

What is a realist review and what can it do for me?

An Introduction to realist synthesis

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During this presentation, please....

- If you can please try to keep your questions to the end so that we can finish on time.
- Turn off your mobile phones, Blackberries, pagers etc.

Structure of this presentation

- Objectives
- Introductions
- Background
- What is a realist review?
- Methods
- Results
- Implications
- Conclusions
- Summary

Objectives

By the end of this presentation I hope you will:

- Have an understanding of what a realist review consists of.
- Have seen an example of a realist review.
- Have an idea of the strengths and weaknesses of a realist review.
- Be able to work out when a realist review is going to help you to answer your research question.

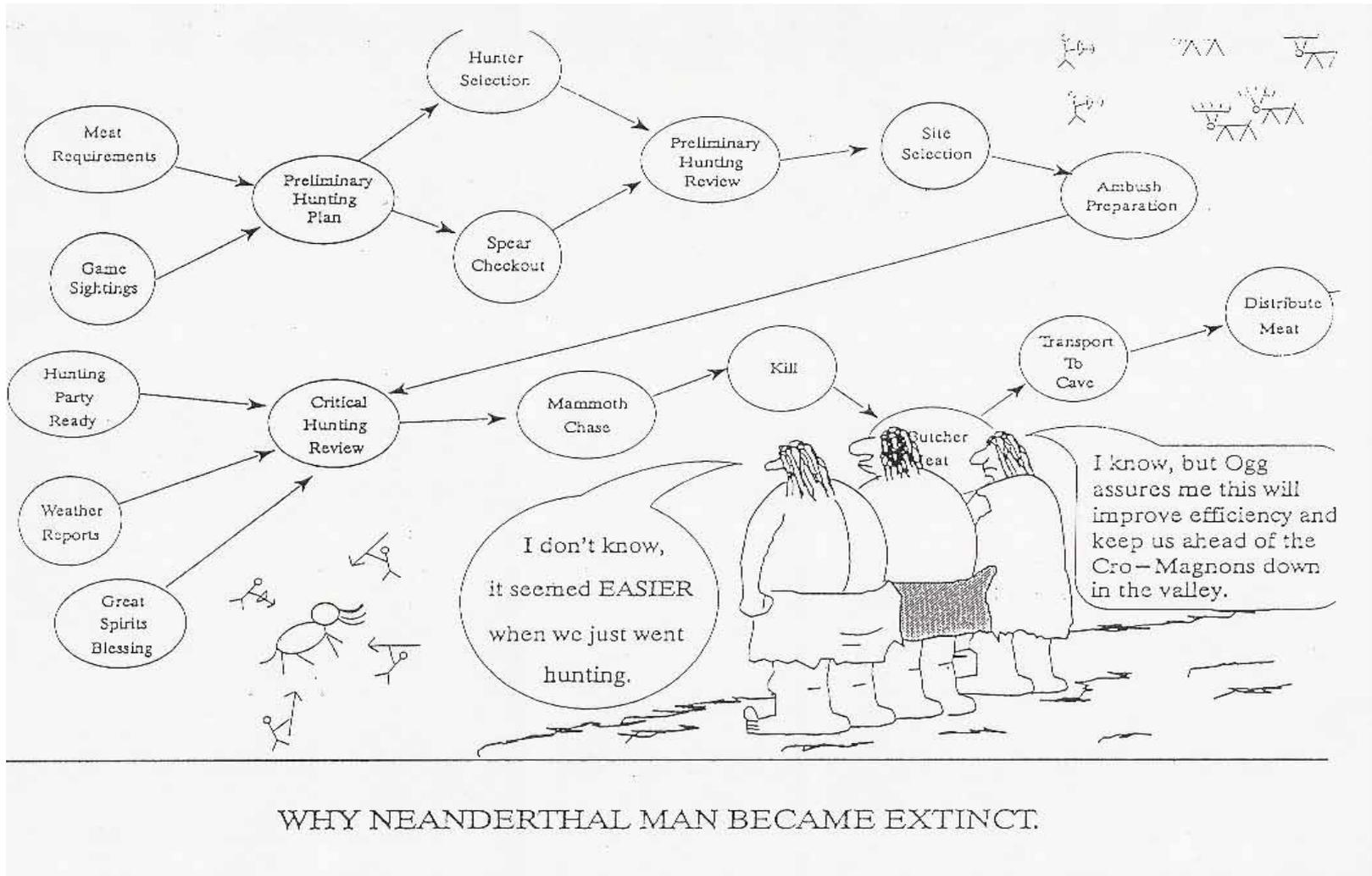
Introductions

- NIHR Clinical lecturer and GP Principal
- Main areas of research:
 - Education
 - Evidence synthesis
- The example realist review was undertaken by me as my MD (Res)
- Review was funded by NoCLoR (North Central London Research Consortium)

Background – Is there a problem?

- Systematic reviews (e.g. Cochrane reviews) have been around for over 30 years.
- Great for ‘simple’ interventions (e.g. medication).
- So what is the problem and why do we need a ‘new’ method of reviewing?
 - Need to deal with heterogeneity (e.g. study designs, study setting or context, intervention used, outcome measures).
 - Meaningful and useful results: not just ‘Laundry-list’, ‘Cook book’, ‘Measure the measurable’ results.
 - Complex interventions!!
- So what is a complex intervention?

