Title: Current use and Cochrane guidance on selection of social theories for systematic reviews of complex interventions

Keywords: Social theory; systematic review; complex intervention; methodology; survey; Cochrane

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Over 100 theories were identified with evidence of proliferation over the last 5 years. New low-level theories (tools, taxonomies etc.) have been developed for classifying and reporting complex interventions. Numerous mid-range theories are used; one example demonstrated how control theory had changed the review's findings. Review-specific logic models are increasingly used, but these can be challenging to develop. New low-level and mid-range psychological theories of behaviour change are evolving. No reviews using grand theory (e.g. feminist theory) were identified. We produced a searchable Wiki, Mendeley Inventory and Cochrane Guidance.

Conclusions
Use of low-level theory is common and evolving; incorporation of mid-range theory is still the exception rather than the norm. Methodological work is needed to evaluate the contribution of theory. Choice of theory reflects personal preference; application of theory is a skilled endeavour.
To the Editor
Journal of Clinical Epidemiology

27th April 2015

Dear Editor,

RE: Manuscript entitled ‘Current use and Cochrane guidance on selection of social theories for systematic reviews of complex interventions’.

We are pleased to submit the above manuscript for consideration by the Journal of Clinical Epidemiology (JCE). The novel methodological work funded by Cochrane is the first of its kind to classify and report the use of social theory in systematic reviews of complex interventions.

The manuscript also directs review authors to two new searchable resources, and is accompanied by new Cochrane guidance of the selection of social theories for use in complex intervention reviews.

The work reported here has not been submitted for publication elsewhere.

We look forward to receiving feedback in due course.

Yours Sincerely,

Jane Noyes on behalf of the authors.
Reviewer suggestions

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Use of social theories in systematic reviews of complex interventions

Current use and Cochrane guidance on selection of social theories for systematic reviews of complex interventions

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200 words (abstract)

The main text is 5,156 words, including in-text references and excluding headings, figures and tables

Running title:
Use of social theories in systematic reviews of complex interventions

Key words: Theory, systematic review, complex intervention, methodology, survey, Cochrane

What is new?

- Low-level, mid-range and grand theories are defined, classified and articulated in the context of systematic reviews of complex interventions.
- Two new searchable author resources (a ‘Theory in Reviews’ Wiki and Mendeley Theory in Reviews Inventory) are presented
- New Cochrane guidance is provided on the selection of social theories in complex intervention reviews

1. Introduction

The importance and use of social theories in health and social care research has become increasingly evident over the last couple of decades. Alderson, in a seminal paper published in the British Medical Journal in 1998, stated that “theories range from explicit hypotheses to working models and frameworks of thinking about reality” and that “the choice of theory, although often unacknowledged, shapes the way practitioners and researchers collect and interpret evidence”[1]. Reeves and colleagues expanded this idea by suggesting that “theories also provide complex and comprehensive conceptual understandings of things that cannot be pinned down: how societies work, how organisations operate, why people interact in certain ways”[2]. From a sociological perspective, Merton classified theories as low-level, mid-range or grand theory lying on a spectrum “between the minor but necessary working hypotheses that evolve in abundance during day-to-day research and the all-
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inclusive systematic efforts to develop a unified theory that will explain all the observed uniformities of social behaviour, social organization and social change”[3]. The boundaries between theory levels can however overlap and theories can transcend levels (or be refuted and discarded) as they are developed and tested over time. Merton’s classification can be applied to theory used in systematic reviews as follows:

**Low-level theory**
Low-level theories (e.g. segregated hypotheses or isolated propositions, and typologies and taxonomies etc.) are used to predict, assume, describe or organise aspects of the phenomena of interest, but do not show the inter relationships between concepts. All reviews contain low-level theory in the form of segregated hypotheses or questions, but review designs and methods vary in the degree to which they incorporate recognised frameworks to systematise the review processes such as use of PICO[4] to develop and refine questions, quality appraisal or risk of bias tools, reporting frameworks (e.g. the PRISMA checklist and flow-chart[5]) and so on.

**Mid-range theory**
Mid-range theories (e.g. conceptual frameworks and models, and theories such as the Theory of Planned Behaviour[6, 7]) have interconnected relationships between concepts with limited scope to explain specific phenomena, are empirically testable, and can be used to describe and predict causal relationships amongst concepts, or used to define activities and processes and predict outcomes. The Theory of Planned Behaviour, for example, is used to predict a person’s intention to engage in a particular behaviour at a specific time in a specific context. Some more sophisticated hypotheses can also be defined as mid-range theories. Likewise, ‘Programme theories’ that make explicit the causal assumptions as to how a complex intervention is intended to work may start off as low level theories and be developed into mid-range theory[8].

**Grand theory**
Grand theories are highly abstracted theories in which organised and integrated concepts explain the social world and are empirically testable (e.g. Feminist theory, Welfarism or Marxism). Feminist theory for example explains the phenomena of gender inequality in all social interactions at societal level, which distinguishes it as a grand theory because its focus moves beyond the more limited context of mid-range theory.

**Evidence-based healthcare as a social theory**
If defined as a social theory, evidence-based healthcare in its broadest sense (combination of best evidence (beyond the RCT), patient/population perspective and clinical judgement) could be conceptualised as a grand theory as well as a philosophy and scientific method underpinning decision-making. Evidence-based healthcare evolved from the conceptually narrower evidence-based medicine which privileges the RCT as the best form of evidence. Although Cochrane reviews contribute to evidence-based healthcare, in isolation, the
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standard Cochrane review of intervention effects is anchored within the positivist hierarchical epistemology of evidence-based medicine. As a consequence it prioritises aggregation of a limited number of pre-determined primary and secondary outcomes from randomised controlled trials to explain a specific phenomenon of interest (intervention effect) which is more closely aligned to mid range theory[9].

Figure 1 shows the different levels of low, mid and grand theory on Merton’s spectrum[10], and where theory can inform the design and conduct, and also be a product of systematic reviews. Application of social theory is common in the context of primary (especially qualitative) research to understand complex issues through specific “lenses” and to analyse and focus attention on different aspects of data[2]. A few review authors who use standard Cochrane review methods have however given explicit consideration to theory when evaluating included primary studies. The Cochrane Public Health Group recognises in their supplemental guidance to the Cochrane Handbook that “as interventions become more multi-faceted, and thus more complex, it is important to reflect on the role theory has played”[11]. For example, in a systematic review of internet-based interventions to promote health behaviour change, Webb and colleagues found that theory-based interventions were more effective than those not based on theory[12]. The limitation of the standard Cochrane approach is that beyond answering a simple question about intervention and effect, it cannot easily address complex questions or accommodate the synthesis of complex interventions with multiple causal pathways, interactions and outcomes. Cochrane has however in recent times become more innovative and published non-standard Cochrane reviews that integrate a synthesis of qualitative evidence to explain different intervention and implementation effects that more closely align with the broader evidence-based healthcare context[13]. The Cochrane Qualitative and Implementation Methods Group (http://cqim.cochrane.org/) has been a driving force behind repositioning Cochrane as a producer of mixed-method and qualitative evidence syntheses linked with Cochrane effect reviews that contribute to evidence-based healthcare decision-making.

