Lecture 6 – Integration by connection

ESI Mixed methods evidence synthesis

25th and 26th September
Galway Bay Hotel

UCL

EPPI Centre
Evidence for Policy & Practice

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Connection

Purpose: To use the findings of one synthesis to inform the conduct and focus of another

Question: Separate question(s) for QES, quantitative synthesis and mixed-method synthesis

Assumptions: The different natures of qualitative and quantitative evidence mean that they should be synthesized separately – but that the synthesis of one type of evidence can inform the synthesis of the other.

Strategy: To connect findings from QES and quantitative / effectiveness synthesis - e.g. to test QES derived theories using effectiveness evidence.

What to connect and how?

Aim	What to connect	Connection tool
5. To derive hypotheses from QES that can then be tested using effectiveness / quantitative data.	QES themes *inform* **Effectiveness synthesis**	Sub-group analysis
6. To identify key intervention, contextual or implementation factors that may influence outcomes from a QES. Combinations of interrelated factors tested via QCA.	QES themes *inform* **Analysis of intervention complexity**	Qualitative comparative analysis (QCA)
7. To ensure QES findings can be translated for policy and practice. Findings of effectiveness research are used as a framework to guide the extraction and synthesis of qualitative data for the QES.	Effectiveness synthesis *informs* **QES**	Framework

Example 5. QES informs sub-group analyses

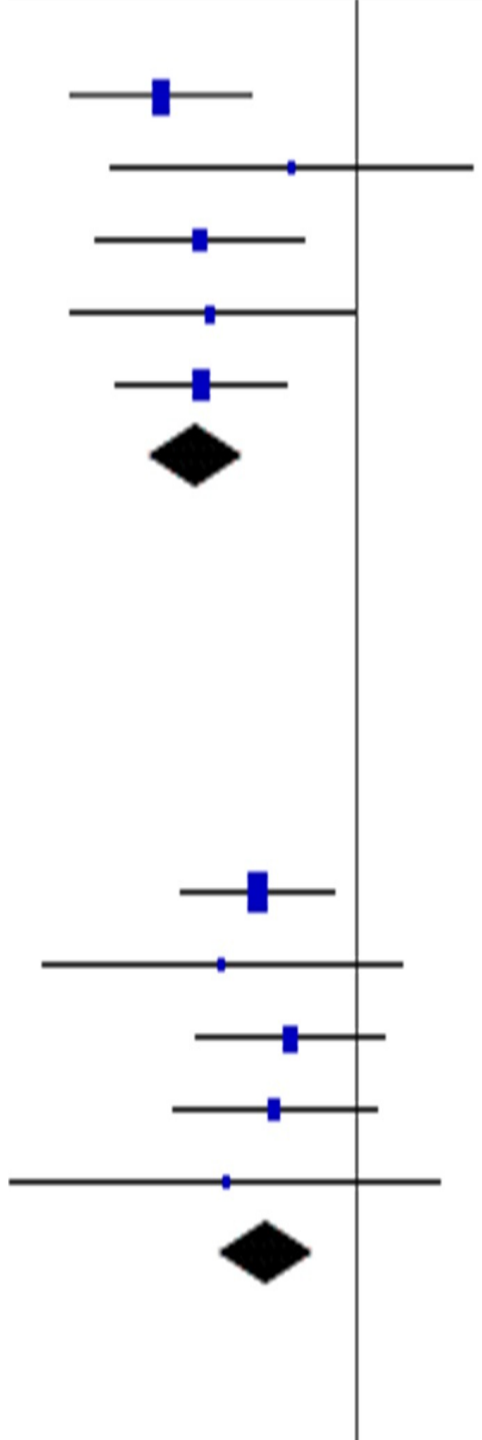
Review: Children and healthy eating: a systematic review of barriers and facilitators

Review objectives: To understand what is known about the barriers to and facilitators of healthy eating amongst children aged four to 10 years old.

Integration objective: To derive hypotheses from QES that can then be tested using effectiveness / quantitative data.

