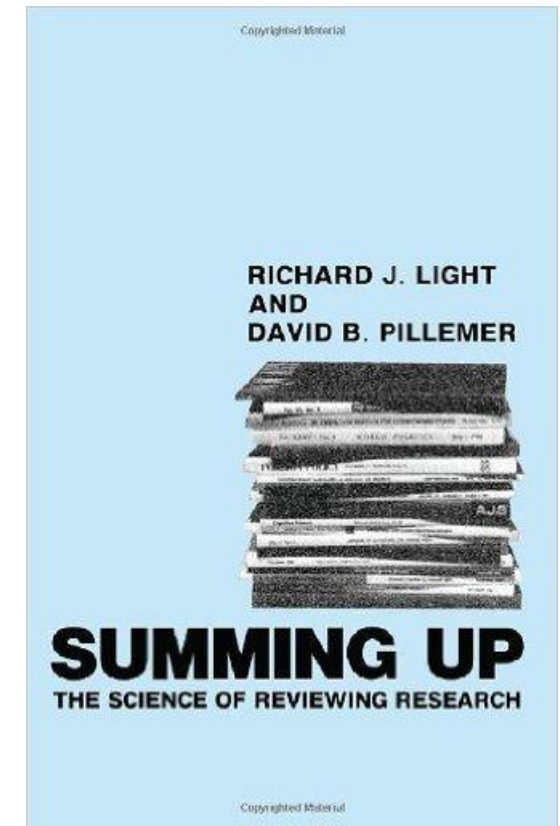


Lord Rayleigh at the 54th meeting of the British Association for the Advancement of Science held in Montreal in 1884.
(Thanks to I. Chalmers, LV Hedges, H Cooper, 2002)

The scientific ideal (3)

“Why do scientists think that new research is better, or more insightful, or more powerful? The underlying assumption must be that new studies will incorporate and improve upon lessons learned from earlier work. Novelty in and of itself is shallow without links to the past....For science to be cumulative, an **intermediate step between past and future research** is necessary:
SYNTHESIS OF EXISTING EVIDENCE”

- The ideal: **all new studies are based on a systematic review of earlier similar studies**



The assumption

One would think:
*No paper has ever been
published without references to
earlier published scientific
results. What's the problem?*