Newer explicitly “theory-led” evidence synthesis approaches (such as Realist Review[14]) are positioned within a realist epistemology and foreground theory use and development with different types of evidence as a way of understanding the complex world and multiple potential realities and outcomes. More recently, perhaps as a consequence of more theory-informed primary research and development of newer theory-led synthesis methods, the potential role of social theory (in particular low-level and mid-range) in Cochrane systematic reviews of complex interventions, or reviews where complexity is an important consideration, has captured increasing interest from review authors and methodologists alike. New United Kingdom (UK) Medical Research Council (MRC) guidance on the design and conduct of process evaluations alongside randomised controlled trials outlines the importance of using theory-informed methods to understand the functioning of a complex intervention[8]. It is therefore not unreasonable to anticipate that future trials of complex interventions are more likely to be designed with more sophisticated theory-informed
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process evaluations that produce various types of data and evidence amenable to synthesis that shed light on a range of short, medium and longer term options and outcomes for decision-makers to consider.
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Figure 1. Spectrum and potential use of theory in the context of systematic reviews. Based on Merton’s hierarchy of theory[10].
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Whilst interest in theory in systematic review gathers pace, methods guidance, such as the Cochrane Handbook[15], and the Centre for Reviews and Dissemination Guidance[16] has a notable absence of reference to, or guidance on, the use of theory in reviews, other than commonly used low-level theory (e.g. frameworks and tools) to systematise the review process. Even then, many systematic reviewers would probably not recognise or conceptualise common systematic review frameworks and tools (PICO[4], PRISMA[5], risk of bias tools[17, 18] etc.) as ‘theories’ and they may not consider that they are using social theory in their systematic reviews.

The main difficulty in understanding the range and use of social theories available as a resource for systematic review authors is lack of common language and understanding regarding their location on the theory spectrum (Figure 1), and the inconsistent terminology employed to label and describe theories in the context of systematic review methods. Social theories are variously and inconsistently termed theories, conceptual models or frameworks, tools, taxonomies, typologies, hypotheses, propositions, conjectures etc. In the context of systematic reviews we propose ‘theory’ as an overarching term, but also characterise two main overlapping categories: (i) theories for systematising review processes, and (ii) theories for conceptualising, theorising and interpreting evidence (see Figure 2).

Figure 2. Categorisation of social theory in the context of systematic reviews

<table>
<thead>
<tr>
<th>‘Theory’ is an overarching term characterised by two categories:</th>
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<tr>
<td><strong>1. Theories</strong> for systematising review processes (e.g. evidence-based frameworks such as PICO[4], classification tools such as iCAT-SR[19], GRADE[18], and reporting standards such as PRISMA[5]. More likely to be low-level theories (see Figure 1)</td>
</tr>
<tr>
<td><strong>2. Theories</strong> for conceptualising, theorising and interpreting evidence (e.g. conceptual and logic models, and theories such as the Normalisation Process Theory or the Theory of Planned Behaviour). More likely to be mid-range or grand theories (see Figure 1).</td>
</tr>
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</table>

Most theories located on the spectrum shown in Figure 1 can be situated within one or other of these two categories. Some theories may however be located within either category, or develop through the process of the review and move across categories or theory level as they become more fully developed and comprehensive and become more powerful in explaining phenomena; such as with the concurrent development of a logic model whilst conducting a review to systematise data processing and interpretation. For example, review authors such as Turley and colleagues, commenced their review by developing rudimentary logic to inform the review design. This was extended within an initial logic model to identify outcomes of interest and then further refined and presented
as a mid-range theory in the form of more fully developed logic model to provide an integrated conceptual picture explaining the review findings[20].

1.1. Ascertaining a picture of current and potential use of theory in systematic reviews of complex interventions

The increasing trend for reviewers to incorporate social theory into their reviews presents difficult challenges related to the identification and selection of appropriate theory that might be useful and add value in specific review contexts. It is likely that the emphasis on using theory in new UK MRC guidance on designing and conducting process evaluations to understand the functioning of a complex intervention will generally lead to increased interest in theory amongst systematic review teams[21]. The role of theory in systematic reviews however has much greater potential than simply acknowledging the theoretical basis for interventions; theory can be deployed at every stage of a review to develop hypotheses, refine questions, select outcomes of interest, systematise processes, organise ideas, extract data, inform thinking and support interpretation of evidence and provide a structure for reporting. Indeed, theory already underpins these stages in systematic reviews, although this contribution may not be explicitly articulated; this suggests that evidence-based medicine which determines the systematisation of the standard Cochrane intervention effect review is not yet well articulated as a mid-range theory.

Methodologists within Cochrane were keen to address the apparent limitations of the standard Cochrane review approach and the lack of guidance on use of social theory in Cochrane reviews when developing new guidance on the conduct of systematic reviews in which complexity was an important consideration. Use of theory in systematic reviews was a major topic for discussion at an international meeting of global methodologists in Montebello in 2012, part-funded by the Methodological Investigation of Cochrane Complex Intervention reviews (MICCI) project grant from Cochrane. A series of published papers from the Montebello meeting articulated the potential important role of theory, particularly within complex intervention reviews, with a future research and development agenda being developed by consensus[22-24]. The research and development agenda outlined the need for urgent exploratory research to establish a picture of current and potential use of theory in systematic reviews. Developing a better-shared understanding of the use and value of theory is critically important as methods for conducting systematic reviews develop in response to the need to answer increasingly diverse review questions, in particular, when seeking to explain how and why complex interventions work, or do not work within any given context. New social theories, and new uses for existing theories, have proliferated to address these questions. One component of the empirical work of the MICCI project was designed to start addressing this critical evidence gap.
Our aim was to:

- Identify and present a snapshot of examples of published theories of social phenomena currently used in systematic reviews of complex interventions; with brief explanations of their potential value in systematic reviews of complex interventions, and with references to associated methodological papers and examples of reviews that had used them,
- Develop a searchable resource of theories and reviews that used theory for review authors, and
- Produce Cochrane Guidance on the classification, use and selection of theory in systematic reviews of complex interventions.

2. Methods

We designed a three stage iterative approach involving literature searching, expert engagement and consultation, and organisation and classification of theories that was subsequently developed into two searchable resources for authors conducting reviews of complex interventions. We used the UK MRC definition of a complex intervention as ‘an intervention comprising multiple components which interact to produce change. Complexity may also relate to the difficulty of behaviours targeted by interventions, the number of organisational levels targeted, or the range of outcomes’ [8], supplemented by a new typology that delineates the different types of complexity in complex interventions (Figure 3) [23]. Data collection and analysis was carried out between January 2013 and September 2014. We then developed Cochrane Guidance for review authors on the use of theory in systematic reviews of complex interventions.

Figure 3. Typology of Complexity in Complex Interventions [23]

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<table>
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<tbody>
<tr>
<td>1. <strong>Intervention complexity</strong></td>
<td>(i.e. situations in which the effects of an intervention are expected to be modified by variant properties or characteristics of the intervention itself.)</td>
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<tr>
<td>2. <strong>Complexity in implementation</strong></td>
<td>(i.e. situations in which the effects of an intervention are expected to be modified by variant characteristics of implementation processes.)</td>
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<tr>
<td>3. <strong>Complexity in context</strong></td>
<td>(i.e. situations in which the effects of an intervention are expected to be modified by variant properties or characteristics of the settings or contexts in which an intervention is implemented.)</td>
</tr>
<tr>
<td>4. <strong>Complexity in participant responses</strong></td>
<td>(i.e. situations in which the effects of an intervention are expected to be modified by variant characteristics of participants receiving an intervention) – recognising also that there may be interactions between variables affiliated with two or more distinct dimensions.)</td>
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**Stage 1 Searching for published examples of theories and creating an initial database**

We set out to identify examples of published and unpublished systematic reviews of complex interventions that incorporated social theories, with brief explanations of the potential added value of the theory in systematic reviews of complex interventions, and
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with references to associated methodological papers and further examples of reviews that had used them. We also sought to identify new theories designed for or that could have potential application in systematic reviews, irrespective of whether it had yet been used in a systematic review. At the outset, we were aware that the rate of development of new approaches to systematic reviewing is too rapid, and the proliferation of theories and ways in which they are applied in systematic reviews too great, to allow us to name, let alone describe all of them. We therefore aimed to identify and present a selective snapshot of examples to raise awareness of theories and provide Cochrane Guidance to encourage review authors to think about when it is appropriate to use theory in their review and the potential added value that this might bring. Although many reviews (especially qualitative evidence syntheses such as meta-ethnography) are designed to develop new theory, in the context of this methodological work we primarily focussed on where social theories have been used to enhance the conduct of a systematic reviews and the interpretation of evidence.

