Research article

A simple method for identifying the theoretical basis for systematic reviews: the BeHEMoTh Procedure

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Abstract

Background

The health services research community is increasingly recognising the potential contribution of theory to the conduct, analysis and interpretation of systematic reviews (Shepperd et al, 2009). However, in marked contrast to the systematic methods employed to identify studies for inclusion in reviews or technology assessments, identification of theory seems opportunistic or even haphazard. There is a need for a systematic methodology to inform the quest for those theories that may enlighten the design, or subsequent success, of an intervention or may facilitate an understanding of differential levels of success for different populations. Objective: To propose and evaluate a new method for the identification of theory in the context of systematic reviews of interventions.

Methods

An initial approach to defining and specifying the characteristics of relevant theory was developed and further refined. A systematic question formulation framework was devised – BeHEMoTh (Behaviour; Health condition; Exclusions; Models or Theories). This framework became the organising principle for further specification of the key steps required to identify theory in a systematic manner. This method was evaluated in two contrasting case studies, opportunistically selected from the authors' current work portfolios.

Results

The BeHEMoTh method of question formulation offers promise as an approach for specifying the search for theory to inform a systematic review. The

performance of this framework can likely be enhanced by using a range of supplementary techniques to identify the theoretical underpinnings for interventions that provide the focus of a systematic review. These techniques can be further specified in terms of their likely utility in order to provide an explicit, transparent and auditable procedure for effective use of theory. However, the effectiveness of such procedures is dependent on the characteristics of the literature being surveyed and of the discipline from which it derives.

Conclusion

This simple framework, and accompanying procedure, could prove useful for identifying theory to inform the design, conduct and analysis of systematic reviews using a variety of methods and approaches including realist synthesis, best-fit framework synthesis or review of complex interventions. It requires further evaluation in an ever expanding range of contexts and circumstances.

Keywords:
Question formulation; Study identification; Complex interventions; Realist synthesis

In summary, this rapid review of existing reviews of model or theories, covering studies published from 1998 onwards, reveals the following:

- The concept of "theories or models" is poorly specified in the review questions of included reviews.
- The concept of "theories or models" is poorly reflected in the search strategies of the included reviews, even where other aspects of the search process appear systematic.
- Even where the concept of "theories or models" is captured within a search strategy this is imperfectly executed using a suboptimal permutation of synonyms or variants.
- Supplementary search strategies, such as handsearching and, particularly, citation searching are poorly reflected in the published version of the literature search strategies
- Lists of search sources itemised for the included reviews appeared to carry little acknowledgement of the specific requirements for retrieval of models or theories.

From the above, we can conclude that there is a need for systematic, formalised and pre-specified methods for undertaking the identification of papers reporting theories from the journal literature. These findings, taken collectively, informed development of the BeHEMoTH Framework and an accompanying search procedure.

Development of the BeHEMoTh Framework

BeHEMoTh was conceived as a structured approach to the specification and subsequent identification of models or theories for use in a systematic review. Evidence based medicine in general, and systematic review of effectiveness interventions in particular, has benefited from the structured prespecification of the **P**opulation of Interest, the **I**ntervention, a **C**omparison and **O**utcomes (embodied in the **PICO** mnemonic) (Menzies, 2011). Such an approach has been demonstrated to improve the specification of concepts and the specificity of subsequent search strategies (Booth et al, 2000). For this reason a plethora of structures for question formulation has subsequently been developed and promoted (Davies, 2011). In the

same way that the PICO structure is used to formulate effectiveness questions BeHEMoTh is intended to predefine search criteria for retrieval of models or theories. The individual elements of BeHEMoTh are as shown in Table 3.

Table 1 Elements of the BeHEMoTh Framework for Specification of Theory-related Review Questions

Be - Behaviour of Interest: Way population or patient interacts with health context e.g. access for a service, compliance, attitude to policy.

H - Health Context: i.e. the service, policy, programme or intervention

E – Exclusions: To exclude non-theoretical /technical models (depends on volume).

MoTh - Models or Theories: operationalized as a generic "model* or theor* or concept* or framework*" strategy together with named models or theories if required.