Integration methods: QES provided analytic themes about important intervention features that could then be tested via sub-group analysis.

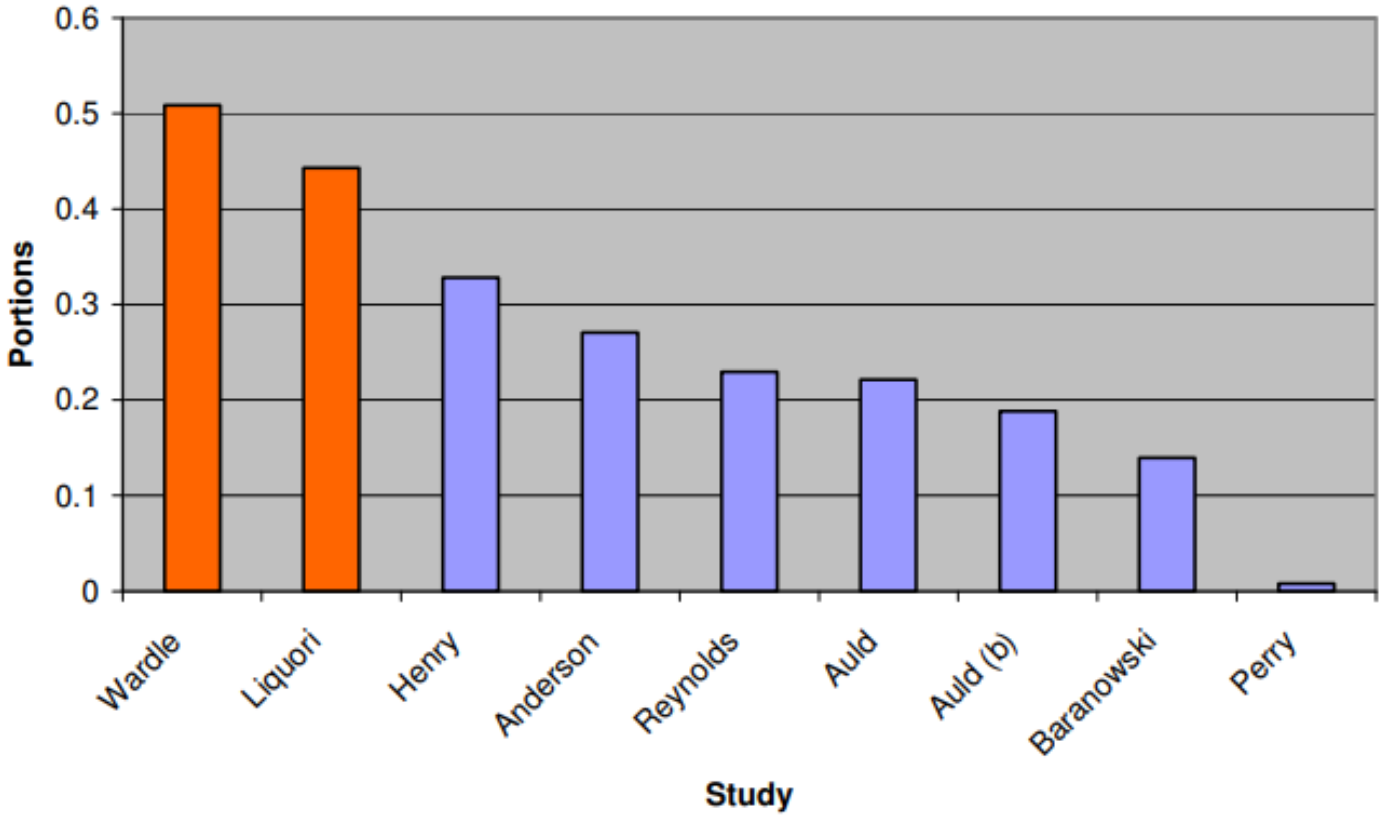
Value of integration: The QES suggested that interventions should treat fruit and vegetables in different ways, and should not focus on health warnings. Sub-group analyses showed that interventions which were in line with these suggestions tended to be more effective than those that were not.