An iterative, consultative approach was adopted by the research team for the following reasons:

1. Results from scoping searches in Google and Google Scholar proved overwhelming. Terms such as “theory”, “model” and “framework” occur very frequently in the context of the health and social care systematic reviews; an exhaustive list of other terms, e.g. the plethora of names of recently developed tools, could not be generated comprehensively. Therefore, we could not reliably construct a search strategy with sufficient sensitivity and specificity for use in either bibliographic databases or internet search engines.

2. Theory development is a rapidly expanding field; we knew from personal contacts in the global systematic review methodology community that a number of tools were currently in developmental or in pre-publication stages.

Expert consultation was used as the main approach to identifying a snapshot of the current use of social theory in complex intervention reviews. In January 2013 we circulated a request to MICCI project co-applicants and collaborators (n= 30), Montebello meeting attendees (n=50) and an email list, managed by Cochrane, of global systematic reviewers with an interest in developing methods for conducting reviews of complex interventions in health and social care (n=70). There was some overlap between lists; when duplicates were accounted for this group consisted of around 100 people who were generally key methodologists and highly experienced systematic reviewers known to undertake Cochrane and non-Cochrane reviews of different types and designs. Initially we asked to be informed of any review protocols, review reports or papers that incorporated a theory as defined in Figure 2, or any methodological papers that described or evaluated methods for using theory in any part of a systematic review.
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We collated the information received by recording the name and/or a brief description of each theory, the theoretical background on which it was based, examples (if any) of systematic reviews using any design in which it had been used, and authors’ comments about its usefulness or potential usefulness in reviews of complex interventions. Many people responded to this request, others forwarded it to colleagues with one contact often leading to another via snowball sampling. Other theories were identified by searching the bibliographies of papers, from our initial scoping searches of Google and Google scholar, or serendipitously in the course of other reading. Where necessary we asked authors for further clarification as to whether any additional methodological work had been undertaken, and whether the theory had been used (or was being used) in a systematic review. The purpose was to be illustrative rather than exhaustive.

Response to our email requests was surprisingly high, yielding information on a large number of theories. Some theories were already known to us, but many were new and recently developed. In order to decide how to handle this large volume of material we convened an open workshop at the 2012 Cochrane Colloquium in Auckland for feedback and comment from 30 collaborators and key methodologists many who had attended a meeting in Montebello, Canada in January 2012 upon commencement of this work. Following feedback, it was agreed to categorise the theories according to their use in the systematic review process (as shown in Figures 1 & 2) and focus most attention on obtaining further information on theories that could potentially aid understanding of intervention complexity, many of which were newer and less well known.

Stage 2 Categorising, organising and clarifying theories
We reviewed each database entry and then created two further databases. The first included mainly low-level theories concerned with systematising review processes and commonly in use. The second, and potentially more important, database contained theories that could potentially be helpful in designing, conducting and interpreting the findings of complex intervention reviews. We noted any theory for which full details were not either published or made available to us by the authors. We contacted the authors again with theory-specific questions such as:

- Has the [name of theory] you developed been used in a systematic review?
- If so, can we cite this review as an exemplar?
- Has the [name of theory] undergone any further development or evaluation?

We also requested authors’ comments on key points to be included in guidance for any reviewers who were considering using their ‘theory’ and annotated each relevant entry.

Stage 3 Developing resources and guidance for review authors
One of the authors (AB) developed a searchable Wiki and a Methodology Register in Mendeley as a review author resource by using data and references from stages 1 and 2 with the intention that it would be augmented over time. Finally, using evidence from
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stages 1 and 2, we developed Cochrane Guidance for review authors on how to identify, choose and use theory in systematic reviews of complex interventions to supplement the two searchable resources.

3. Results
Over the last ten years, with a notable proliferation within the last five years, authors have incorporated social theory in every stage of a systematic review from the design and protocol stage to the interpretation of findings. Review authors have used social theory both to standardise and to innovate systematic review methods. We collated details of over 100 theories and briefly described them in tabular form, organised by the stage of review in which they might be deployed. For illustrative purposes, Table 1 shows a selection of commonly used theories to systematise the review process and Table 2 shows selected examples of theories that could be used to enhance review design and data processing and interpretation in systematic reviews of complex interventions.

3.1. Low-level theory
Numerous low-level theories have been designed for the purpose of systematising review processes. Many were well-known, some to the extent that they have become more or less absorbed into standard practice for systematic reviews of effectiveness, pharmacological interventions or diagnostic test accuracy (Table 1). For example, every Cochrane review is expected to begin with a theory of how the intervention is intended to work, and the whole Cochrane template, embedded in RevMan software, (as well as its component parts such as PICO[4]) could be described as an overarching framework within which to systematise the review conduct and reporting. We chose not to include many such examples in the database as this represents the norm.

The proliferation of development of new low-level theories to systematise review processes now extends beyond the effectiveness review to include other review types and designs with particular relevance for complex intervention reviews. For example, since 2000, GRADE has been developed to determine the confidence in findings for effect reviews[18], and since 2011 CERQual has been developed to determine the confidence in findings from qualitative evidence syntheses[13, 17]. Three tools to systematise review processes developed in response to specific gaps identified in the research and development agenda, published following the 2012 meeting of methodologists in Montebello, are yet to be fully tested; the TIDieR tool for reporting complex interventions[25], a tool to measure complexity in public health interventions[26], and the iCAT_SR tool for classifying complex interventions in included studies[19].

3.2. Mid-range theories
Not surprisingly, mid-range theories, commonly used in primary studies, are often transferred without adaptation for use in systematic reviews to inform the review design
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and data interpretation. Reviews that used mid-range theory were more commonly conducted outside of a Cochrane context. For example, Garside and colleagues used the Health Belief Model as the conceptual framework to extract and interpret evidence in their qualitative evidence synthesis of influences on the uptake of information to prevent skin cancer[27]. Normalisation Process Theory developed by May and colleagues has also gained some traction as a framework of choice for conceptualising implementation in complex intervention reviews[28, 29]. If a bespoke theory is not available, Booth and colleagues have developed an approach whereby if the theory is a reasonable, but not optimal, fit for the review, then it can be adapted to facilitate a ‘Best Fit’ Framework Synthesis; there are several examples of this approach used in a review[30, 31]. Conversely, we also noted theories used thus far solely by their originators (see for example the “effectiveness plus” model developed by Snilsveit[32]).

For recent Cochrane complex intervention reviews, since Anderson and colleagues’ 2011 seminal paper on the use logic models in systematic reviews[33], increasing examples of this particular use of mid-range theory have been reported. In their mixed method systematic review protocol, Hurley et al developed two conceptual logic diagrams from an initial synthesis of literature to show the effects of erroneous health beliefs and the complex reciprocal inter-relationship between pain, physical and psychosocial function and exercise interventions[34]. Turley et al developed an a priori logic model that was developed over the course of the review exploring the effectiveness of slum upgrading initiatives[20]. Glenton et al used a logic model as a means of integrating a qualitative evidence synthesis on implementation with the findings of a Cochrane effectiveness review on community health workers[13].

Psychologists such as Michie have had considerable influence on methodological development of low-level and mid-range theory for the conduct of systematic reviews of behaviour change interventions (for example, taxonomies of behaviour change interventions and a behaviour change wheel)[35, 36], which have been adopted by other authors.

