Centre for Cognitive Ageing and Cognitive Epidemiology

Systematic reviews

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Lifelong Health & Wellbeing
Research for Healthy Ageing

1

Outline

- **What is a systematic review?**
- **Introduction to Cochrane and EQUATOR**
- **How to do a systematic review?**
  - Practical demonstration (Sheila Fisken)
- **Presenting results**
- **Writing the paper**

What is a systematic review?

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- "an overview of primary studies which contains an explicit statement of objectives, materials, and methods and has been conducted according to explicit and reproducible methodology"

Greenhalgh, BMJ 1997; 315:672

What is a systematic review?

- clearly stated set of objectives with pre-defined eligibility criteria for studies
- explicit, reproducible methodology
- a systematic search that attempts to identify all studies that would meet the eligibility criteria
- assessment of the validity of the findings of the included studies, for example through the assessment of risk of bias
- systematic presentation, and synthesis, of the characteristics and findings of the included studies

http://www.cochrane-handbook.org/

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- systematic presentation, and synthesis, of the characteristics and findings of the included studies *?????Does yours do this??????*

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Systematic literature review?

- A **systematic review** attempts to identify ALL data (including unpublished) related to research question
  - Very important for RCTs (randomised controlled trials) where all trials should contribute to overall effect size
  - Perhaps less important for non-RCTs

- A **systematic <u>literature</u> review** is of published literature, attempts to identify ALL PUBLISHED data
  - Probably adequate for non-RCTs

What is a meta-analysis?

What is a meta-analysis?

- "a mathematical synthesis of the results of two or more primary studies that addressed the same hypothesis in the same way"

- **i.e. A specific type of systematic review**

Why are reviews needed?

- **Massive numbers of publications**
- **Both print, and electronic media**
- **Diverse languages**
- **Different countries**
- **Primary studies can appear contradictory**
- **Psychology and social sciences predated medical systematic reviews (1930s)**

Why are systematic reviews needed?

- **Literature/narrative/critical review**
  - **Often not replicable/updated**
  - **May be biased by prior beliefs**
  - **May be commissioned due to published opinion**
  - **Often miss small but important effects**
  - **Different reviewers reached different conclusions**
  - **Affected by subspecialty of reviewer**
  - **Little attempt to discuss heterogeneity**

Why are systematic reviews needed?

- **Benefits of therapy not brought into clinical practice**
  - e.g. Clot-busters/beta blockers for heart attacks
  - SR would have identified benefit in mid-1970s
  - Not in clinical practice till 1990s
- **Inadequate summaries of current knowledge**
  - Omitted mention of effective treatment, or suggested only as part of trials

Why are systematic reviews needed?

- As part of student dissertation/PG thesis
- To secure grant funding for research
- To propose future research agenda
- To establish clinical or cost-effectiveness
- To establish feasibility of an intervention
- To allow information to be assimilated quickly and easily
- To reduce delay of research to clinical implementation
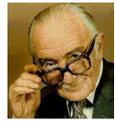- *Note this is as substantial a piece of work as original research*

Why are systematic reviews needed?

- **Mostly**
  - A substantive question
  - Several primary studies
  - Uncertainty
- **Can be of**
  - RCTs (randomised controlled trials) of intervention (vaccine, drug, behaviour)
    - e.g. MMR, clot busters, exercise after stroke
  - **Observational studies**
    - e.g. Birth weight and IQ, IQ and mortality, WMH and morbidity/mortality

'Hierarchy of evidence'

Systematic Reviews
Randomized Controlled Trials
Cohort Studies
Case-Control Studies
Case Series, Case Reports
Editorials, Expert Opinion

Introduction to Cochrane

Cardiff University Library, Cochrane Archive, University Hospital Llandough

- **Archie Cochrane (1909-88)**
  - **British epidemiologist**
  - **Advocated RCTs to inform healthcare practice**
- **Cochrane collaboration**
  - **Established 1993**
  - **Cochrane Reviews (>4,000)**
  - **Identify, appraise and synthesise research-based evidence and present it in accessible format; regularly updated**
  - **Focus on interventions, but useful resource**

http://www.cochrane-handbook.org/

Introduction to EQUATOR

- **Enhancing the QUAlity and Transparency Of health Research**
- **Started March 2006**
- **Grew from guideline development groups (including CONSORT)**
- Aim to:
  - Provide resources and education enabling the improvement of health research reporting
  - Monitor progress in the improvement of health research reporting

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Introduction to EQUATOR

- **Detailed reporting guidelines**
  - CONSORT Statement (reporting of randomized controlled trials)
  - STARD (reporting of diagnostic accuracy studies)
  - STROBE (reporting of observational studies in epidemiology)
  - PRISMA (reporting of systematic reviews), which replaced QUOROM
  - MOOSE (reporting of meta-analyses of observational studies)

- Minimum Information for Biological and Biomedical Investigation (MIBBI) portal
  - e.g. minimum dataset for fMRI studies

http://www.equator-network.org/resource-centre/library-of-health-research-reporting/

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http://www.metaxis.com/PROSPERO/

RCTs or observational studies

- **RCTs**
  - **'gold standard' for interventions**
  - **Minimise bias**
  - **Exposed/unexposed groups are comparable**

http://www.cochrane-handbook.org/

RCTs or observational studies

- **Observational studies**
  - The majority of studies
  - When RCTs are not ethical/feasible/done
  - Need clarity about design ?filter by method
  - What search techniques are appropriate?
  - Specific data extraction/quality assessment tools
  - Concern about bias, confounding
  - Difficult to combine different study designs

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How to do a systematic review?

1. **Define a question**
2. **Search the literature**
3. **Assess the studies**
4. **Combine the results**
5. **Put the findings in context**

Presenting results

- **Use the 27-point PRISMA checklist**
- **Use the PRISMA flow diagram**

Moher D, Liberati A, Tetzlaff J, Altman DG,
The PRISMA Group (2009). *Preferred Reporting Items for Systematic Reviews and Meta-Analyses:
The PRISMA Statement.* PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

Writing the paper

- **Follow conventional structure**
- **Be clear and comprehensive**
- **Should be reproducible**
- **Check with target journal (length?)**
- **Very useful guide by Prof Joanna Wardlaw (SBIRC):**
  - **http://www.sbirc.ed.ac.uk/documents/advice%20on %20how%20to%20write%20a%20systematic%20revi ew.pdf**

Resources

- **http://www.cochrane-handbook.org/**
- Systematic Reviews in Health Care: Meta-Analysis in Context, 2nd Edition: M Egger, G Davey Smith, D Altman (Eds), 2001, BMJ Books; ISBN: 978-0-7279-1488-0
- http://www.equator-network.org/
  - CONSORT http://www.consort-statement.org/
  - STARD http://www.stard-statement.org/
  - STROBE http://www.strobe-statement.org/Checklist.html
  - PRISMA http://www.prisma-statement.org/index.htm
  - MOOSE
- http://www.sign.ac.uk/guidelines/fulltext/50/section6.html

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