Example 5. QES informs sub-group analyses

QES key finding: children not interested in health benefits of F&V

Red bars: trials that did not focus on health benefits of F&V



Example 7: Effectiveness synthesis drives QES

- **Review**: Flemming (2010) Synthesis of quantitative and qualitative research: an example using Critical Interpretive Synthesis
- **Review objectives**: To synthesize quantitative research, in form of an effectiveness review and a guideline, with qualitative research, in form of a QES, to examine the use of morphine to treat cancer-related pain.
- **Integration objective**: To ensure QES findings can be translated for policy / practice.
- **Integration methods**: The findings from the effectiveness review interface with and drive the synthesis of qualitative research. Matrix based on effectiveness findings drives conduct / focus of QES.
- **Value of integration:** demonstrated how practical enactment of effective interventions can alter in relation to other elements, e.g. threats to health, interaction with healthcare professionals and perceived meaning of the intervention.

Example 7: Effectiveness synthesis drives QES

	Opioid of first choice is morphine	If pain returns on a regular basis, regular dose should be increased and rescue medication taken	For patients on normal release medication a double dose should be taken at bedtime	Successful pain management requires adequate analgesia without adverse effects
Coyle 2004	Morphine is viewed as positive to relieve pain Good analgesia leads to a sense of control	Poorly controlled pain is interpreted as worsening disease Unlimited analgesia is required for a comfortable death		Adverse effects are a burden Cognitive side effects lead to 'loss of self' Opioids are a burden because of side effects
Ersek *et al.* 1999	Need to prove pain to get analgesia Patients took opioids regularly to improve functioning Side effects are tolerated		Patients wake at night in pain as they can't afford sustained release preparations	Functionality more important than pain relief Adverse effects are a deterrent Analgesic use altered because of side effects Side effects seen as a sign of addiction
Johnston-Taylor *et al.* 1993	Morphine works so it gets taken despite side effects	Patients had conflict over management of opioids, what, when how to take?	Fear that pain will increase towards death	Negative connotations associated with morphine use because of side effects Carers have concerns over side effects and addiction Nurses concerns over side effects

Example 6: QES Themes inform analysis of intervention complexity

Review: Melendez-Torres et al (2019) Developing and testing intervention theory by incorporating a QES into a qualitative comparative analysis of intervention effects

Review objectives: To identify the critical features of successful weight management programmes (WMPs) for adults.

Integration objective: To identify key intervention, contextual or implementation factors that may influence outcomes from a QES. Combinations of interrelated factors then tested via QCA.

Integration methods: QES provided working theory to structure a QCA, specifically by suggesting specific intervention features to be examined.