We also were notified of an updated review where the authors had taken the opportunity to reassess their methods and introduce a theory when updating. The 2012 Cochrane review of audit and feedback effects on professional practice and health outcomes updated an earlier version that did not draw on theory and resulted in no clear pattern of findings. The updated version of the review reanalysed the data using the mid-range Control Theory finding support for the hypothesis that adding goals or targets and action plans to feedback interventions improved effectiveness. This proved a useful finding given that very few audit and feedback interventions included these components[37].
3.3. Grand theory
We were unable to identify any reviews in the field of health and social care that incorporated an explicit grand theory (beyond being located in evidence based medicine or healthcare contexts), neither through targeted literature searching, due to the lack of specificity in currently available search techniques, nor via the consultation process. It is likely that such reviews do exist in a health and social care context even if the theory is not explicitly stated. Use of grand theory such as Feminist theory is common in primary research in a health and social care context, and published examples exist in reviews in advertising, media and business[38].

3.4. Added value of using theory in a systematic review of complex interventions
Convention dictates that there are core set of low-level theories in the form of systematic review tools and reporting standards that add value in systematising review processes. Although these may not be commonly thought of as theories within the standard Cochrane intervention effect review template, they reveal an underlying set of understandings from an evidence-based medicine perspective about how impact comes about and how it should be measured[9]. In a Cochrane context use of low-level theory in the form of PICO[4], Risk of Bias tools, application of GRADE[18] summary of findings tables and PRISMA[5] reporting standards etc. have become mandatory. Beyond this core set of low-level theories a large number of tools exist from which review authors are able to select. However few published reports or evaluations exist to establish, beyond the testimony of their originators, the added value of incorporating low, mid-level and grand theory into systematic reviews. Unless authors publish their experiences of using particular theories, and the difference (or not) they made, it is problematic to determine their usefulness.

Reviewers who used mid-range theoretical frameworks in their reviews said that such theories enabled a greater depth of inquiry and more nuanced interpretations of findings. More instrumental use of conceptual frameworks is believed to facilitate the speed and efficiency of data extraction[30, 31, 39]. Review authors report that expertise and team development is needed to fully engage with the specific theory. In a published report, Turley and colleagues outlined their experiences of developing and using a logic model. They identify the additional advantages, as well as the challenges, that the review team encountered in what appeared to be a long and convoluted process[20]. In contrast, authors of a qualitative evidence report being overly constrained by an a priori theoretical framework and having to change tack mid review. Thomas and Harden developed an inductive line by line approach to thematic synthesis having previously given up on trying to develop an initial a priori framework to explain children’s conceptualisations as to why they do and do not eat fruit and or vegetables[40]. Overall, we do not have a clear picture of when and how review teams select mid-range theories in the review process, or how common it is for theories to be tried, modified or discarded if they do not add value. Nor is
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it clear how to kit together use of theories in a sensible and coherent way and there is little documented experience of the optimal number of theories in any given review.

3.5. Theory in Reviews Wiki and Mendelay Theory Inventory

The ‘Theory in Reviews’ wiki [http://theoryinreviews.pbworks.com/] (see Figure 4) will be maintained as part of the study register activities of the Cochrane Qualitative and Implementation Methods Group. It includes examples of theories that can be used in the systematic review process, particularly in systematic reviews of complex interventions. Theories are listed under each stage of the review process. Links to full text records, or to abstracts where full text is not openly available, are given within the individual wiki pages. The wiki is searchable, using an internal search engine you can identify theories by, for example author (e.g. May author of Normalisation Process Theory) or theory name (e.g. Behemoth).

Figure 4. Screenshot of the Wiki ‘Theory in Reviews’

Papers identified during the search are also tagged for social bookmarking via the Mendeley Theory In Reviews Inventory (Figure 5) as a free searchable resource for authors to find and locate studies and reviews that report or use theory that may be of interest to review author. The inventory will also be updated periodically. [http://www.mendeley.com/groups/4714181/].

Authors and methodologists are invited to notify the convenors of the Cochrane Qualitative and Implementation Methods Group of any new or additional publications via their website [http://cqim.cochrane.org/].
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3.6. Guidance for review authors on the classification, choice and use of theory in complex intervention reviews

The Cochrane guidance for review authors (see supplemental Appendix ‘Guidance for review authors on choice and use of theory in complex intervention reviews’[41]) provides a framework (i.e. low-level theory) for the identification, selection and use of theory in complex intervention reviews with reference to the searchable Wiki and Mendeley Inventory. Criteria of ‘good’ and ‘bad’ theory are outlined (Figure 6). The guidance also recommends use of BeHEMoTh – (Behaviour of Interest - Health Condition or Setting – Exclusions – Models or Theories) as a tool for searching for theories[42].

Figure 5. Screenshot of Mendeley ‘Theory in Reviews Inventory’. 
Use of social theories in systematic reviews of complex interventions

Figure 6. Criteria for ‘good’ and ‘bad’ theory in a systematic review context:

- Is exploring complexity an important consideration? If so:
  - Does the theory explain the phenomenon of interest[43]?
  - Does the theory contain unambiguous concepts that are understood by the team (external validity)[43, 44]?
- If selecting, adapting or developing a mid-range theory - are the relationships between and among the concepts clearly articulated[43]?
- Where multiple theories are used, do the concepts translate across theories[43, 45]?
- Are the theoretical propositions empirically testable?
- Has the theory actually been verified by data or not[10]?
- Are there published examples and evaluations of using the theory in a systematic review of a complex intervention?
- Is the theory originator contactable for advice and support?
- Does the review team have access to appropriate methodological expertise and support to optimally apply and use the theory?
- Are the concepts operationalised consistently by different coders (internal validity)[44]?
- Does the theory promote comparison of results across studies[45]?
- Does ease of use encourage over-simplification, misapplication or abuse of already existing theories[45, 46]?
- Does the theory stimulate new theoretical development, if not then its usefulness is constrained[45]?
- Will the review team discard the theory if it does not add value?

Davidoff and colleagues also report a set of specific criteria for ‘good’ behaviour change theory that is of relevance to Cochrane reviews of behaviour change interventions[45]:

- Clarity of theoretical concepts: ‘Has the case been made for the independence of constructs from each other?’
- Clarity of relationships between constructs: ‘Are the relationships between constructs clearly specified?’
- Measurability: ‘Is an explicit methodology for measuring the constructs given?’
- Testability: ‘Has the theory been specified in such a way that it can be tested?’
- Being explanatory: ‘Has the theory been used to explain/account for a set of observations?’ Statistically or logically?
- Describing causality: ‘Has the theory been used to describe mechanisms of change?’
- Achieving parsimony: ‘Has the case for parsimony been made?’
- Generalisability: ‘Have generalisations been investigated across behaviours, populations and contexts?’
- Having an evidence base: ‘Is there empirical support for the propositions?’

4. Discussion
This is the first snapshot of the use of social theory in systematic reviews addressing complex health and social care questions and provides new insights into the range and extent of theory used. Given that widely used systematic review methods guidance such as the Cochrane Handbook[15] and Centre for Reviews and Dissemination Guidance[16] barely mention the use of social theory, apart from low-level theory in the form of tools to
Use of social theories in systematic reviews of complex interventions

systematise review processes, it was particularly surprising to document how prevalent use of social theories, especially mid-range theories, has been in published systematic reviews of complex health and social care interventions. It is however important to acknowledge that there is mathematical theory in systematic review methods such as network meta-analysis (statistical and geometric theory), and different levels of social theory underpinning the overarching context of evidence-based medicine and healthcare that is not made explicit in systematic review manuals. It appears that the increasing number of qualitative researchers from a sociological tradition who now undertake theory-informed systematic reviews may have influenced the introduction of familiar social theories used in primary qualitative research into complex intervention systematic review methods and processes. For example, Popay and colleagues’ Narrative Synthesis Guidance published in 2006 was strongly influenced by sociologists and outlined a four stage approach starting off with developing a social theory of how the intervention or implementation worked[47]; the examples shown are mid-range logic models. Likewise, most complex interventions involve behaviour change and key methodologists and researchers from a psychology tradition have developed new theories that have been adopted in complex intervention reviews. The most recent MRC guidance on the design of process evaluations for complex interventions recommends development of a mid-range logic model and consideration of the use of mid-range complexity theory to guide analysis and interpretation[8]. Newer theory-informed review approaches such as realist and meta-narrative reviews are also increasing the visibility and potential of using and developing theory as part of the systematic review process. Most recently, methods for undertaking reviews of theory have been published, which give further prominence to the potential use of theory in systematic reviews[48].