The assumption

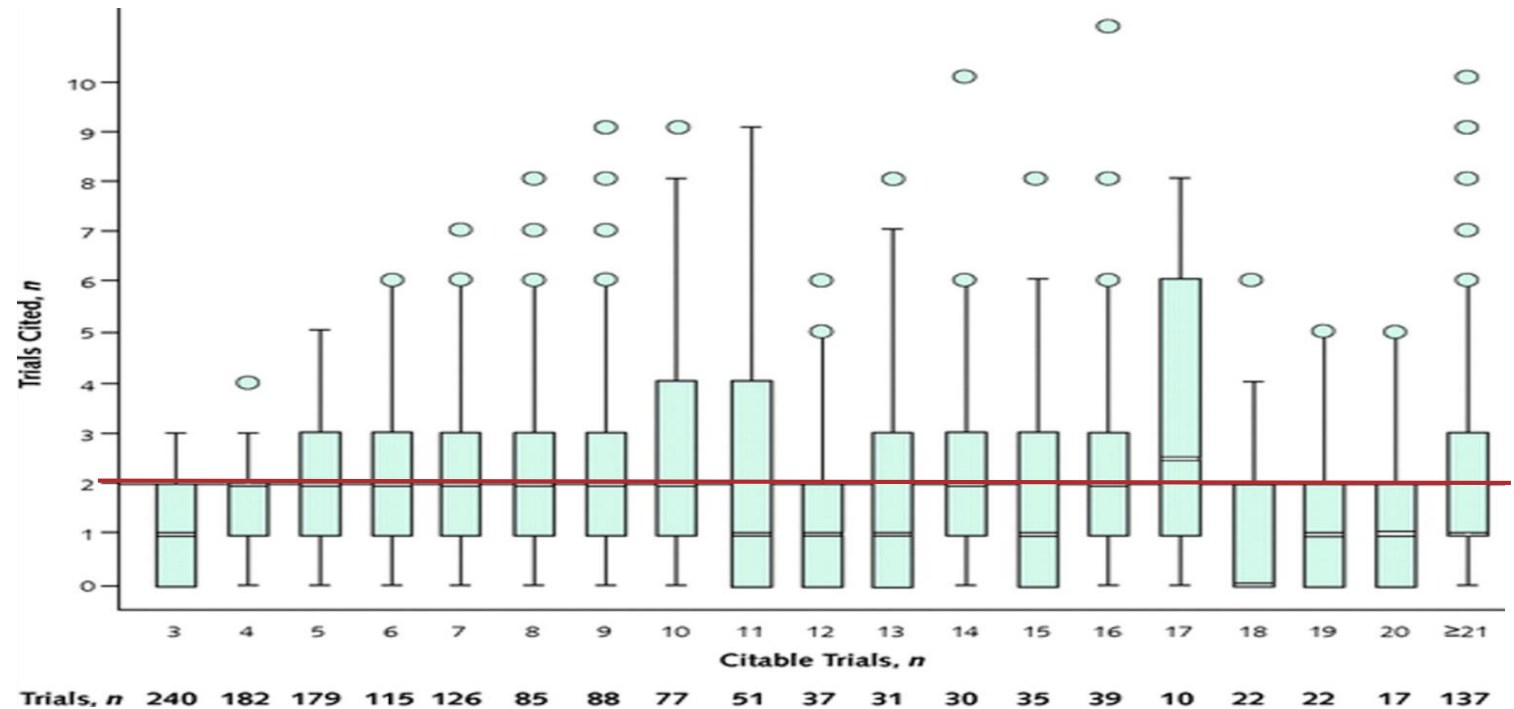
“Strictly speaking it seems hard to imagine any research not evidence-based.

At least it seems impossible to imagine that articles published in journals with a high impact factor do not relate to earlier research”

The evidence (1)

How often do scientific authors refer to the totality of earlier research?

- 55% cited no trials even though they could potentially refer to 3 or more studies within the same area
- the median number of references for earlier studies was consistently 2
- The problem: **systematic and transparent approach** is rarely used when **referencing** earlier similar trials



The evidence (2)

Are systematic reviews of existing studies used to see if a new study is required?

- Meta-epidemiological, descriptive cross-sectional study analysing RCTs published in high impact anaesthesiology journals between 2014 and 2016.
- Less than $\frac{1}{5}$ explicitly mentioned a systematic review as justification for the new study
- 44% did not cite a single systematic review
- The problem: **a systematic and transparent approach is rarely used to justify new studies**

Section of the manuscript	SR cited, N (%)	Number of SRs cited, range	SR cited as a justification for conducting trial, N (%)
Introduction	278 (43)	1-10	76 (12)
Methods	51 (8)	1-4	2 (0.03)
Discussion	245 (39)	1-11	62 (10)
Entire manuscript	360 (56) ^a	1-19	126 (20) ^a

^aIn some of the trials, SR reported in multiple sections of a manuscript.

The evidence (3)

Do previous systematic reviews guide the research agenda?

- Retrospective study using application for funding to see if a systematic review used in the planning and design of new RCTs
- 37 trials (77.1%) referenced a SR
- 20 of these (i.e. 41.7% of the total) used information in the systematic review in the design or planning of the new study
- The problem: **a systematic and transparent approach is rarely used to design new studies**

Area of use	Number of applications (%)
	(n=37)
Justification of treatment comparisons	6 (16.2)
Choice of frequency/dose	2 (5.4)
Selection or definition of outcome	7 (18.9)
Recruitment and consent	2 (5.4)
Estimating the difference to detect or margin of equivalence	6 (16.2)
Estimating the control group event rate	3 (8.1)
Inform standard deviation	1 (2.7)
Duration of follow up	8 (21.6)
Withdrawal rate	1 (2.7)
Adverse events	9 (24.3)

The evidence (4)

How often do scientific authors put their results in the context of earlier similar research?