* Indicates use of truncation, for example to retrieve the terms theory, theoretical or theories

Development of the BeHEMoTh Procedure

The BeHEMoTh Procedure seeks to address two related needs in connection with the use of theory in systematic reviews. First, reviewers need to identify candidate theories that have been used to explain the possible mechanisms by which an intervention, policy or programme might be expected to work. Subsequently, having identified one or more candidate theories, reviewers then need to identify instances of their practical application. In the first circumstance either empirical or discursive articles are equally valuable. In contrast, when it comes to the actual application of a theory, the review team is seeking primarily empirical studies so that actual data can be used to explore the theory. A prerequisite to the BeHEMoTh Procedure is therefore that it should follow a temporal sequence in which identification of named theories is followed up by the location of such theories in candidate articles through phrase and citation searching. The phases of the BeHEMoTh Procedure in sequence are described using a fishing analogy as follows:

1. **"Trawling" using the BeHEMoTh framework.** This requires constructing an initial search strategy that includes both the Behaviour and Health Context of

Interest together with terms relating to theories (i.e. models, theories, frameworks and concepts) and excluding non-theory based models (e.g. statistical models, economic models etcetera). If initial retrieval results are few in quantity then the recognised search tactic of "drop a concept" (where you typically drop either the concept of least relevance or the concept possessing most specificity) may come into play (Booth, 2008). In this particular context "drop a concept" may refer to a tactic where a more generic theory may have potential application to a specific Behaviour-Health Context (For example, if a review team has been looking specifically for theories relating to alcohol dependence it might be relevant to extend their search to the related area of drug abuse or to the broader area of addiction). This can be operationalised by dropping terms associated with the Health Context or by substituting the specific Health context for a broader, more generic setting.

2. **"Depth-charging" for common theories.** This refers to a more speculative approach of searching for co-occurrences of the Behaviour and Health Context with a shortlist of named theories, so-called because it is used to "surface" common theories It is included in the BeHEMoTh procedure as a systematic adaptation of methods originally described by Trifiletti et al (2005). Their original shortlist has been extended following reference to several evidence based studies of the prevalence of theories (Painter et al, 2008; Filiatrault & Richard (2005); Glanz et al (2002); Godin et al, 2008, Pinto & Floyd, 2008) (Table 5). This approach may also be useful in identifying articles that describe the inadequacies of one or more common theories as a prequel to proposing a novel or alternative theory.

Table 2 Most widely used or 'dominant' theories and models in health education and health promotion (Expanded from Glanz et al., 2002)

Health Belief Model*#**	Theory of Reasoned Action+#
Theory of Planned Behavior+$#**	Stages of Change or Transtheoretical Model*$**
Precaution Adoption Process Model	Protection Motivation Theory
Social Learning Theory$	Social Cognitive Theory*$#**
Community Organization Theory	Organizational Change Theory
Diffusion of Innovation Theory	PRECEDE PROCEED Model

Cognitive Behavioral Theory$	Motivational Interviewing$
Social Marketing.	Social Ecological Model**

* Most common theories identified by Painter et al (2008)

+ Most common theories identified by Godin et al (2008)

$ Most common theories identified by Pinto & Floyd (2008)

Most common theories identified by Filiatrault & Richard (2005)

** Most common theories identified by Glanz & Bishop (2010)

3. **"Fishing" using named item searches for theories generated from Phase One** (above) [excluding those already covered in Phase Two]. This recognises that a review team will not only be interested in the occurrence of the most common theories but particularly in theories that are idiosyncratic or specific to a particular Behaviour-Context.
4. **"Using a sprat" refers to the practice of using an item already retrieved to access a potentially more productive line of inquiry.** This requires the review team to identify key citations for a particular theory (identified from either Phase One or Phase Two) and to use this as a basis for a citation search. Such key citations may relate to the first use of a model regardless of context and/or the first use of that model in the specific context of the review. The particular innovation of an otherwise common technique is not to search for citations to a model exhaustively but to combine the query number for the result set for cited articles with the Behaviour and/or Context. For example a result set for all citations to the Health Belief Model (original reference by Rosenstock, 1966) contains at least 1,420 references (Web of Science, July 2012). However when this result set is combined with a specific topic (for example "alcohol") this produces a result set of just 27 references (Table 5).