Although novel, this work does have some limitations. It was not possible to conduct a systematic search for examples of the use of social theory in systematic reviews of health and social care interventions and thus the aim was to present illustrative examples and not to be exhaustive. Nor do the examples provided cover the full range of theories that may be appropriate for specific review contexts. However, there will be an opportunity to add further examples to the ‘Theory in Reviews’ Wiki and Mendeley Inventory over time. Although this study was funded by Cochrane, a strength is that the expert methodologists and reviewers consulted represent a wide range of influential systematic review interests and were not confined to Cochrane. Although use of snowballing techniques widened the reach to other reviewers and methodologists, we cannot establish how representative those consulted are of the entire methods and complex intervention systematic review community.

5. Conclusion
Social theory, especially low and mid-range theory, is increasingly used throughout every stage and process in systematic reviews and especially in complex intervention reviews. Choice of theory remains a personal preference and is constrained by the knowledge and
Use of social theories in systematic reviews of complex interventions

disciplinary backgrounds of the review team. Effective application of theory in the future is likely to depend on such factors as the review question, suitability of the theory, the type and quality of the data, the skills of the review team and the time available to complete the review. Further methodological research is needed to evaluate use and added value of theory in systematic reviews, particularly in relation to the systematic identification and quality assessment of candidate theories.

References

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Competing interests

JN, AB and RG are co-convenors of the Cochrane Qualitative and Implementation Methods Group. JN is a Co-Chair of the Methods Executive and member of the Methods Application and Review Standards group. SL and CG are both editors for the Cochrane Effective Practice and Organisation of Care Group and the Cochrane Consumers and Communication Review Group. JC is Cochrane Methods Co-ordinator.

Author contributions and acknowledgements

JN conceived the original idea and outline plan for the research, which was coordinated by JC on behalf of Cochrane for the purposes of developing a chapter on complex interventions for the Cochrane Handbook. All authors contributed to further development of the methods. MH collected data and conducted the analysis and, in collaboration with JN, the interpretation of the data. CG and SL contributed to study design and data interpretation. AB conceived and developed the study registers. RG shared additional references to support development of the guidance. All authors read and critically revised drafts of the manuscript.

We also acknowledge the valuable contribution of a large number of people including: wider MICCI project co-applicants and collaborators who attended a meeting in Montebello in January 2012 and those who supported the project throughout; participants who attended the meetings and workshops at the Cochrane Colloquium in Auckland New Zealand in October 2012; MICCI workshop attendees at the Cochrane mid-year meeting in Oxford in March 2013, those who attended a MICCI meeting and the Methods Symposium at the 2013 Cochrane Colloquium in Quebec City, and attendees at the Methods symposium at the 2014 Cochrane Colloquium in Hyderabad in September 2014; and all others who contributed by email to the development of the databases. There are too many people to name individually and we thank you all for your support with this important work.

The views expressed are those of the authors and not necessarily those of Cochrane or its registered entities, committees or working groups.

Funding

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funded Chandler’s time. The University of Sheffield contributed 2% of Booth’s time over the equivalent of a one year period for database development and for information management advice.
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<table>
<thead>
<tr>
<th>Table 1</th>
<th>Some selected examples of low-level theories for systematising review processes</th>
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<tbody>
<tr>
<td>Review process</td>
<td>Example of theory</td>
</tr>
<tr>
<td>Planning the review and formulating the review question</td>
<td>PICOS (Patient, Intervention, Comparison, Outcomes, Study types) and alternative frameworks for different review types help in planning the review and framing the review question. Organisations such as the Cochrane (<a href="http://www.Cochrane.org/">www.Cochrane.org/</a>) and the EppiCentre (eppi.ioe.ac.uk/) offer a framework and software for conducting a review that is compatible with their specific “brand”.</td>
</tr>
<tr>
<td>Searching the literature</td>
<td>Search strategies are tailored to an individual review question, but methods for documenting the search processes can be standardised and search results should be reported in a PRISMA flow-diagram, available from <a href="http://www.prisma-statement.org/">http://www.prisma-statement.org/</a>.</td>
</tr>
<tr>
<td>Data-collection</td>
<td>PICOS (or alternative) informs inclusion/exclusion criteria and aids study selection. Data-extraction forms are often designed to suit individual reviews but may be based on standardised templates, e.g. the example provided by the Centre for Research and Dissemination at York University available from <a href="http://www.york.ac.uk/inst/crd/SysRev/ISSLI/WebHelp/1_3_UNDERTAKING_THE_REVIEW.htm">http://www.york.ac.uk/inst/crd/SysRev/ISSLI/WebHelp/1_3_UNDERTAKING_THE_REVIEW.htm</a>. The National Institute for Health and Care Excellence (NICE) provides a standard tool for its reviews (Methods for the Development of NICE Public Health Guidance. 2nd edn. National Institute for Health and Clinical Excellence, London, 2009. Appendix K)</td>
</tr>
<tr>
<td>Synthesising the evidence</td>
<td>The Cochrane Handbook provides a general framework for synthesis, whether quantitative or narrative, in chapter 9, available from <a href="http://www.cochrane-handbook.org">www.cochrane-handbook.org</a></td>
</tr>
<tr>
<td>Reporting the findings</td>
<td>The PRISMA statement with checklist and flow-diagram available from <a href="http://www.prisma-statement.org/">http://www.prisma-statement.org/</a> is intended to standardise good practice in reporting systematic reviews.</td>
</tr>
</tbody>
</table>
### Table 2  Some examples of theories that have been deployed in systematic reviews of complex interventions

<table>
<thead>
<tr>
<th>Theory</th>
<th>Theoretical background</th>
<th>Use in reviews of complex interventions</th>
<th>Example systematic review</th>
</tr>
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</table>
| Behaviour Change Taxonomies (BCTs)    | The first cross-behaviour classification system to demonstrate inter-rater reliability in identifying 22 BCTs and four BCT packages in descriptions of interventions was published in 2008. Building on this and five other taxonomies, Michie and colleagues developed BCT Taxonomy v1; the first cross-behaviour, hierarchically organised taxonomy, established by international expert consensus and comprising 93 clearly labelled, well-defined behaviour change techniques with demonstrated reliability in specifying 26 of the most frequently occurring BCTs:  


BCTs have been used by NICE in the systematic reviews for its 2012/13 update of its Behaviour Change Guidance (http://www.nice.org.uk/nicemedia/live/13596/59328/59328.pdf).  

A web-based users’ resource is available, including the most recent version of the taxonomy, guidance on its use, and a discussion board for questions, comments and feedback. [www.ucl.ac.uk/health-psychology/BCTtaxonomy/](http://www.ucl.ac.uk/health-psychology/BCTtaxonomy/).  