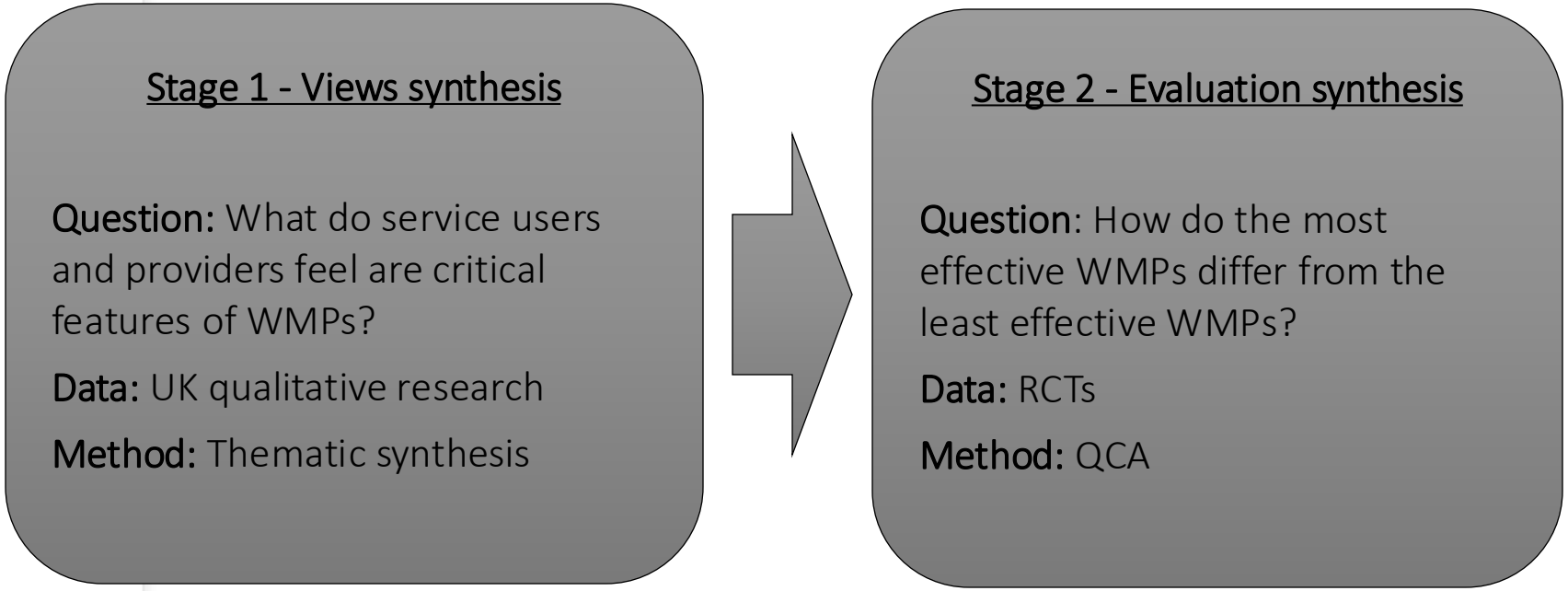
Value of integration: The QES helped to sharpen the focus on the most salient features to be examined, supported interpretation of findings, and ensured that we avoided data dredging.

Review context: Adult weight management programmes (WMPs)

