

Improving the reporting of behaviour change interventions

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The publication of the results of a behaviour change trial should have an impact on both science and practice, but this can only be done successfully if adequate information is available about the behaviour change intervention (BCI). Incomplete or confusing reporting may result in implementation of an intervention which omits essential elements included in the trialled intervention, while asserting that it is 'evidence-based'. If the intervention is misinterpreted by systematic reviewers, it may not be included or it may be wrongly categorised with potential negative impact on evidence synthesis and theory development.

There is ample evidence that interventions are inadequately reported. Hoffmann, Eructi and Glasziou (2013) found that essential information, such as the provider and the materials used, was missing from published reports of surgical, pharmacological, rehabilitation, psychotherapy and behavioural ('non-pharmacological') interventions and was not available even after contacting the authors (Figure 1). Pharmacological interventions may also be poorly reported: 16% of authors of cancer chemotherapy trials failed to mention the route by which the drug was administered (Duff, Leather, Walden, LaPlant, & George, 2010).

There is some evidence that reporting of BCIs is worse than for other non-pharmacological interventions (e.g. surgery, rehabilitation): McCleary, Duncan, Stewart, and Francis (2013) found that the titles and abstracts of BCIs frequently failed to mention the active ingredients of the intervention (Figure 2). Thus systematic reviewers might easily

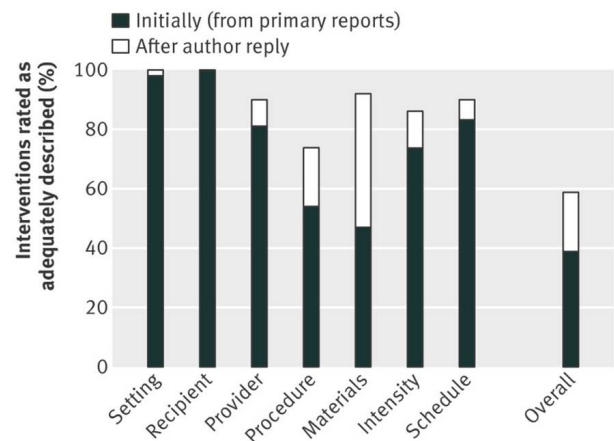


Figure 1: Adequacy of reporting on non-pharmacological interventions (Hoffmann et al., 2013)

overlook these papers when applying inclusion criteria.

Is this the fault of 'naughty' or 'secretive' triallists? A more likely explanation is that there has been no agreement about what needs to be reported, and for BCIs, no shared language for reporting active content. We need more precise reporting to make interventions recognisable and replicable. Recent developments have resulted in the beginnings of international, interdisciplinary consensus on what and how BCIs should be reported.

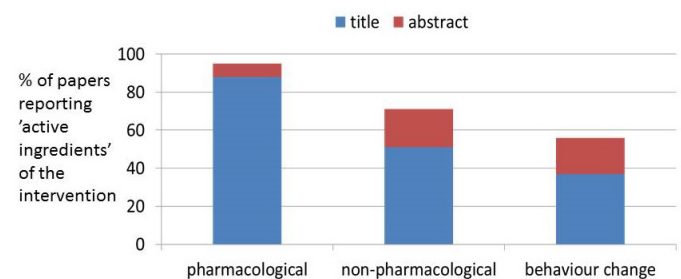


Figure 2: Reporting active ingredients of interventions in title or abstract (McCleary et al., 2013)

What to report: Template for Intervention Description and Replication (TIDieR)

Hoffmann and colleagues recently published the TIDieR checklist as an extension to the CONSORT 2010 (<http://consort-statement.org>) and SPIRIT (<http://spirit-statement.org>) guidelines as to what should be included in describing *any* healthcare intervention - including surgical, pharmacological, rehabilitation, psychotherapy and behavioural interventions (Hoffmann et al., 2014). The checklist was developed using EQUATOR network (www.equator-network.org/) recommended consensus procedures. A steering committee developed a list of 34 potential items based on existing checklists and literature reviews. This list was evaluated in a 2-round Delphi procedure by 90 international participants from many disciplines and including primary researchers, systematic reviewers and journal editors. The results were then discussed in a two day face-to-face meeting which agreed the items for inclusion in an essential, minimal data set, as well as how they should be labelled and defined. These labels and definitions with examples spanning different disciplines were piloted before publication, with video (<http://bmj.com/multimedia/video/2014/03/17/tidier-better-reporting-interventions>).