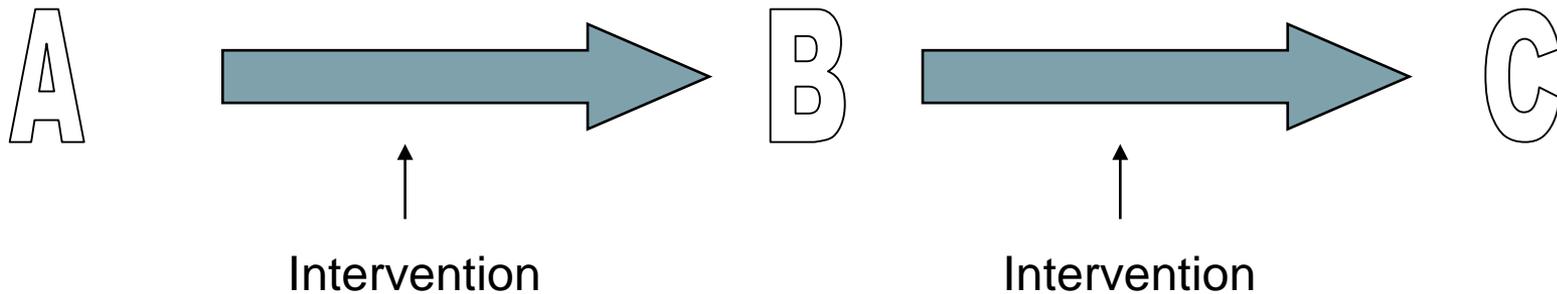
Complexity



Background – Complex interventions

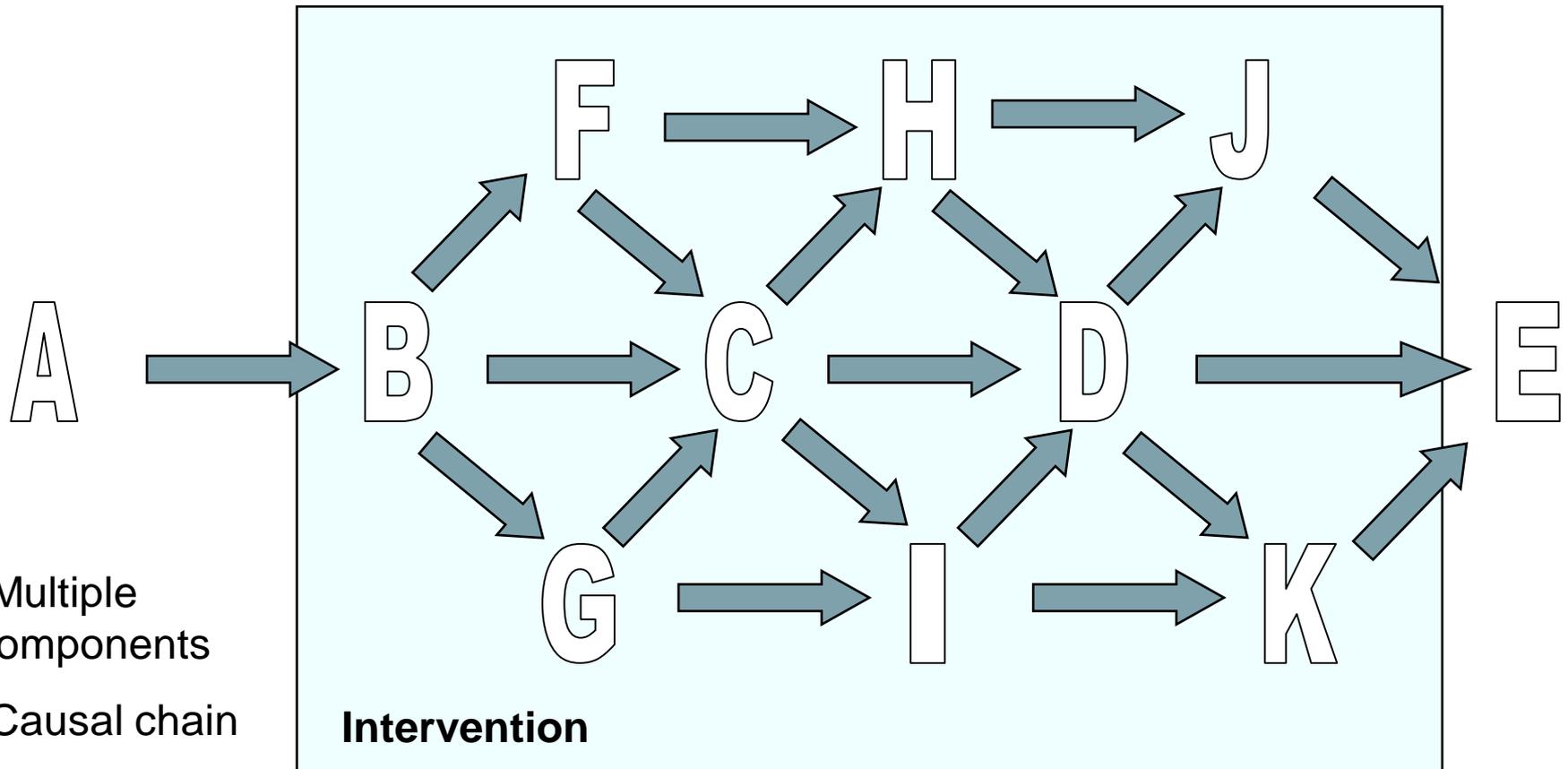
- Number of interacting components within the experimental and control interventions
- Number and difficulty of behaviours required by those delivering or receiving the intervention
- Number of groups or organisational levels targeted by the intervention
- Number and variability of outcomes
- Degree of flexibility or tailoring of the intervention permitted
 - Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M. Developing and evaluating complex interventions: the new Medical Research Council guidance. *BMJ* 2008; 337:a1655.
- Importantly:
 - Not simple ‘black boxes’
 - The components tend not to act in a linear fashion
 - Complex interventions are reliant on **people** carrying out the intervention
 - Are highly dependent on the context in which they take place

A 'simple' intervention



- Linear
- Deterministic
- E.G: Anti-hypertensive medication

A 'complex' intervention



- Multiple components
- Causal chain
- Non-linear
- E.G: A falls clinic

Background – A possible solution?

- Why does a realist review help?
 - Because it unpacks the ‘black box’.
 - Has methods for dealing with the influence of context and heterogeneity.
 - Provides ‘answers’ which are explanatory and allow for causal inferences to be made (‘predictive’).

Background - What is a realist review?

- Realist reviews:
 - have more of an explanatory rather than judgmental focus.
 - Looks to answer the ‘How?’, ‘Why?’, ‘For whom?’, ‘To what extent?’ and ‘In what circumstances?’
 - Looks for middle-range theories (Merton).
 - test and build these theories.
 - borrows some techniques from ‘traditional’ Cochrane systematic reviews.
 - are iterative.

What's a theory?

“A theory is an attempt to organize the facts – some ‘proven’, some more conjectural – within a domain of inquiry into a structurally coherent system.”

Klee R. Introduction to the philosophy of science. Cutting nature at its seams. New York: Oxford University Press, 1997.

What's a middle-range theory and why is it so important?

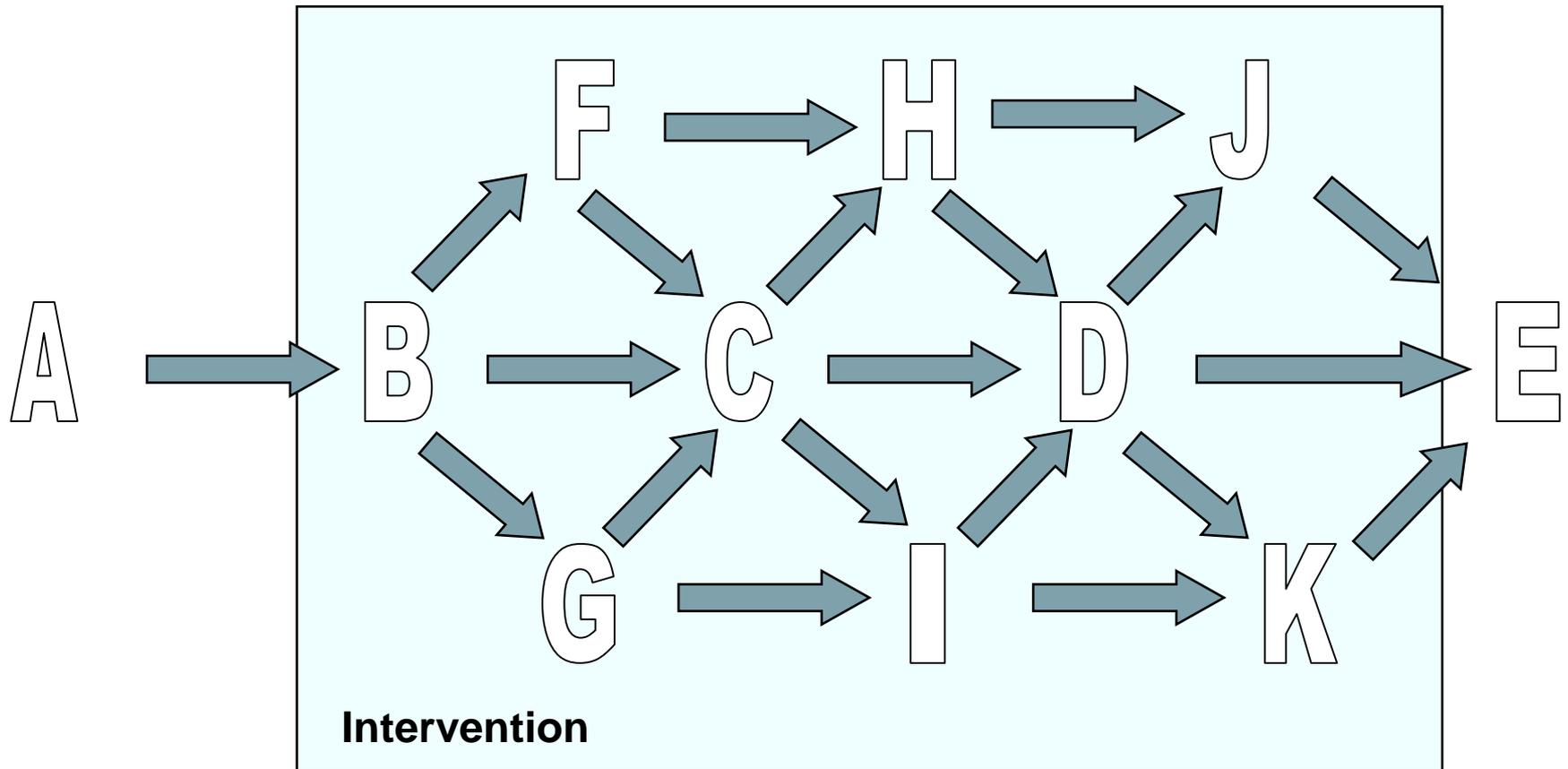
This is a theory that lies "...between the minor but necessary working hypotheses that evolve in abundance during day-to-day research and the all-inclusive systematic efforts to develop a unified theory that will explain all the observed uniformities of social behavior, social organization and social change...It is intermediate to general theories of social systems which are too remote from particular classes of social behavior, organization and change to account for what is observed and to those detailed orderly descriptions of particulars that are not generalized at all.