There is an online training course for using behaviour change techniques in specifying complex interventions. [http://www.ucl.ac.uk/health-](http://www.ucl.ac.uk/health-) | In systematic reviews of complex interventions this approach allows the specification of intervention content into its component behaviour change techniques. By combining this with the statistical technique of meta-regression and theory-driven analyses, commonly occurring BCTs associated with effective outcomes can be identified.                                                                                                                                                                                                                       | National Institute for Health and Clinical Excellence (2007). Health systems and health-related behaviour change: a review of primary and secondary evidence. London: *National Institute for Health and Care Excellence*  


Use of social theories in systematic reviews of complex interventions

<table>
<thead>
<tr>
<th>Frameworks for evidence synthesis based on psychological theories</th>
<th>Glanz K, Bishop DB: The role of behavioral science theory in development and implementation of public health interventions. <em>Annu Rev Public Health</em> 2010, 31:399-418.</th>
<th>Psychological theories can provide a useful basis from which to develop a framework for data analysis and synthesis. In the case of the example reviews the Health Belief Model was chosen because it was used in several of the included studies and thus offered a useful starting point for developing codes to analyse the findings.</th>
<th>Garside R, Pearson M, Moxham T. What influences the uptake of information to prevent skin cancer? A systematic review and synthesis of qualitative research. <em>Health Education Research</em> 2009; 25:1 162-182.</th>
</tr>
</thead>
</table>

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**Normalisation Process Theory (NPT)**

http://www.normalizationprocess.org/


NPT can provide a valuable method to aid the conduct and interpretation of systematic reviews of a range of different types of qualitative study and that there are three main ways in which it could be used:

- To support the development of research questions and overall design of a systematic review.
- To serve as a framework for data analysis within a systematic review
- To support the interpretation of a systematic review’s results

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**Frameworks for evidence synthesis based on psychological theories**


Psychological theories can provide a useful basis from which to develop a framework for data analysis and synthesis. In the case of the example reviews the Health Belief Model was chosen because it was used in several of the included studies and thus offered a useful starting point for developing codes to analyse the findings.


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**Mid-range theories**


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**Mid-range theory**

http://www.normalizationprocess.org/


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- To support the interpretation of a systematic review’s results


Use of social theories in systematic reviews of complex interventions

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<tr>
<td><strong>Using logic models in a systematic review</strong></td>
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<tr>
<td>Logic models can be used at different stages, for example scoping the review, refining and conducting the review, making the review relevant to policy and practice. Turley et al developed a logic model at the protocol stage of their review to describe potential components of slum upgrading strategies, whereas Glenton et al developed their logic model to integrate their qualitative findings about interventions delivered by lay health workers with the results of a separately conducted effectiveness review. In review on preschool feeding, a logic model was developed to make assumptions about the program explicit, and the assumptions were tested in the synthesis and analysis.</td>
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**Mid-range theories**


WK-Kellogg-Foundation-Logic-Model-Development-Guide.aspx (accessed 7
## Use of social theories in systematic reviews of complex interventions

**February 2012**


### Dealing with diverse interventions: developing and prioritising outcome categories

- **Low-level theory**
  - Because there are multiple approaches to problems, the authors of these example reviews devised a conceptual framework for the intervention and developed “outcome categories”.

### Key points:

1. Determine *a priori* the process to use to categorise outcomes in included studies, including how you will choose an outcome when more than one is included in an outcome category.

2. Think about how you would select a time-point for outcomes measured at multiple time-points.

3. Think about what you will do if the same outcome is measured in different studies but isn’t selected through the process you determine in point 1 above (for example, if you have a category called “treatment outcomes” and 3 out of 4 studies measure a similar outcome, such as cholesterol level, but it doesn’t meet the selection criteria you have established for choosing a treatment outcome in some studies will you report it as an additional outcome?)

### References


Use of social theories in systematic reviews of complex interventions
Guidance for review authors on choice and use of social theory in complex intervention reviews

Jane Noyes, Maggie Hendry, Andrew Booth, Simon Lewin, Claire Glenton, Ruth Garside, Jackie Chandler

Version 1 01.03.15
Guidance for review authors on choice and use of social theory in complex intervention reviews

Introduction
Davidoff and colleagues assert that use of social theory has been seriously under recognised in healthcare improvement science[1]. The role of social theory in systematic reviews of complex interventions holds much greater potential than simply acknowledging the theoretical basis for interventions. Social theory is used to understand complex issues through specific “lenses” and to analyse and focus attention on different aspects of data[2]. Social theory can potentially be deployed at every stage of a review to develop hypotheses, refine questions, select outcomes of interest, systematise processes, provide a framework for data extraction, organise ideas, inform thinking and support interpretation of evidence and provide a structure for reporting. More recently, the potential role of theory in systematic reviews of complex interventions, or reviews where complexity is an important consideration has captured increasing interest from review authors and methodologists alike. We used the United Kingdom Medical Research Council (UK MRC) definition of a complex intervention as ‘an intervention comprising multiple components which interact to produce change. Complexity may also relate to the difficulty of behaviours targeted by interventions, the number of organisational levels targeted, or the range of outcomes’[3]. A new typology delineates the different types of complexity in complex interventions (Figure 1)[4, 5]. Reviewers who respond to a requirement to incorporate social theory into their complex intervention review face difficult challenges related to how they define, identify and select appropriate theory that might be useful and add value to a specific review. The purpose of this guidance is to address these issues informed by research funded by the Cochrane Methods Innovation Fund[6].

<table>
<thead>
<tr>
<th>Figure 1. Typology of Complexity in Complex Interventions[4]</th>
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<tr>
<td>1. <strong>Intervention complexity</strong> (i.e. situations in which the effects of an intervention are expected to be modified by variant properties or characteristics of the intervention itself).</td>
</tr>
<tr>
<td>2. <strong>Complexity in implementation</strong> (i.e. situations in which the effects of an intervention are expected to be modified by variant characteristics of implementation processes).</td>
</tr>
<tr>
<td>3. <strong>Complexity in context</strong> (i.e. situations in which the effects of an intervention are expected to be modified by variant properties or characteristics of the settings or contexts in which an intervention is implemented).</td>
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<tr>
<td>4. <strong>Complexity in participant responses</strong> (i.e. situations in which the effects of an intervention are expected to be modified by variant characteristics of participants receiving an intervention) – recognising also that there may be interactions between variables affiliated with two or more distinct dimensions.</td>
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Defining social theory in the context of systematic reviews
Alderson defines theories as “ranging from explicit hypotheses to working models and frameworks of thinking about reality”[7]. Reeves and colleagues expand on this idea by suggesting that “theories also provide complex and comprehensive conceptual
understandings of things that cannot be pinned down: how societies work, how organisations operate, why people interact in certain ways”[2]. Merton classified theories as low-level, mid-range or grand theory lying on a spectrum “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 behaviour, social organization and social change”[8]. Merton’s classification can be applied to social theory used in systematic reviews as follows:

**Low-level theory**
Low-level theories (e.g. segregated hypotheses or isolated propositions, and typologies and taxonomies etc.) are used to predict, assume, describe or organise aspects of the phenomena of interest, but do not show the interrelationships between concepts. All reviews contain low-level theory in the form of segregated hypotheses or questions, but review designs and methods vary in the degree to which they incorporate recognised frameworks to systematise the review processes such as use of PICO[9] to develop and refine questions, quality appraisal or risk of bias tools, reporting frameworks (e.g. the PRISMA checklist and flow-chart[10]) and so on.

**Mid-range theory**
Mid-range theories (e.g. conceptual frameworks and models, and theories such as the Theory of Planned Behaviour[11, 12]) have interconnected relationships between concepts with limited scope to explain specific phenomena, are empirically testable, and can be used to describe and predict causal relationships amongst concepts, or used to define activities and processes and predict outcomes. The Theory of Planned Behaviour, for example, is used to predict a person’s intention to engage in a behaviour at a specific time in a specific context. Some more sophisticated hypotheses can also be defined as mid-range theories. Likewise, ‘programme theories’ that make explicit the causal assumptions as to how a complex intervention is intended to work may start off as low level theories and develop into mid-range theory[4].

**Grand theory**
Grand theories are highly abstracted theories in which organised and integrated concepts explain the social world and are empirically testable (e.g. Feminist theory, Welfarism or Marxism). Feminist theory for example explains the phenomena of gender inequality in all social interactions at societal level, which distinguishes it as a grand theory because its focus moves beyond the more limited context of mid-range theory.