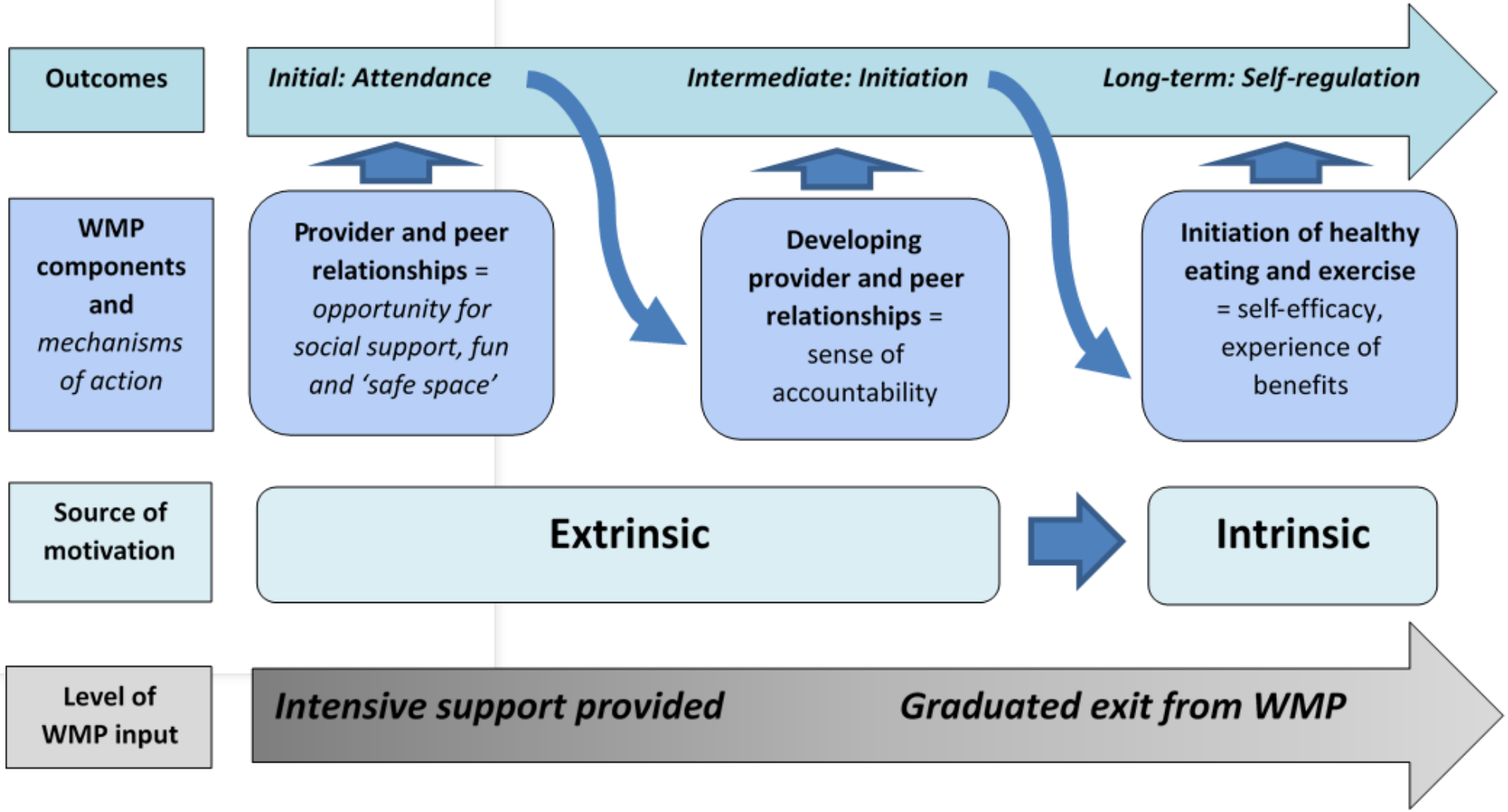
- Existing SRs show *multi-component* WMPs (addressing both diet and exercise) *more effective* than those addressing *diet or exercise alone*
- BUT more *fine-grained* evidence not available
- NICE (2014) meta-regression – "*key ingredients* that differentiate more effective from less effective interventions remain *largely unknown* "
- DH commissioned us to try an alternative method
- Built on work of colleagues - Thomas, O'Mara-Eves and Brunton (2014)

Design of our review

Overarching review question: *'What are the critical features of successful WMPs for adults?'*



Stage 1 findings: What do service users and providers describe as the critical features and underlying mechanisms of weight management programmes?



What is QCA?

- **Aim**: to identify mechanisms through which interventions have impact they do - not 'what works, on average'
- **How**: Identifies combinations of intervention/contextual features that are (or are not) present when an intervention is successful (or not) in obtaining desired outcome
- **Logic**:
  - Case rather than variable oriented – deep holistic understanding of interventions, features and context
  - Set-theoretic logic – systematic comparison of cases (interventions) within sets (e.g. effective vs ineffective) to identify necessary and sufficient conditions
  - Analysis informed by, or underpinned by existing theories

(cochrane.org)Microsoft Word - QES_Chapter_18_QCA_v0_161023.docx (cochrane.org)

QCA lingo

Condition – single feature or characteristic of an intervention

Configuration – a combination of conditions

Cases – interventions and the context in which they occur (e.g. a particular intervention evaluated in a trial)

Sets – Groups of cases that are similar (e.g. with similar outcomes in terms of weight loss)

Key stages of QCA

Stage	Name	Details
1	Building 'data table'	- rows = cases, columns = conditions - to capture whether conditions are present or not in each case
2	Constructing 'truth tables'	Summarises how many cases within a particular configuration are instances of outcome
3	Checking quality of truth tables	**Contradictory configurations** = identical configurations present in both pos. & neg. cases **Satisfactory Spread** = good spread in terms of outcomes and conditions within configurations
4	Boolean minimisation	Most simplified configurations, i.e. reduced to essential components of configuration
5	Consideration of 'logical remainders'	Consideration of the *potential* outcome of configurations not present in any interventions
6	Interpretation	interpreting findings in the light of theory – ensures that findings are grounded – not 'fishing'