Middle-range theory involves abstraction, of course, but they are close enough to observed data to be incorporated in propositions that permit empirical testing."

From: Merton R. On Theoretical Sociology. Five Essays, Old and New. New York: The Free Press, 1967.

In simple terms, a theory that is at the correct level of abstraction to be 'useful' and 'testable'.

A 'complex' intervention



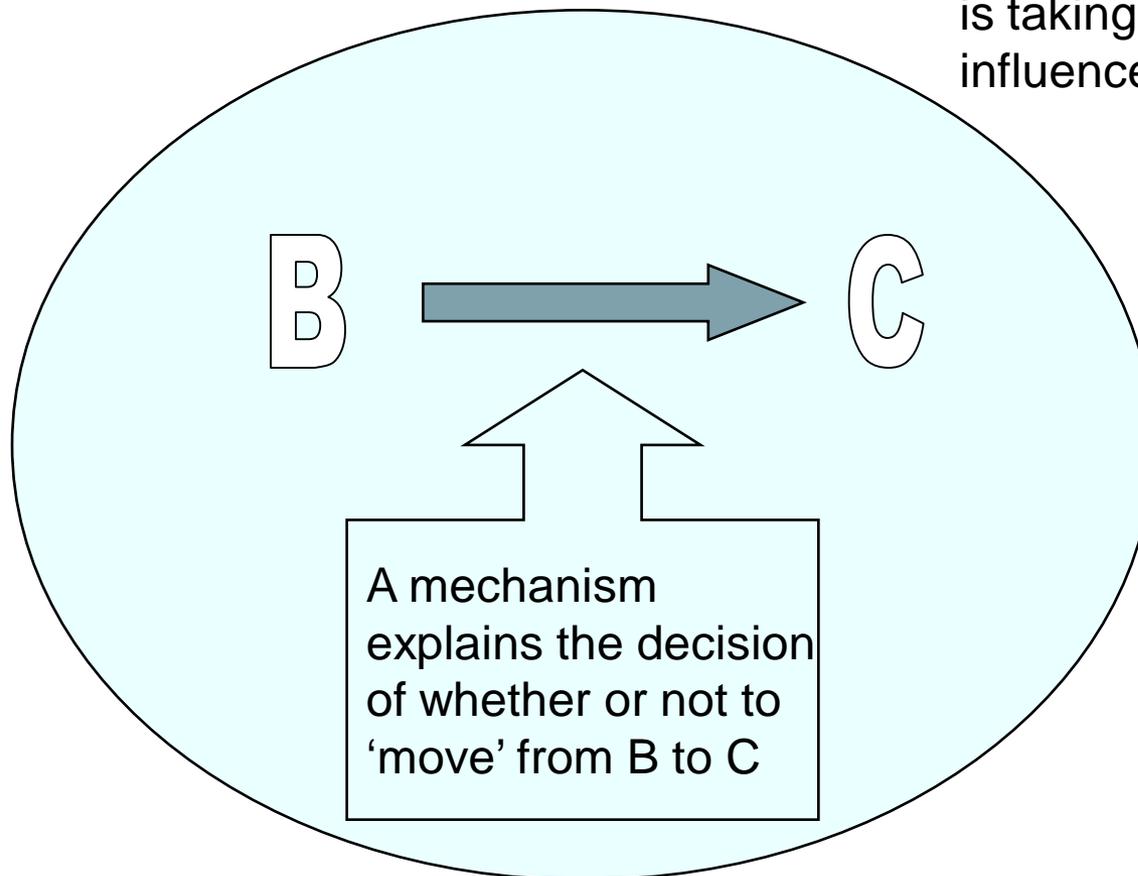
The multitude of interactions within a complex intervention may seem daunting!

What's a middle-range theory and why is it so important?

- ...but, when participants take part in a complex intervention study, they make choices about what actions to undertake and these choices about actions give us our outcomes.
- Various 'mechanisms' determine these choices.
- Participants do not have an infinite range of choices available to them as to what actions they might take.
- The range of choices is limited and determined by the context in which the study takes place.

One section of the causal chain of a 'complex' intervention

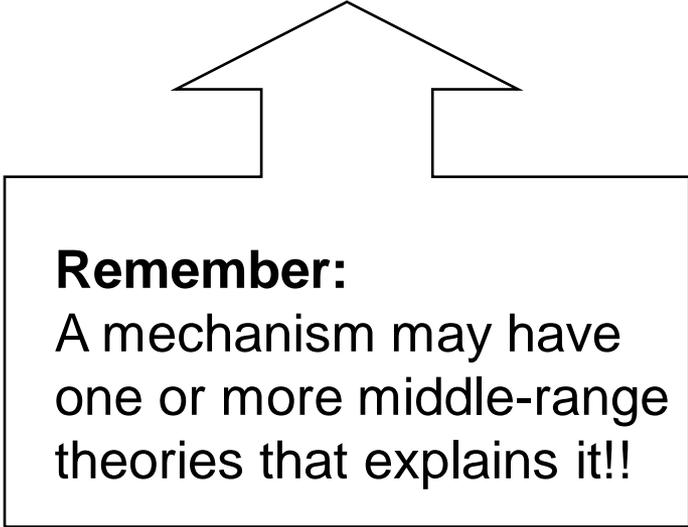
BUT... the context in which this intervention is taking place may influence this decision



What's a middle-range theory and why is it so important?

- Hence...

Context + Mechanism = Outcome



Remember:

A mechanism may have one or more middle-range theories that explains it!!