**Evidence-based medicine and healthcare as social theories**
If defined as a social theory, evidence-based healthcare in its broadest sense (combination of best evidence (beyond the randomised controlled trial RCT), patient/population perspective and clinical judgement) could be conceptualised as a grand theory as well as a philosophy and scientific method underpinning decision-making. Evidence-based
healthcare evolved from the conceptually narrower approach of evidence-based medicine which privileges the RCT and meta-analyses of RCTs as the best form of evidence. Although Cochrane reviews contribute to evidence-based healthcare, in isolation, the standard Cochrane review of intervention effects is anchored within the positivist hierarchical epistemology of evidence-based medicine that prioritises aggregation of a limited number of pre-determined primary and secondary outcomes from randomised controlled trials to explain a specific phenomenon of interest (intervention effect) which is more closely aligned with mid-range theory[13].

Figure 1 shows the different levels of low, mid and grand theory on Merton’s spectrum[14], and where theory can inform the design and conduct, and also be a product of systematic reviews. The boundaries between theory levels can however overlap and theories can transcend levels (or be refuted and discarded) as they are developed and tested over time. Application of social theory is common in the context of primary (especially qualitative) research to understand complex issues through specific “lenses” and to analyse and focus attention on different aspects of data[2]. A few review authors who use standard Cochrane review methods have however made explicit theory considerations when evaluating included primary studies. The Cochrane Public Health Group recognises in their supplemental guidance to the Cochrane Handbook that “as interventions become more multi-faceted, and thus more complex, it is important to reflect on the role theory has played”[15]. For example, in a systematic review of internet-based interventions to promote health behaviour change, Webb and colleagues found that theory-based interventions were more effective than those not based on theory[16]. The limitation of the standard Cochrane approach is that beyond answering a simple question about intervention and effect, it cannot easily address complex questions or accommodate the synthesis of complex interventions with multiple causal pathways, interactions and outcomes. Cochrane has however in recent times become more innovative and published non-standard Cochrane reviews that integrate a synthesis of qualitative evidence to explain different intervention and implementation effects that more closely align with the broader evidence-based healthcare context[17]. The Cochrane Qualitative and Implementation Methods Group (http://cqim.cochrane.org/) have been the driving force behind repositioning Cochrane as a producer of mixed-method and qualitative evidence syntheses linked with Cochrane effect reviews that contribute to evidence-based healthcare decision-making.

Newer explicitly “theory-led” evidence synthesis approaches (such as Realist Review[18]) are positioned within a realist epistemology and foreground theory use and development with different types of evidence as a way of understanding the complex world and multiple potential realities and outcomes. More recently, perhaps as a consequence of more theory-informed primary research and development of newer theory-led synthesis methods, the potential role of social theory (in particular low-level and mid-range) in Cochrane systematic reviews of complex interventions, or reviews where complexity is an important consideration, has captured increasing interest from review authors and methodologists.
alike. Most recently, methods for undertaking reviews of theory have been published, which give further prominence to the potential use of theory in systematic reviews[19]. New UK MRC guidance on the design and conduct of process evaluations alongside randomised controlled trials outlines the importance of using theory-informed methods to understand the functioning of a complex intervention[3]. It is therefore not unreasonable to anticipate that future trials of complex interventions are more likely to be designed with more sophisticated theory-informed process evaluations that produce various types of data and evidence amenable to synthesis that shed light on a range of short, medium and longer term options and outcomes for decision-makers to consider.
Categories of social theory mapped against review processes and stages

The main difficulty in understanding the range and use of social theories available as a resource for systematic review authors is lack of common language and understanding regarding their location on the theory spectrum (Figure 1), and the inconsistent terminology employed to label and describe theories in the context of systematic review methods.

Social theories are variously and inconsistently termed theories, conceptual models or
frameworks, tools, taxonomies, typologies, hypotheses, propositions, conjectures etc. In the context of systematic reviews we propose ‘theory’ as an overarching term, but also characterise two main overlapping categories: (i) theories for systematising review processes, and (ii) theories for conceptualising, theorising and interpreting evidence (see Figure 2).

Figure 2. Categorisation of social theory in the context of systematic reviews

<table>
<thead>
<tr>
<th>‘Theory’ is an overarching term characterised by two categories:</th>
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<tbody>
<tr>
<td>1. <strong>Theories</strong> for systematising review processes (e.g. evidence-based frameworks such as PICO[9], classification tools such as iCAT-SR[20], GRADE, and reporting standards such as PRISMA[10]. More likely to be low-level theories (see Figure 1)</td>
</tr>
<tr>
<td>2. <strong>Theories</strong> for conceptualising, theorising and interpreting evidence (e.g. conceptual and logic models, and theories such as the Normalisation Process Theory or the Theory of Planned Behaviour). More likely to be mid-range or grand theories (see Figure 1).</td>
</tr>
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</table>

**Choice of social theory**

UK MRC Guidance on the design and conduct of process evaluations alongside randomised controlled trials outlines the importance of using theory-informed methods to understand the functioning of a complex intervention[3]. The choice of social theory in a systematic review is important as it influences and shapes the way reviewers collect and interpret evidence.[7] Although choice and use of theory in systematic reviews is dictated by both methodological convention and personal preference, methodological convention is clearly gravitating towards using social theory (beyond the standard Cochrane review template) to design, systematise, and interpret evidence for those reviews in which complexity is an important consideration. It is also possible to include low-level, mid-range and grand theory in a single review. For example, a review may determine the effectiveness and women’s experiences of cervical screening strategies and could incorporate common low-level theories such as PICO[9] to systematise question development; the reviewers could develop a mid-range logic model of women’s decision-making, and the evidence could be interpreted through a Feminist theoretical perspective (grand theory).

*Choosing low level theories beyond those commonly used*

New tools, taxonomies and classification systems are constantly being developed and implemented within the field of research synthesis. Use of some of these low level theories becomes mandatory (as with the Cochrane risk of bias tool[21] and GRADE[22]), whilst others are optional. By way of example, optional new tools to better understand and
classify intervention complexity such as the recently developed iCAT _SR[20] may assist in clarifying, organising and processing information on interventions that may help designing the review, extracting data and interpretation of findings. Optional tools merit piloting within a specific review context to establish if, and how, such tools may add value. If they do not help the specific review team then they can be discarded.

Choosing existing mid-range theories
Some reviewers opt for a commonly used mid-range theory used in primary studies. For example, Garside chose the Theory of Planned Behaviour in a review of influences on the uptake of information to prevent skin cancer [23]. It is however likely to be much more challenging to select a theory as an overarching organisational principle for a review when included studies within that review individually select from a wide range of different theories. Figure 3 reproduced from the UK MRC Guidance on designing complex intervention process evaluations[3] to determine the function of complex interventions illustrates examples that might be selected from a range of theories for use within a primary complex intervention process evaluation.

Figure 3. Illustration showing examples from the range of different theories that may be used in a primary complex intervention process evaluation[3].

If the primary studies contain a range of different theories, review teams can opt to privilege a single theory, or core group of existing theories, to interpret or reinterpret extracted evidence in a systematic review. For example, the 2012 Cochrane review of audit and feedback updated an earlier version that did not draw on theory and resulted in no clear pattern of findings. The updated version of the review reanalysed the data using the mid-range Control Theory finding support for the hypothesis that adding goals or targets and action plans to feedback interventions improved effectiveness. This was a particularly
useful finding given that very few audit and feedback interventions included these components [24].

*Developing a ‘best fit or new mid-range theory*

Carroll and colleagues have developed an approach for circumstances where a single bespoke theory is not useable or not identifiable, whereby if the theory is a reasonable, but not optimal fit for the review, then it may be adapted as a contingent ‘Best Fit’ theory [25, 26]. Booth recommends that ‘compendia of behavioural theories[27] or evidence based practice models[28] may offer a useful starting point for a “best fit” framework’[29].