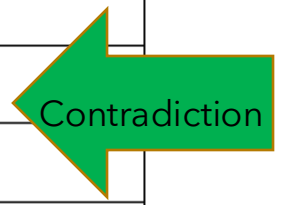
Stage 1: Data Table (well some of it …)

	Practical info	De-emphasis 'diet'	visual demos	Diet monitoring 'easy'	Diet monitoring not further stated	Direct provision	focus on fitness gains	tailored to fitness levels	graduated
Bertz 2012	1	0	1	0	1	1	1	1	1
DPP 2002	1	0	0	1	0	1	0	1	0
Foster-Schubert 2012	0	0	0	0	1	1	0	1	1
Kuller 2012	1	0	0	0	1	0	0	0	1
Rejeski 2011	1	0	1	0	1	1	1	0	1
Rock 2010 (CB)	1	0	0	0	0	0	0	0	0
Rock 2010 (TB)	1	0	0	0	0	0	0	0	0
Villareal 2011	0	0	0	0	1	1	0	1	1
Vissers 2010 (fitness)	0	0	0	0	0	1	0	0	1
Vissers 2010 (vibration)	0	0	0	0	0	1	0	0	1
Eriksson 2009	1	0	0	0	0	1	0	1	1
Hersey 2012 (2)	0	0	0	0	1	0	0	0	0
Hersey 2012 (3)	0	0	0	0	1	0	0	0	0
Jolly 2011 (GP)	1	0	1	0	1	0	0	0	1
Jolly 2011 (pharmacist)	1	0	1	0	1	0	0	0	1
Jolly 2011 (SW)	1	0	1	0	1	0	0	0	1
Munsch 2003 (clinic)	0	0	0	0	1	0	0	0	1
Nanchahal 2011	1	0	0	0	1	0	0	1	0
Patrick 2011	1	0	0	1	0	0	0	1	1
Vermunt 2011	1	0	0	0	1	0	0	0	0
Very effective total	6	0	2	1	5	7	2	4	7
Not very effective total	7	0	3	1	8	1	0	3	6
Total	13	0	5	2	13	8	2	7	13

Stage 2 & 3: Construct Truth Table and examine quality

Table 3.7: Configurations represented in the provider alliance model

Direct provision of exercise	Provider relationships	Graduated exit	High intensity	Number of most effective interventions	Number of least effective interventions
Present	Present	Present	Present	5	0
Present	Present	Absent	Present	1	0
Present	Present	Absent	Absent	1	0
Absent	Present	Present	Present	3	0
Present	Absent	Present	Present	0	1
Absent	Present	Present	Absent	0	1
Absent	Present	Absent	Absent	0	5
Absent	Absent	Absent	Present	0	1
Absent	Absent	Absent	Absent	0	2



Stage 4: Boolean minimisation

- This stage uses Boolean logic to produce the most simplified expression configurations found to lead to a specific outcome
- The range of configurations are examined to determine pathways with the least possible number of conditions

Stage 5: Consideration of logical remainders

Table 3.8: Logical remainders in the provider alliance model

Provider relationship	Direct provision of exercise	High intensity	Graduated exit	Number of most effective interventions	Number of least effective interventions
Present	Present	Absent	Present	0	0
Absent	Present	Absent	Present	0	0
Absent	Present	Absent	Present	0	0
Absent	Present	Absent	Absent	0	0
Present	Absent	Present	Absent	0	0
Absent	Absent	Present	Present	0	0
Absent	Absent	Absent	Present	0	0

Stage 6: Interpretation

Critical feature	Example view	Most effective interventions (n=10)	Least effective interventions (n=10)
Good quality provider relationship	*'You feel that somebody's batting for you'* *'personality and approach of the advisor is likely to determine the success or failure of the service'*	All 10 most effective interventions had: Provider-user relationships emphasised AND Characteristics perceived to foster self-regulation.	All 10 least effective interventions had: NO emphasis on provider relationships. OR An emphasis on provider relationships BUT NO self regulation characteristics.