- Retrospective study showed that most randomised studies published in the month of May in the top 5 high impact journals made no systematic attempt to set their results in context with no improvement over time.
- The problem: **systematic and transparent approach rarely used when placing new results in the context of existing results from earlier similar trials**

	1997 N=26	2001 N=33	2005 N=18	2009 N=29	2012 N=35
First trial addressing the question	1	3	3	5	2
Contained an updated systematic review integrating the new results	2	0	0	1	2
Discussed a previous systematic review in the topic area of the new trial but did not attempt to integrate their results	4	3	5	10	11
No apparent systematic attempt to set the results in the context of other trials	19	27	10	13	20

Classification of Discussion sections in reports of randomised studies published in May in Annals of Internal Medicine, BMJ, JAMA, Lancet and NEJM

Some thoughts

- To embark on research without systematically reviewing the evidence of what is already known, particularly when the research involves people or animals, is **unethical, unscientific, and wasteful**.
- We fully acknowledge that most of the time clinical researchers refer to previous studies and try to do it correctly - however the evidence shows that researchers, research funders, regulators, sponsors and publishers of research fail to use earlier research when preparing to start, fund, regulate, sponsor or publish the results of new studies.

The suggested solution

- To implement «**systematicity**» and «**transparency**» in all phases of research.
 - To make sure that research is valuable, i.e. “**relevant**” and “**necessary**”.
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- To achieve this an international group of researchers established the Evidence-Based Research Network (EBRNetwork) in Bergen in December 2014.
 - EVBRES (EVIDence-Based RESearch) is 4 year (2018-2022) EU-funded COST action aimed at creating an international European-based network to raise awareness of the need to use systematic reviews when planning new studies and when placing new results in context.
 - Sustainability of EVBRES is secured by the EBRNetwork.

The impact

By building on the existing body of evidence and presenting results in context an Evidenced-Based Research approach will:

- help to prevent research waste by making research more relevant, more ethical and more worthwhile
- reduce false positives (type 1 error) and medical reversals
- focus money spent on research improving resource allocation
- make better evidence available for informed choices
- help with how clinical trials are reported in the media
- restore end user trust in research.

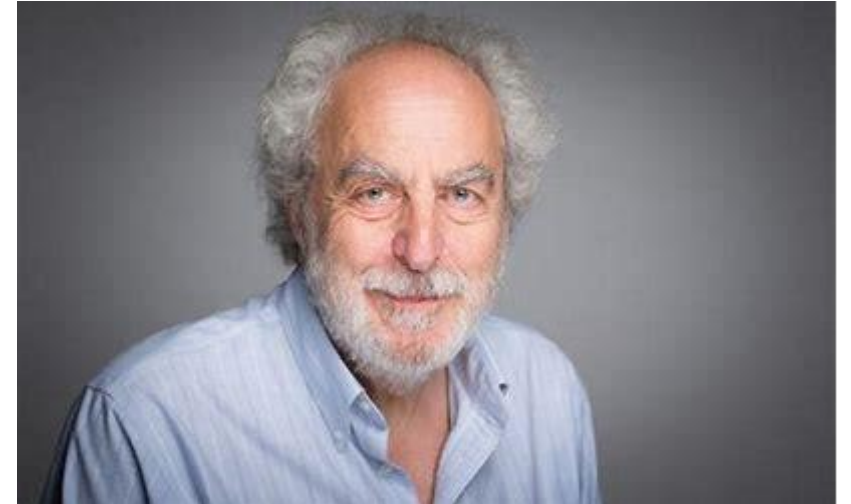
Stakeholders (especially clinical researchers) will need to invest in learning the knowledge and skills to be evidence-based, however they will gain more interesting and relevant research.



The impact

In 1994 Prof. Doug Altman expressed the need for less but better research. Evidence-Based Research will help make this a reality:

- better research for same money
- research not for research sake but research for society.



“We need less research, better research, and research done for the right reasons”.

Professor Doug Altman, 1994

Thank you



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