Table 5 - Illustration of combined Citation-Topic searching (Web of Science)

Set	Results	Search Strategy
# 3	27	#2 AND #1
# 2	318,362	Topic=(alcohol)
# 1	1,420	Cited Author=(Rosenstock) AND Cited Year=(1966)

This latter approach has particular utility given that the underpinning theory for an article may not be specifically mentioned in the title or the abstract. Using this citation approach offers an additional line of retrieval not otherwise possible unless, of course, the reviewer is prepared to undertake the typically prohibitive approach of looking through the full text of every single paper on a topic in a desultory quest for mentions of theory.

Table 3 - Summary of the four phases of the BeHEMoTh Protocol.

Strategy	**Elements**			
1. Trawling (and drop a concept)	Be AND	H	NOT E	AND Models or Theories
2. Depth-charging	Be AND	H	AND any/all the most common theories	
3. Fishing	Be AND	H	AND named theories identified from 1.	
4. Using a sprat	Be AND	H	AND the original model citation	

Key = Be = Behaviour; H = Health Context; E = Exclusions

References

Balcazar FE, Suarez-Balcazar Y, Taylor-Ritzler T. **Cultural competence: development of a conceptual framework.** Disabil Rehabil. 2009;31(14):1153-60. OTHER

Baranowski T, Cullen KW, Nicklas T, Thompson D, Baranowski J. **Are current health behavioral change models helpful in guiding prevention of weight gain efforts?** Obes Res. 2003 Oct;11 Suppl:23S-43S. OTHER

Booth A, O'Rourke AJ, Ford NJ. **Structuring the pre-search reference interview: a useful technique for handling clinical questions.** Bull Med Libr Assoc. 2000 Jul;88(3):239-46.

Booth, A. **Unpacking your literature search toolbox: on search styles and tactics.** Health Info Libr J. 2008 Dec;25(4):313-7.

Crosby R, Noar SM. **Theory development in health promotion: are we there yet?** J Behav Med. 2010 Aug;33(4):259-63. OTHER

Davies, K . **Formulating the Evidence Based Practice Question: A Review of the Frameworks.**Evidence Based Library and Information Practice [Online], 6.2 (2011): 75-80. Web. 15 May. 2012

Filiatrault J, Richard L. **Theories of behavior change through preventive and health promotion interventions in occupational therapy.** Can J Occup Ther. 2005 Feb;72(1):45-56.

Glanz, K., Rimer, B.K. and Lewis, F.M., (eds) (2002) **Health Behavior and Health Education: Theory Research and Practice**, 3rd edn. Wiley, San Francisco, CA.

Godin G, Bélanger-Gravel A, Eccles M, Grimshaw J. **Healthcare professionals' intentions and behaviours: a systematic review of studies based on social cognitive theories.** Implement Sci. 2008 Jul 16;3:36

Kaakinen J, Arwood E. **Systematic review of nursing simulation literature for use of learning theory.** Int J Nurs Educ Scholarsh. 2009;6(1):Article 16. PUBMED

McGlashan AJ, Finch CF. **The extent to which behavioural and social sciences theories and models are used in sport injury prevention research.** Sports Med. 2010 Oct 1;40(10):841-58. OTHER

Menzies D. **Systematic reviews and meta-analyses**. Int J Tuberc Lung Dis. 2011 May;15(5):582-93.

Painter JE, Borba CPC, Hynes M, Mays D, Glanz K. **The use of theory in health behavior research from 2000 to 2005: a systematic review.** Ann Behav Med 2008 Jun;35(3):358-362

Pinto BM, Floyd A. **Theories underlying health promotion interventions among cancer survivors.** Semin Oncol Nurs. 2008 Aug;24(3):153-63.

Shepperd S, Lewin S, Straus S, Clarke M, Eccles MP, Fitzpatrick R, Wong G, Sheikh A. **Can we systematically review studies that evaluate complex interventions?** PLoS Med. 2009 Aug;6(8):e1000086.

Trifiletti LB, Gielen AC, Sleet DA, Hopkins K. **Behavioral and social sciences theories and models: are they used in unintentional injury prevention research?** Health Educ Res. 2005 Jun;20(3):298-307.OTHER