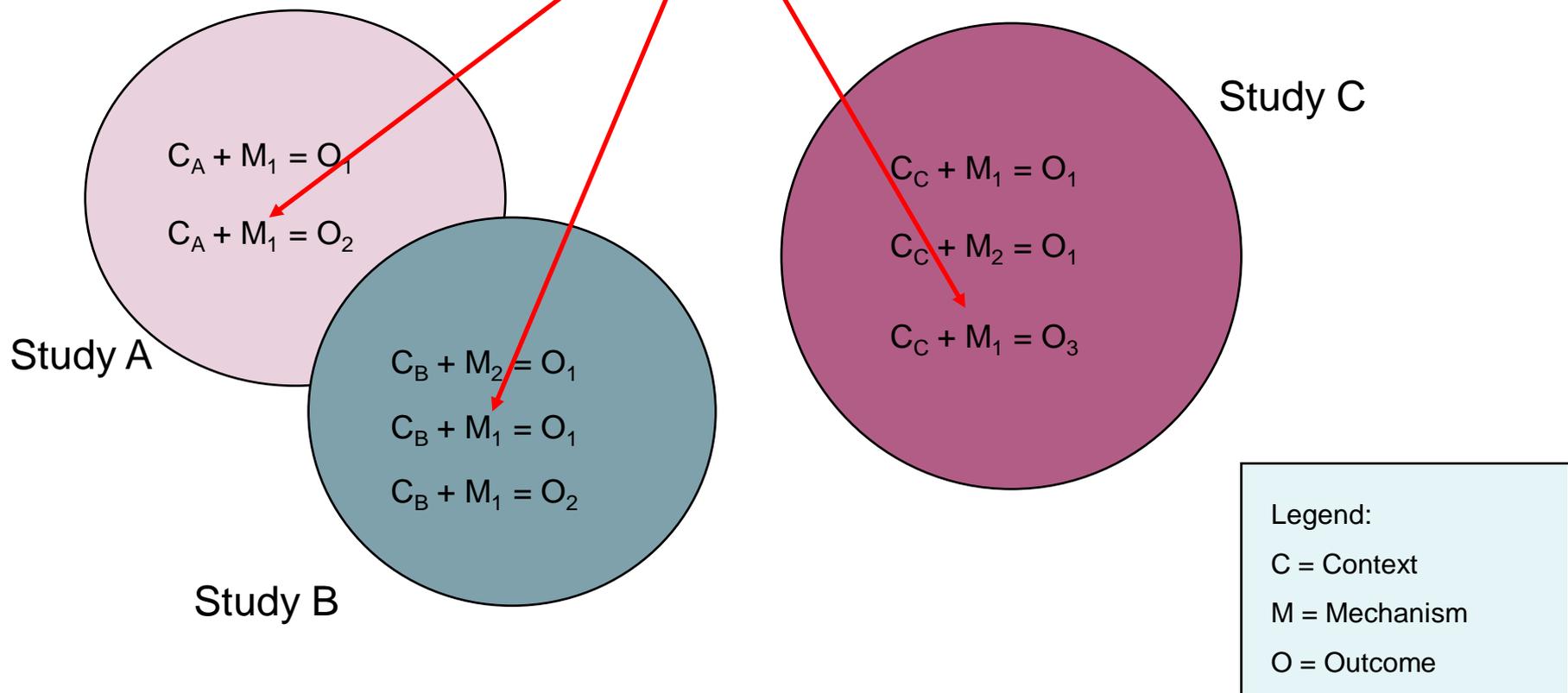
What's a middle-range theory and why is it so important?

- Because the range of choices is limited and determined by the context in which the study takes place.
- For any intervention, patterns (or demi-regularities) occur.
- Whilst the context may change, these demi-regularities tend not to.
- Middle-range theories explain these demi-regularities.
- The key goal of a realist review is to uncover these middle-range theories.

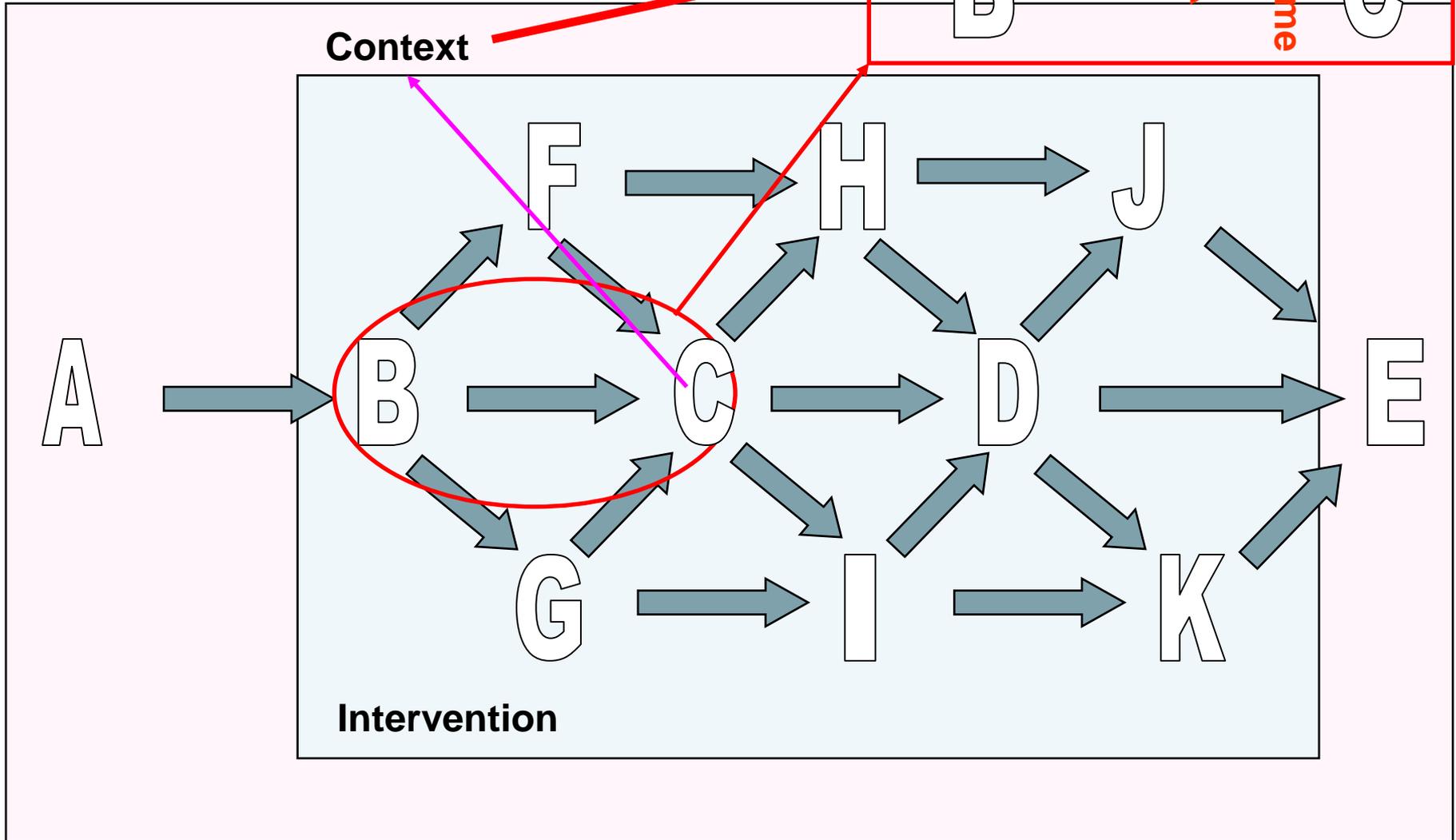
What's a middle-range theory and why is it so important?