The resulting TIDieR checklist is shown in Table 1 and since publication has been widely downloaded and cited. The complete checklist which is recommended for use by reviewers and authors is available on the EQUATOR Network website (<http://equator-network.org/reporting-guidelines/tidier>). While most of the items are self-explanatory, the examples add further information. Ten items report the planned intervention, two items report any changes made during a trial and the fidelity of delivery of the planned intervention (see also Knittle, 2014, this issue). Of particular interest, and perhaps most challenging to behavioural and social scientists are items 2 'why', 4 'what procedures'

and 5 'who provided'. Importantly, the 'why' item seeks information on the theoretical or other rationale for the intervention (see also Kok, 2014 and Peters, 2014; both in this issue) and behavioural scientists might additionally wish to note how theory was used in developing the intervention (Michie & Prestwich, 2010; Prestwich et al., 2014). 'What procedures' and 'Who provides' a BCI are important issues which are discussed below.

'What procedures': Communicating the active ingredients of BCIs

BCIs are typically complex and we need clarity in interpreting what the intervention involves. The TIDieR item 'What procedures' involves both the activities that support the delivery of the active ingredients and the actual active ingredients of the BCI i.e. the behaviour change techniques (BCTs) which are somewhat similar to the methods of behaviour change discussed by Kok (2014) except that the latter are theory-based. A BCT is defined in the Encyclopedia of Behavioral Medicine as: 'a systematic procedure included as an active component of an intervention designed to change behavior, which is observable and irreducible. It is the smallest component compatible with retaining the postulated active ingredients, that is, the proposed mechanisms of change, and can be used alone or in combination with other BCTs' (Michie & Johnston, 2013). Recent developments in specifying BCTs have resulted in improved methods of reporting BCTs, culminating in the publication of the Behaviour Change Technique Taxonomy v1 (BCTTv1) with 93 hierarchically organised BCTs with labels, definitions and examples (Michie et al., 2013).

The first BCT list was published in 2008 by Abraham and Michie (2008). This paper has been widely cited and has been followed by publication of several other lists of BCTs appropriate for different applications. Michie and colleagues gathered all of

Table 1: *Template for Intervention Description and Replication: the TIDieR checklist*
 (*These items are not relevant to protocol reporting and cannot be described until study is complete.
 #Use this column to indicate where the item can be found.)

Item number and label	Definition	Location of information #
1. Brief name	Provide the name or a phrase that describes the intervention	
2. Why	Describe any rationale, theory, or goal of the elements essential to the intervention	
3. What Materials	Describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers. Provide information on where the materials can be accessed (such as online appendix, URL)	
4. What Procedures	Describe each of the procedures, activities, and/or processes used in the intervention, including any enabling or support activities	
5. Who provided	For each category of intervention provider (such as psychologist, nursing assistant), describe their expertise, background, and any specific training given	
6 How	Describe the modes of delivery (such as face to face or by some other mechanism, such as internet or telephone) of the intervention and whether it was provided individually or in a group	
7. Where	Describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features	
8. When and How Much	Describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity, or dose	
9. Tailoring	If the intervention was planned to be personalised, titrated or adapted, then describe what, why, when, and how	
10. *Modifications	If the intervention was modified during the course of the study, describe the changes (what, why, when, and how)	
11. How well Planned	If intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them	
12. * How well Actual	If intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned	

the available lists of BCTs together and, over a 3 year project funded by the UK Medical Research Council and guided by an international, interdisciplinary advisory board, developed BCTTv1. The intensive development process involved Delphi and other consensus methods combined with repeated testing of the extent to which the labels and definitions resulted in agreement between coders using the developing list. In the final stages, the long list of BCTs was organised into a hierarchical structure grouping the BCTs by similarity of mode of action (Cane, Richardson, Johnston, Ladha, & Michie, 2014).

Table 2 illustrates labels, definitions and examples of BCTs from different groupings. The published BCTTv1 also provides additional guidance in the definitions about BCTs that might also be considered when selecting a BCT. A BCTTv1 App is also available in both the iTunes and Google Play stores; an example screenshot is shown in Figure 3.

The first step in using BCTTv1 is to be clear about the behaviour that is targeted. Reports of BCIs may apply different BCTs to different behaviours within the same programme e.g. BCTs directed at dietary behaviours vs activity behaviours in a weight loss

Table 2: Illustrative examples of BCTs from BCTTv1.