Experienced review teams are also choosing to develop a review-specific mid-range theory in the form of a logic model [7]. For example, Hurley and colleagues developed two conceptual logic diagrams from an initial synthesis of literature to show the effects of erroneous health beliefs and the complex reciprocal inter-relationship between pain, physical and psychosocial function and exercise interventions [30]. Turley et al developed an a priori logic model, developed over the course of the review, exploring the effectiveness of slum upgrading initiatives [31]. Glenton et al used a logic model as a means of integrating a qualitative evidence synthesis on implementation with the findings of a Cochrane effectiveness review on community health workers [17]. Figure 4 illustrates a section of Glenton and colleagues’ logic model.
Choosing a grand theory

Although grand social theories (such as Feminist theory) are commonly used in primary research and to a lesser extent in systematic reviews outside of a Cochrane context, Noyes and colleagues did not identify any examples of Cochrane review teams using a grand social theories (beyond location within an evidence-based healthcare context) to interpret evidence in complex intervention reviews[6]. If review teams feel that an additional grand social theory could potentially further aid interpretation from a specific theoretical perspective then we encourage them to do so and report their experiences as an exemplar.

Theory in Reviews Wiki and Mendeley Theory Inventory

When designing a systematic review, authors may find searching the ‘Theory in Reviews’ Wiki and Mendeley Inventory helpful in identifying candidate low and mid level theories that may be applicable to their review. The ‘Theory in Reviews’ wiki:
http://theoryinreviews.pbworks.com/ includes examples of theories that can be used in the systematic review process, particularly in systematic reviews of complex interventions. Theories are listed under each stage of the review process. Links to full text records, or to abstracts where full text is not openly available, are provided within the individual wiki pages. The wiki is searchable i.e. you can use an internal search engine e.g. try searching for May (author of Normalisation Process Theory) or Behemoth (Name of model). Papers are also tagged in the Mendeley Theory Inventory (Figure 4) as a free searchable resource. Review authors can therefore identify and locate studies and reviews that report or use theory of relevance to their review topic. The inventory will be periodically updated. (https://www.mendeley.com/groups/4714181/).

Searching electronic databases for theories
Unfunded pre-protocol work prior to commencement of the project identified the challenges associated with the systematic identification of theories. A rapid review of systematic reviews incorporating theory revealed (i) suboptimal search strategies using a limited number of theory-associated keywords and (ii) a lack of systematicity when specifying the scope and methods of such reviews. Booth and colleagues recommend that (i) as a minimum review teams should construct a search string that includes theor*, framework*, concept* and model*, (ii) teams should use a structured format for specification of the review problem (BeHEMoTh – Behaviour of Interest - Health Condition or Setting – Exclusions – Models or Theories), (iii) teams should use a structured approach to identification of theories including citation searching and follow up of references[32].

Questions to consider when selecting a theory
Davidoff and colleagues outline criteria to determine ‘good’ and ‘bad’ theory as being equally important as reviewers need to be aware that seemingly attractive theories may be ‘partial, Inappropriate for the context or flawed[1]’. In selecting a theory, review authors may want to ask the following questions:

- Is exploring complexity an important consideration? If so:
  - Does the theory explain the phenomenon of interest[33]?
  - Does the theory contain unambiguous concepts that are understood by the team (external validity)[33, 34]?
  - If selecting, adapting or developing a mid-range theory - are the relationships between and among the concepts clearly articulated[33]?

- Where multiple theories are used, do the concepts translate across theories[1]?
- Are the theoretical propositions empirically testable?

- Has the theory actually been verified by data or not[14]?
• Are there published examples and evaluations of using the theory in a systematic review of a complex intervention?
• Is the theory originator contactable for advice and support?
• Does the review team have access to appropriate methodological expertise and support to optimally apply and use the theory?
• Are the concepts operationalised consistently by different coders (internal validity)?
• Does the theory promote comparison of results across studies?
• Does ease of use encourage over simplification, misapplication or abuse of already existing theories?
• Does the theory stimulate new theoretical development, if not then its usefulness is constrained?
• Will the review team discard the theory if it does not add value?

Davidoff and colleagues also report a set of specific criteria for ‘good’ behaviour change theory that is relevant to Cochrane reviews of behaviour change interventions:
• Clarity of theoretical concepts: ‘Has the case been made for the independence of constructs from each other?’
• Clarity of relationships between constructs: ‘Are the relationships between constructs clearly specified?’
• Measurability: ‘Is an explicit methodology for measuring the constructs given?’
• Testability: ‘Has the theory been specified in such a way that it can be tested?’
• Being explanatory: ‘Has the theory been used to explain/account for a set of observations?’ Statistically or logically?
• Describing causality: ‘Has the theory been used to describe mechanisms of change?’
• Achieving parsimony: ‘Has the case for parsimony been made?’
• Generalisability: ‘Have generalisations been investigated across behaviours, populations and contexts?’
• Having an evidence base: ‘Is there empirical support for the propositions?’

Review authors should also be cautious when examining the role of theory within contributing studies, or selecting a common theory used in included studies for use in their systematic review. Not only might theories be selected simply to manufacture credentials for an intervention or to support the academic pedigree of a study report but, even when genuinely used, they may also be followed partially or incorrectly. Issues of “theory fidelity” are therefore likely to become of increasing importance as systematic reviews incorporating theory become more prevalent. Sidani and Braden illustrate an approach to establish theoretical fidelity of interventions in primary studies that has yet to be translated for use in systematic reviews. The assessment theoretical fidelity is dependent on detailed information that is unlikely to be in the primary study report. It may however
be possible to obtain this information from the authors of the primary study in the same way that missing data is clarified.

**Potential advantages and limitations to consider when selecting and using theory**

Application of appropriate theory can enable reviewers to escape the constraints of “one size fits all” review design and standard processes. Use of theory has been shown to facilitate exploration of more complex review questions whilst maintaining reliability and credibility.[6] Reviewers who include theoretical frameworks within their reviews report that these enabled a greater depth of inquiry and more nuanced interpretations of findings in specific examples shared. Others report the contribution of theory in instrumental, rather than conceptual, terms. Extraction of data to a pre-existing framework may be quicker and more efficient although cautions apply to the tendency to squeeze data into an existing framework in preference to the effort of modifying the framework[37]. Other authors of qualitative evidence syntheses report having been limited and overly constrained by the imposition of an *a priori* theoretical framework at the data analysis and interpretation stage of the review. In some cases review authors have reported having had to change tack mid review [38]. We have further experience to suggest that temporal or stage of pathway considerations may also be important; a theory relating specifically to treatment of a condition may be unhelpful when prevention of a condition is the focus of a review. In selecting a theory, reviewers should be aware when designing their review that relevant methodological expertise and skills and knowledge of the selected theory are critical success factors and there are few published examples to inform key stages of this important decision process.

With the exception of review-specific logic models which possess inherent and self-evident merits, there are advantages in utilising existing social theories as opposed to developing new ones[3]. Whilst not yet encountered as an issue within the context of social theories to systematise review processes, some theories to inform review design and interpretation of evidence had not been used beyond their originators and little methodological testing had been reported [6]. Repeated use of the same social theory, with further development or modification if necessary, helps build its validity. Feedback to the originators and publication of experiences of use of a particular theory, positive and negative, encourages the development of improved versions. Potentially it may save time and resources for reviewers and avoid the proliferation of tools that serve a similar purpose but have been developed within a review-specific context.

**Sharing experiences and evaluating use of theory in complex intervention reviews**

Methodological research is needed on the development and use of theory in systematic reviews, particularly in relation to identification, selection and quality assessment of appropriate theories. Review authors are encouraged to evaluate and share their experiences of using theory in complex intervention reviews.
References


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**Competing interests**

JN, AB and RG are co-convenors of the Cochrane Qualitative and Implementation Methods Group. JN is a Co-Chair of the Cochrane Methods Executive and member of the Methods Application and Review Standards group. SL and CG are both editors for the Cochrane Effective Practice and Organisation of Care Group and the Cochrane Consumers and Communication Review Group. JC is Cochrane Methods Co-ordinator.

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