The same mechanisms are operating in these different contexts AND SO the same middle-range theory can be used to explain why certain outcomes arise.

In three 'seemingly' similar complex interventions (Study A, B and C) with two mechanisms and three outcomes

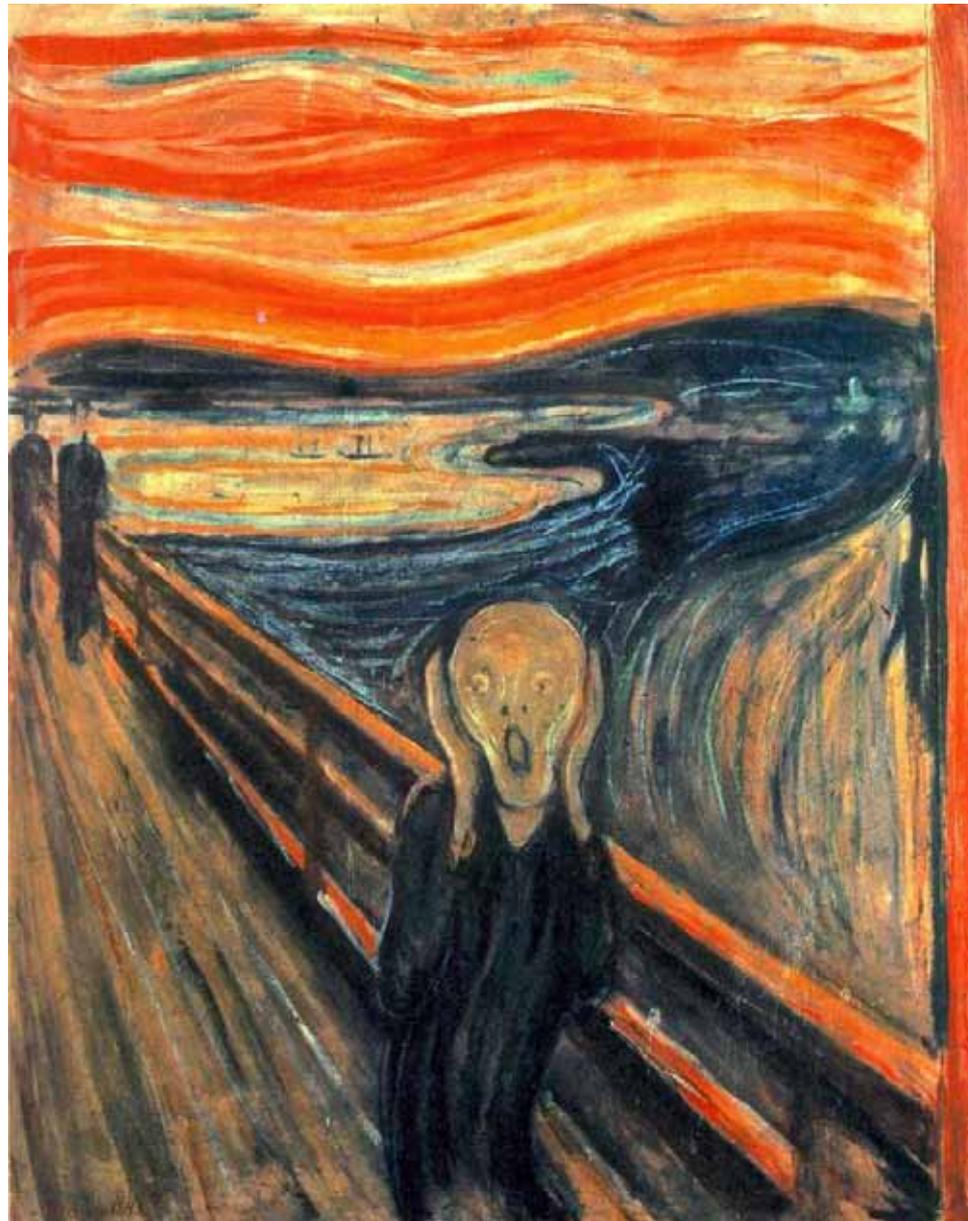


Putting it all together...



Background - Design and sequence of 'traditional' systematic review and realist review

Traditional 'Cochrane' review	Realist review
1. Identify the review question	1. Clarify scope of review Identify review question Refine purpose of review Articulate key candidate theories to be explored
2. Search for primary studies, using clear predefined inclusion and exclusion criteria	2. Search for relevant evidence, refining inclusion criteria in the light of emerging data
3. Appraise quality of studies using a predefined and validated critical appraisal checklist, considering relevance to research question and methodological rigour	3. Appraise 'quality' of studies using judgment to consider relevance and rigour from a 'fitness for purpose' perspective
4. Extract standard items of data from all primary studies using template or matrix	4. Extract different data from different studies using a range of tools (e.g. Excel, NVivo, etc.) in an iterative fashion
5. Synthesise data to obtain effect size and confidence interval and/or transferable themes from qualitative studies	5. Synthesise data to achieve refinement of programme theory – that is, to determine what works for whom, how and under what circumstances
6. Make recommendations, especially with reference to whether findings are definitive or whether further research is needed	6. Make recommendations, especially with reference to contextual issues for particular policymakers at particular times
7. Disseminate findings and evaluate extent to which practitioners' behaviour changes in a particular direction	7. Disseminate findings and evaluate extent to which existing programmes are adjusted to take account of elements of programme theory revealed by the review



Methods I - Research question

- *What is it about the Internet that works in medical education, for whom, to what extent, in what circumstances, in what respect, how and why?*

Methods II – Stages of review process

- Searched for candidate theories – especially on how and why it works and what makes it work:
 - Laurillard
 - Schon
 - Slotnick
 - Reeves
- Developed:
 - Inclusion and exclusion criteria
 - Data extraction matrix
 - Search strategy
- Piloted data extraction sheets and candidate theories on a subset of trials.