Strengths of QCA

- Ability to identify critical features where other approaches unsuccessful
- Works particularly well with (relatively) small number of heterogeneous studies
- Ability to reflect complexity – configurations of factors rather than single efactors AND multiple pathways to effectiveness
- Grounding in theory (views synthesis / ICA / existing theory) structures analysis and avoids data dredging
- Grounding in theory (views) ensured not just justification but explanation i.e. not just ‘what works’ but ‘why it works’

Limitations of QCA

- Analytical approach is abductive > findings more tentative than from deductive approaches
- Poor intervention reporting is common in trials > may hinder deep understanding
- BUT – QCA is explicit and systematic approach - provides useful/usable info for decision-makers where otherwise they have nothing to base decision

Activity 6 – trying out integration by connection - QCA

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Activity 6

- Do the implications for interventions examined in previous activities explain why some interventions are more successful than others?
  1. Step 1 - calibrating outcome set: How should we define which interventions are 'more successful' and which are 'less successful'? (group discussion)
  2. Step 2 - Building a 'data table' - mapping out each intervention's characteristics and outcome
  3. Step 3 – Building and analysing the Truth Table – moving to examining configurations and conditions and their association with outcome sets

Approach	Useful when …	Strengths	Limitations
1. Compare: synthesis matrix (trial recruitment)	QES aims to understand existing quant synthesis	Understand weight of evidence supporting QES	Synergies between QES and interventions unclear
2. Compare: interventions matrix (labour companions)	Seeking detail about interventions	Offers finer grained detail re interventions	Depends on detailed intervention descriptions
2. Compare: annotated logic model (care farms)	Seeking to understand theory / mechanisms	Offers holistic picture of how interventions work	Challenging to link evidence to mechanisms
4. Compare: line of argument (ACEs)	Synthesis findings do not "speak to each other"	Conceptual enlightenment / reveals research gaps	Lacks detail / limited use in decision-making
5. Connect: QES inform sub-group analysis (fruit & veg)	Seeking to test QES derived theory	Enables testing of factors difficult to identify in advance	Depends on sufficient trials / outcome variation
6. Connect: QES informs QCA (weight management)	Exploring intervention complexity	Understand interaction of intervention / context	Depends on sufficient trials / outcome variation
7. Connect: Effectiveness	Need to interpret	Ensures QES is relevant	Important QES findings

Further useful resources

- [Mixed methods evidence synthesis (ioe.ac.uk)]
- Cochrane handbook chapter on integration
- Hong et al. (2020) Variations of mixed methods reviews approaches: A case study.
- Variation seen across five key dimensions
  - types of questions answered
  - purposes of the mixed methods questions
  - types of evidence and sources
  - integration strategies
  - reasons for using a mixed methods approach

Research Synthesis Methods

RESEARCH ARTICLE | Open Access

Variations of mixed methods reviews approaches: A case study

Quan Nha Hong, Rebecca Rees, Katy Sutcliffe, James Thomas

First published: 18 July 2020 | https://doi.org/10.1002/jrsm.1437 | Citations: 21

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Abstract

Conducting mixed methods reviews is challenging. The aim of this article is to describe a range of rationales for and approaches to mixed methods reviews, with a particular focus on one research group. A case study was conducted to describe the mixed methods review process used at the Department of Health and Social Care Reviews Facility in England. The case study used document analysis. A total of 30 mixed methods reviews were identified and analyzed. The analysis revealed five key dimensions on which the reviews varied: review questions and purposes of the mixed methods questions, types of evidence and sources, reasons for using a mixed methods approach, synthesis methods and designs, and integration strategies. The questions in the included reviews addressed stakeholders' views, and intervention processes and/or intervention effectiveness. The mixed methods questions addressed four different purposes: comparing findings,