(* full definitions in BCTTv1 include notes on alternative or additional BCTs that should be considered in selecting the BCT)

BCT code	Grouping	Label	Definition (abbreviated*)	Example
1.1	Goals and Planning	Goal setting (behaviour)	Set or agree on a goal defined in terms of the behaviour to be achieved	Agree on a daily walking goal (e.g. 3 miles) with the person and reach agreement about the goal.
2.3	Feedback and monitoring	Self-monitoring of behaviour	Establish a method for the person to monitor and record their behaviour(s) as part of a behaviour change strategy	Ask the person to record daily, in a diary, whether they have brushed their teeth for at least two minutes before going to bed.
5.1	Natural consequences	Information about health consequences	Provide information (e.g. written, verbal, visual) about health consequences of performing the behaviour	Explain that not finishing a course of antibiotics can increase susceptibility to future infection
7.1	Associations	Prompts/cues	Introduce or define environmental or social stimulus with the purpose of prompting or cueing the behaviour. The prompt or cue would normally occur at the time or place of performance.	Put a sticker on the bathroom mirror to remind people to brush their teeth
8.3	Repetition and substitution	Habit formation	Prompt rehearsal and repetition of the behaviour in the same context repeatedly so that the context elicits the behaviour	Prompt patients to take their statin tablet before brushing their teeth every evening

programme, or BCTs to enhance attendance at a class vs BCTs delivered within the class to reduce smoking. Some programmes involve the behaviour of more than one person e.g. parents may be targeted as well as their children in programmes to reduce children's sedentary behaviour. Short sections of text may contain several BCTs, sometimes in overlapping text; for example, consider the text in Box1 and try to identify text describing distinct BCTs. Table 3 indicates 9 BCTs that can be identified.

A central aim of BCT development is to ensure that a BCI is interpreted in the same way by different readers and so a key element has been the assessment of inter-coder agreement on the identification of BCTs. Evidence to date suggests that agreement between trained coders is satisfactory for most of the commonly occurring BCTs (Michie et al., 2013). Note that without a methodology for specifying BCTs it would not even have been possible to assess the degree of agreement as there would be no shared language for comparison of coding. The shared language of BCTTv1 can be applied to reports of BCIs in other languages provided the coders can

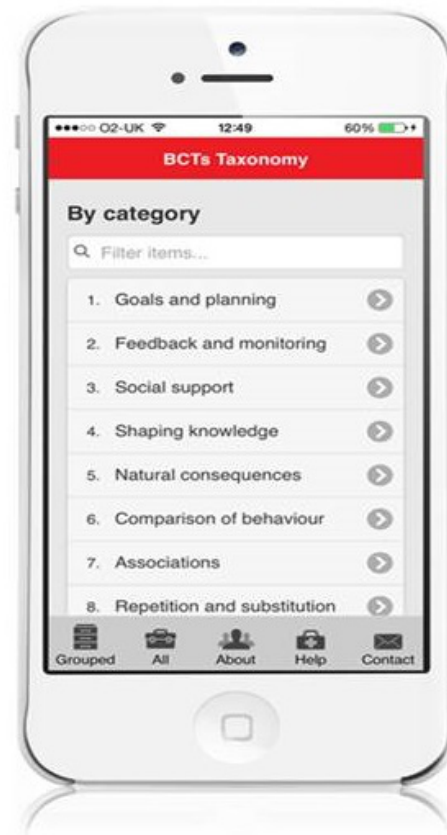


Figure 3: BCTTv1 App screenshot

Box 1: Short report of a BCI with several BCTs

Target Behaviour: hand washing

'After instruction on how to find and assess a patient's pulse, students practiced taking each other's pulse. They then read a booklet on hospital infection control procedures and, after a brief discussion, watched a video of a consultant washing his hands correctly and advocating the importance of this to all staff. Students were prompted to write down their handwashing aims, in particular, to ensure that they would try to always have bacteria-free hands at work and to ensure that they would wash their hands correctly after touching each patient. Students were observed washing their hands and the instructor discussed their technique. Finally, students were asked to identify a colleague on the ward who would remind them of their handwashing goal.'

use the English labels and definitions in addition to reading in the language of the BCI report.