Methods III – Stages of review process

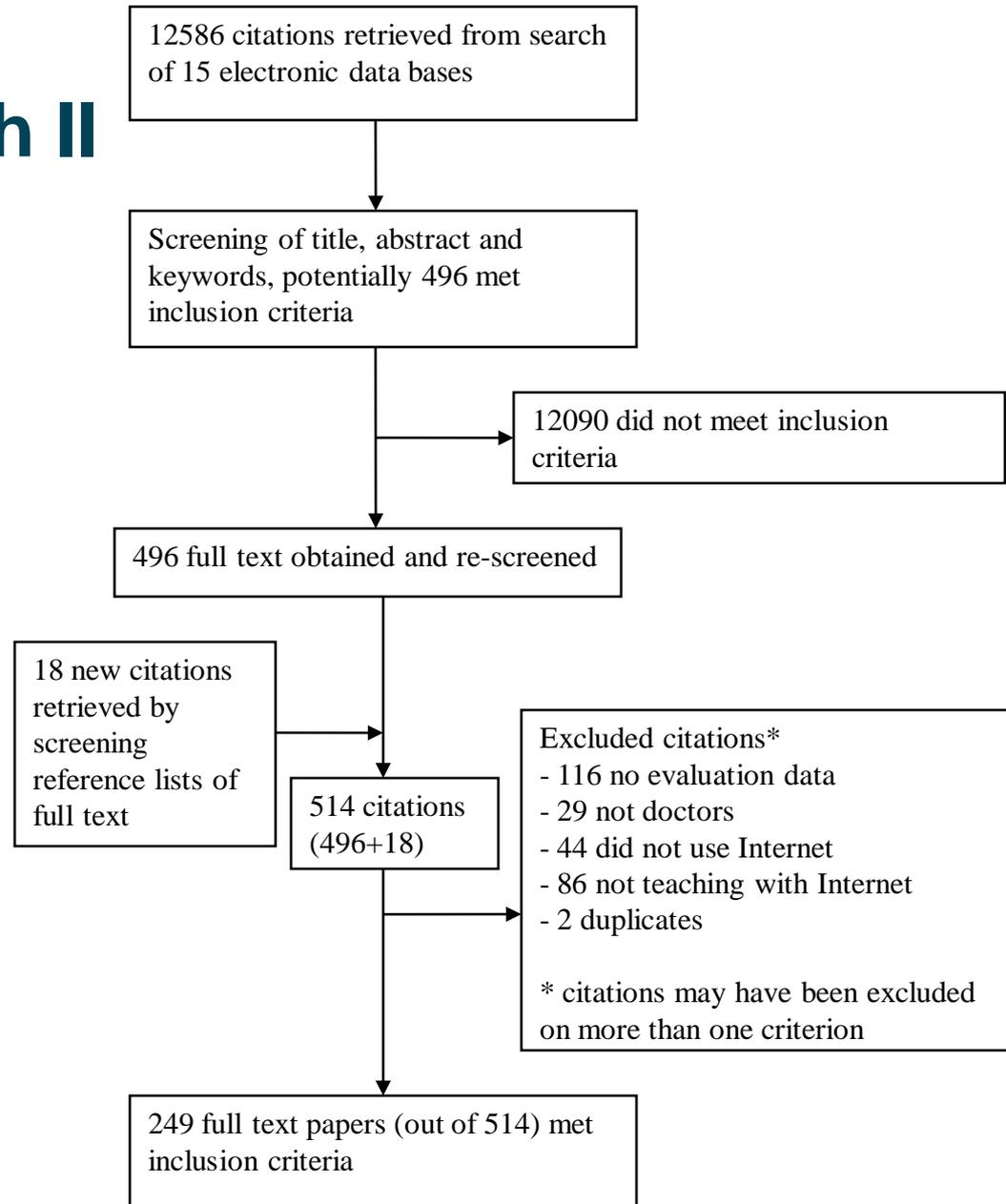
- Ran searches (15 electronic databases '94 -'06).
- Screened against inclusion and exclusion criteria:
 - 2 screeners (2nd rater checked random subset)
 - 1st stage – title, abstract keywords
 - 2nd stage – full text
- Data extraction – Excel spreadsheet and NVivo.
- Test, refine and develop new theories.
- Iterative – if new codes emerged it was searched for in previously coded papers.



Results – Search I

- 15 Electronic databases searched.
- 249 articles met inclusion criteria.
- 1st Stage inter-rater agreement – 92%.
- 2nd Stage inter-rater agreement – 84%.
- Disagreements settled by discussion.

Results – Search II



Results – study characteristics I

- Number of relevant papers increased year on year.
- 96% in English.
- 93% from developed nations (USA, Canada, Australia and Europe).
- 133 journals provided the 249 included articles.
- 44591 participants.
- Roughly equal male vs female participants (52 vs 48%).
- Mean age 32.4 (range 21 to 61).

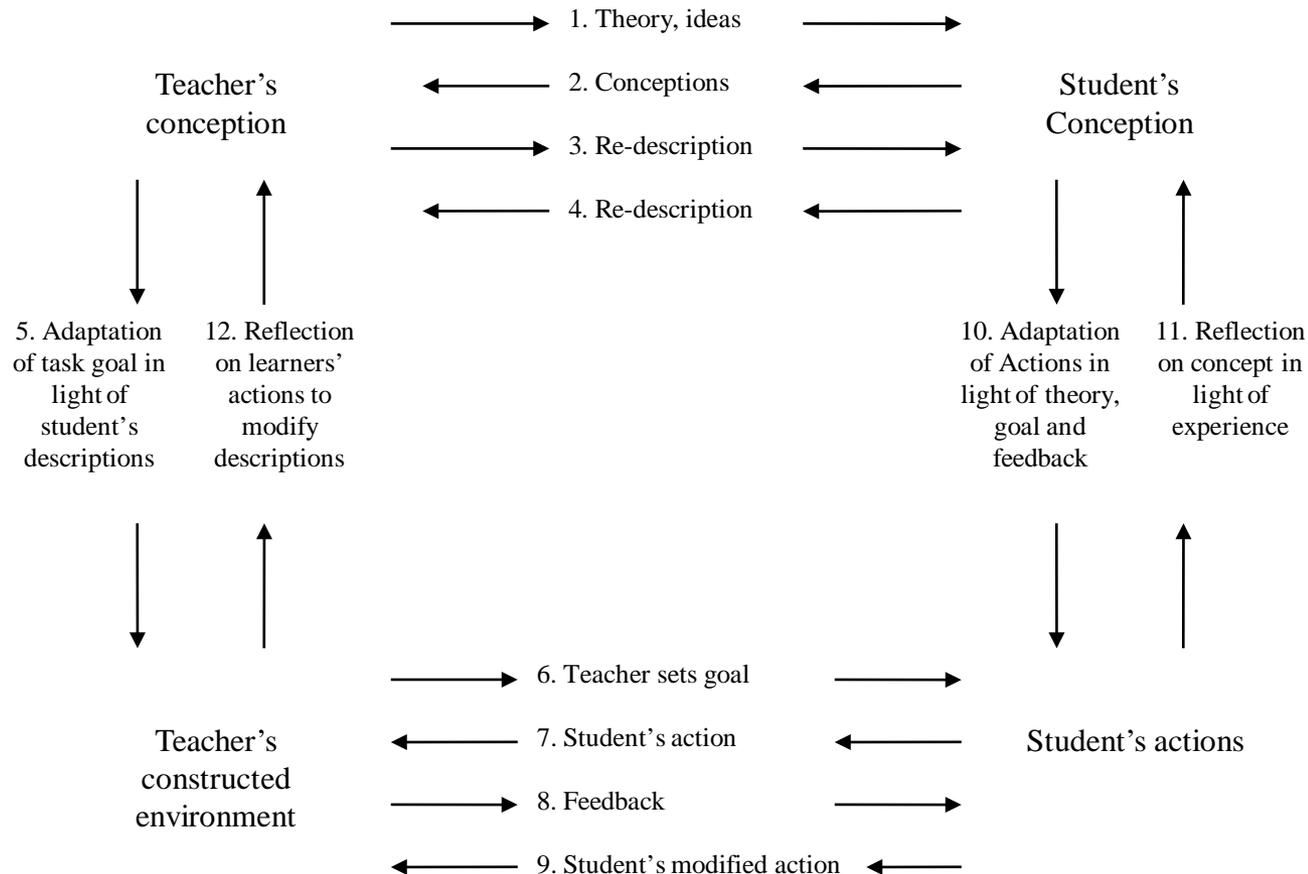
Results – study characteristics II

- Very broad range of specialities represented.
- Very broad range of topics taught.
- Courses were mainly of 3 types:
 - Stand-alone web based courses with minimal interaction
 - Blended learning
 - Tele-education
- Study designs:
 - RCT (20%)
 - Quasi-experimental (60% - mainly pre/post design)
- Vast majority only looked at Levels 1 and 2 of Kirkpatrick's Levels of Evaluation (i.e. satisfaction and knowledge change).
- 72% had a positive outcome

Results – theory testing I

- Two theories had data within the included articles to support them:
 - Laurillard’s Conversational Framework.
 - Rogers’ Diffusion of Innovations theory (Innovation theory) and its attributes.

Results – theory testing II: Laurillard’s Conversational Framework



Results – theory testing III: Laurillard’s Conversational Framework

- Learners learn by entering into a dialogue with others that allows them to clarify their own understanding.
- Supporting text examples:
 - “The interactive dialog probably played a large role in the program’s effectiveness by encouraging the students to work through problems, inducing them to take more time on particular tasks and probably to give more attention to the material.”
[Medical students, RCT, Learner-content interaction]
 - “When asked to design an effective learning tool for this e-course, the students unanimously said they wanted interactivity—interactive quizzes and interactive cases.... Students want e-courses to be built around cases, quizzes, and conversations with teachers.”
[Medical students, long term evaluation study using multiple methods, Learner-learner/content/tutor interaction]
 - “After surveying the students, the modular and dynamic teaching approach of simPHYSIO (interactivity, user driven manipulations, animations) was one of the most significant features in helping the student learn the material and enjoy the learning process..... “I like the interactive approach of virtual labs. It made the concepts easier to understand.””
[No data on participants, long term evaluation study using multiple methods, Learner-content interaction]

Results – theory testing IV: Innovation theory

Attributes according to Rogers	Attributes as adapted by Moore and Benbasat
Compatibility	Compatibility (with existing practices and values)
Complexity	Ease of use (the degree to which the innovation is expected to be free of effort)
<p>Relative advantage: Innovations that have a clear, unambiguous advantage in terms of either effectiveness or cost-effectiveness will be more easily adopted and implemented. This advantage must be recognised and acknowledged by all key players. If a potential user sees no relative advantage in the innovation he or she does not generally consider it further: in other words, relative advantage is a <i>sine qua non</i> for adoption. Relative advantage is a socially constructed phenomenon.</p>	<p>Relative advantage (split into the degree to which it is perceived as better than its precursor and the degree to which it is perceived as useful - implicitly, for doing one's job)</p>
Trialability	Trialability (can be tried out on a limited basis)
Observability	Result demonstrability (the degree to which it is perceived as amenable to demonstration)
Reinvention	No equivalent
No equivalence	Image (the degree to which it is seen as adding to the user's social approval)
No equivalence	Visibility (the degree to which the innovation is seen to be used by others)
No equivalence	Voluntariness (the degree to which use of the innovation is controlled by the potential user's free will)

Results – theory testing V: Innovation theory

- Example texts:

- Relative advantage

- “Students gave significantly higher ratings to the accessibility and efficiency of the Virtual Microscope Laboratory vs. the regular microscope laboratory. Regular microscope laboratories were open during the day, but the additional accessibility of the Virtual Microscope Laboratory after hours was taken advantage of by students, especially preceding practical examinations.”

- Ease of use

- “Students prefer CAI to traditional glass slides because the skill level and the time required for learning CAI is less than the time needed to use a microscope or projector.”

- Compatibility

- “Even though the four surgeons were at different levels in their learning curve, they noted that the presence of an experienced surgeon was at the least reassuring and, in many instances, vital in helping with choreography of the operation... The surgeons also considered that this process facilitated collegial relationships between academic and community surgeons.”

Results – theory testing VI: Important subcomponents of ‘relative advantage’

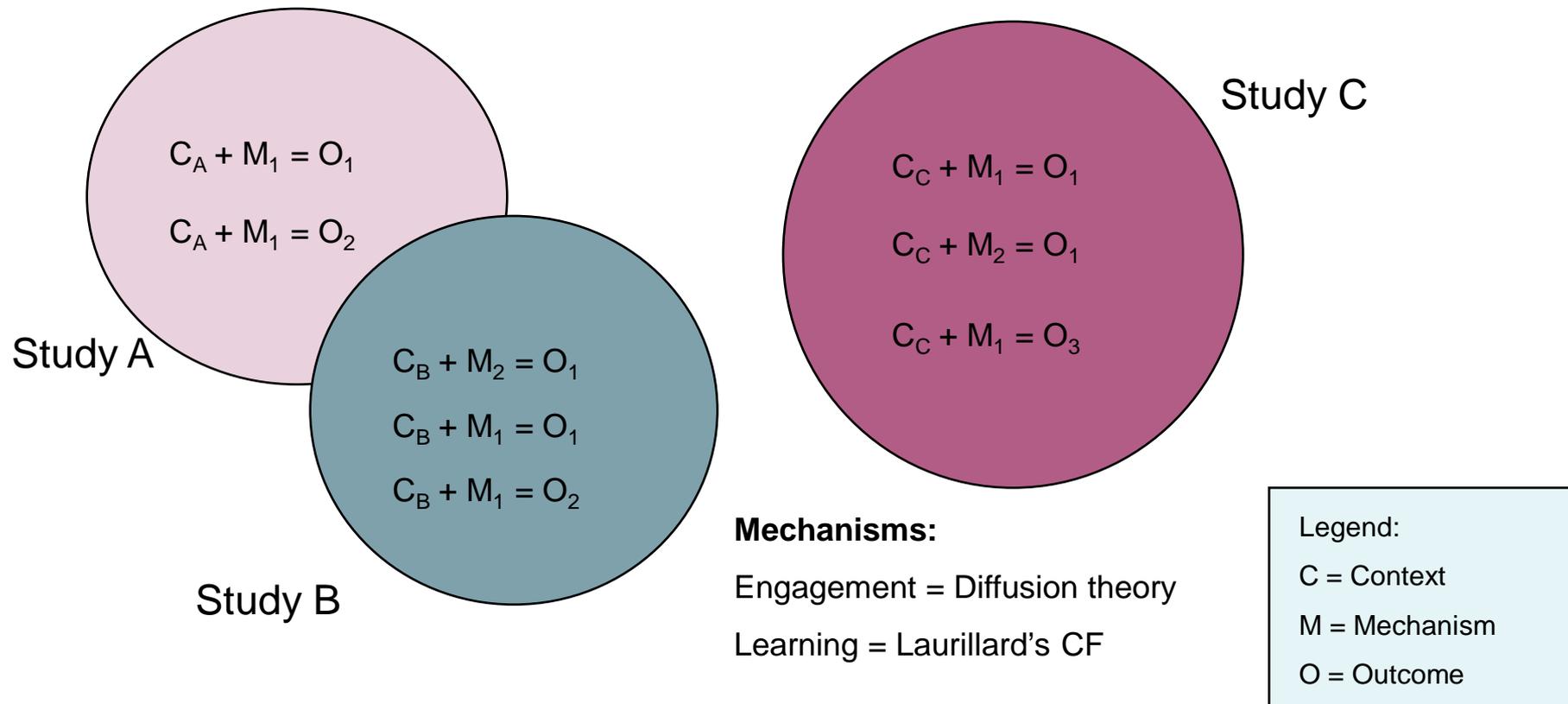
- Access to learning
- Assessment linkage
- Content uniformity
- Convenience
- Cost saving
- Interactivity
- Time saving

Results – theory testing VII: Innovation theory

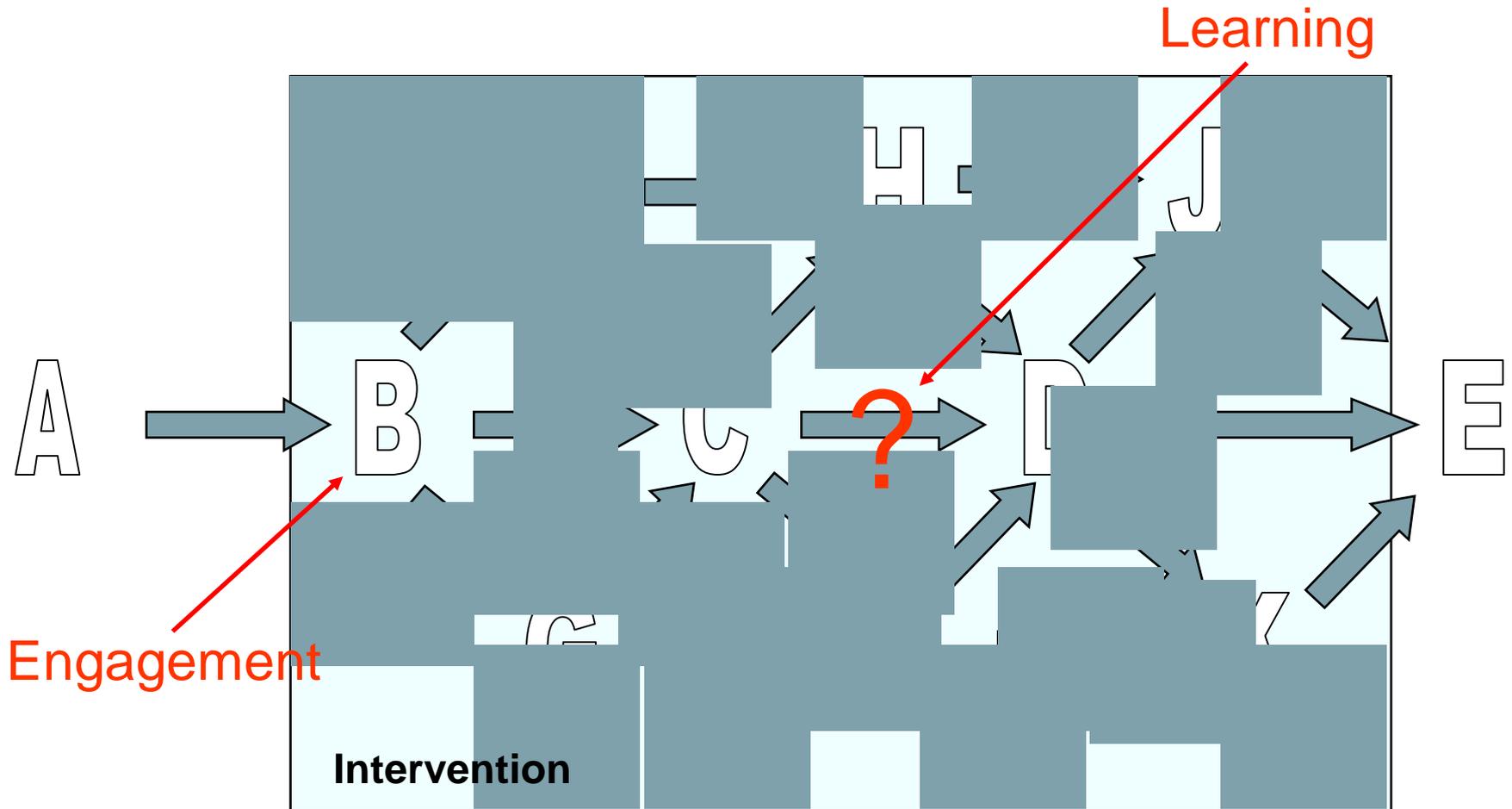
- The most important attribute ‘relative advantage’. This was best illustrated by the included articles on ‘Virtual microscopy’.
- This was also evident in other examples (e.g. teleconferenced lectures and asynchronous conferencing – via the Internet).
- Whilst ‘ease of use’ and ‘compatibility’ were important, they seemed to be less so compared to ‘relative advantage’.

Results – theory testing VII

In the case of the use of the Internet in medical education, there were 200+ contexts, two mechanisms were identified and numerous outcomes



The Internet in medical education



The multitude of interactions within a complex intervention may seem daunting!

Implications I

- The educational context within which an intervention takes place is an important ‘variable’ and cannot just be ignored.
- It is only by analysing how the context and various mechanisms interact that we can explain, understand and ‘predict’ why some educational interventions are ‘successful’ whilst others are not.
- There are middle range theories which can explain how, why etc. some aspects of internet based educational interventions ‘work’.
- There is no such thing as a ‘one-size-fits-all’ set of guidelines or ‘cook book’ which can explain or predict the success of internet based courses – but there are theories which can help us and as each course is unique, each course needs to be adapted using these theories.

Implications II

Technology acceptance

- How useful will the prospective learners perceive the Internet technology to be? For example, in any particular context and compared to what is currently available to them, to what extent will this technology
 - Increase their access to learning?
 - Provide consistent, high-quality content?
 - Be a convenient format in which to receive their education?
 - Save them money?
 - Save them time?
 - Link to course assessment?
- How easy will the prospective learners find this technology to use?
- How well does this format fit in with what learners are used to and expect?

Achieving interactive dialogue

- How will high-quality human-human (learner-tutor and learner-learner) interaction be achieved? For example what use will be made of
 - Structured virtual seminars?
 - Email, bulletin boards?
 - Real-time chat?
 - Supplementary media e.g. phone calls, videoconferencing?
 - Course assessment and feedback on performance?
- How will high-quality human-technical interaction be achieved? For example what use will be made of
 - Questions with automated feedback?
 - Simulations?

Conclusions

- Theory can be used to help us understand how educational interventions work, for whom, in what circumstances and to what extent.
- Learners value interaction as this allows them to clarify what their understanding (Laurillard's Conversational Framework).
- Courses will only be 'successful' when they can engage learners by offering them a relative advantage from what else is on offer, are easy to use and compatible with their values, expectations and needs (Innovation theory).

Our next steps...

- Testing the method in other fields...
- ... Legislative interventions in public health

Almost there.....

- Are there any more questions?

Summary

- Education is a ‘complex intervention’
- Complex interventions depend on theory and context in order to understand how they work
- ‘Traditional’ systematic reviews strip out this context
- Realist reviews help us understand complex interventions by focussing on context and looking inside the ‘black-box’ of the intervention itself

How many realists does it take to change a light bulb?



It depends on
the context J

Thank you for listening and for your questions

Suggested readings:

- Pawson R. Evidence-based Policy. A Realist Perspective. London: Sage, 2006.
- Pawson, R., Greenhalgh, T., Harvey, G., and Walshe, K. Realist Synthesis: an introduction.
<http://www.ccsr.ac.uk/methods/publications/documents/RMPmethods2.pdf> . 2004. ESRC Research Methods Programme.
- Popay J. Moving beyond effectiveness in evidence synthesis. Methodological issues in the synthesis of diverse sources of evidence. London: National Institute for Health and Clinical Excellence, 2003.
- Klee R. Introduction to the philosophy of science. Cutting nature at its seams. New York: Oxford University Press, 1997

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