Given that a main aim of BCTTv1 is to improve reliability in communicating about BCIs, it is recommended that researchers use BCTTv1 as a basis for reporting the active ingredients of BCIs. However BCT coding is a skilled activity and training is required to ensure that due attention is paid to the full definitions and that coders do not infer the presence of BCTs from ambiguous text. Two personal

methods of training, workshops and distance tutorials have been evaluated (Wood et al., in press) and these form the basis for on-line training. On-line training in the use of BCTTv1 is available at <http://bct-taxonomy.com/> with an introduction at <http://youtu.be/qR3lNe7ht2o>. It is anticipated that users will need to adapt, add to and suggest improvements which should result in an updated BCTTv2 within a few years. Other users may wish to tailor the list of BCTs with reference to a specific

Table 3: BCTs identified in the text in Box 1 reporting a BCI

Text in the report in Box 1	BCT (with BCTTv1 code)
watched a video of a consultant washing his hands correctly	Demonstration of the Behaviour (6.1)
watched a video of a consultant washing his hands correctly and advocating the importance of this	Credible source (9.1)
Students were prompted to write down their handwashing aims, in particular, to ensure that they would try to always have bacteria-free hands at work	Goal setting (outcome)(1.3)
Students were prompted ... to ensure that they would wash their hands correctly	Goal setting (behaviour) (1.1)
Students were prompted ... to ensure that they would wash their hands correctly after touching each patient.	Action Planning (1.4)
Students were observed washing their hands	Behavioural practice/rehearsal (8.1)
the instructor discussed their technique.	Feedback on behaviour (2.2)
asked to identify a colleague on the ward who would remind them of their handwashing goal	Prompts and cues (7.1)
asked to identify a colleague on the ward who would remind them of their handwashing goal	Social support (practical) (3.2)

theory and such tailoring is likely to result in the identification of additional BCTs: for example, Silva, Marques, and Teixeira (2014, this issue) discuss BCTs related to self-determination theory.

'Who provides' the BCI: competences for delivering BCIs

The TIDieR framework requires reporting of who provides the intervention, including any relevant training. Such information is essential for implementation of a BCI as a proven successful BCI may be less effective if delivered by a provider with less behaviour change competence than those delivering the intervention in the published trial.

BCIs are delivered by a wide range of practitioners including specialists in behaviour change, but also other professionals with a broader range of activities such as doctors, nurses, public health specialists, teachers etc. whose main training and experience are not in behaviour change. Others may have been trained for practice in a specific behavioural domain such as counsellors in smoking cessation, alcohol brief intervention or sexual health services. For example, Michie, Churchill, and West (2011) identified BCT competences and supporting activities which had evidence of effectiveness in smoking cessation programmes. Competent delivery of BCIs involves a range of knowledge and skills and there are several situations in which it is important to be able to describe and assess these competencies. Clearly successful implementation of an effective BCI requires practitioners of comparable competence to those involved in the evaluation of the BCI. Additionally, one may wish to consider the competencies that are transferable from one domain to another e.g. does a specialist in sexual behaviour change have the competencies to deliver a smoking cessation programme? What additional competencies would they require? Competencies are also important in employing staff to deliver behaviour change

programmes or in assessing training needs for oneself or for others.

Because of the increasing importance of behaviour change, we were commissioned by Scottish Government to develop a framework for describing the competencies required to deliver behaviour change programmes (Dixon & Johnston, 2010). We took as our starting point the items of the competency framework for cognitive behavioural therapy interventions (Roth & Pilling, 2007) as a recently developed framework with relevance to changing behaviour. Items were selected with good inter-coder agreement, re-formulated to be relevant to health behaviour change and organised to be readily accessible. In addition each competency was reliably coded into three levels of intensity of skill required: low (scripted protocol); medium (manual-based but with some flexibility); and high (flexible to match assessed client needs).

The HBCC framework has three domains, one concerning competency to deliver BCTs and two dealing with competences required to support the delivery of BCTs:

- Foundation competences: communication skills required to develop an effective intervention alliance professional and ethical guidelines required for effective practice with different clients and client groups (12 topics, divided into 56 competencies).
- Behaviour change competences: knowledge of the relationship between behaviour and health status; knowledge of models and theories of behaviour and how these have been used to develop behaviour change interventions; general assessment and core intervention skills required to implement theory based interventions for behaviour change in practice (12 topics, divided into 54 competencies).
- Behaviour Change Techniques: full breadth of behaviour change techniques relevant to health behaviour organised into three routes to behaviour and behaviour change (Motivation development; Action on motivation; and Prompted or cued behaviour).

The Foundation and Behaviour Change competence

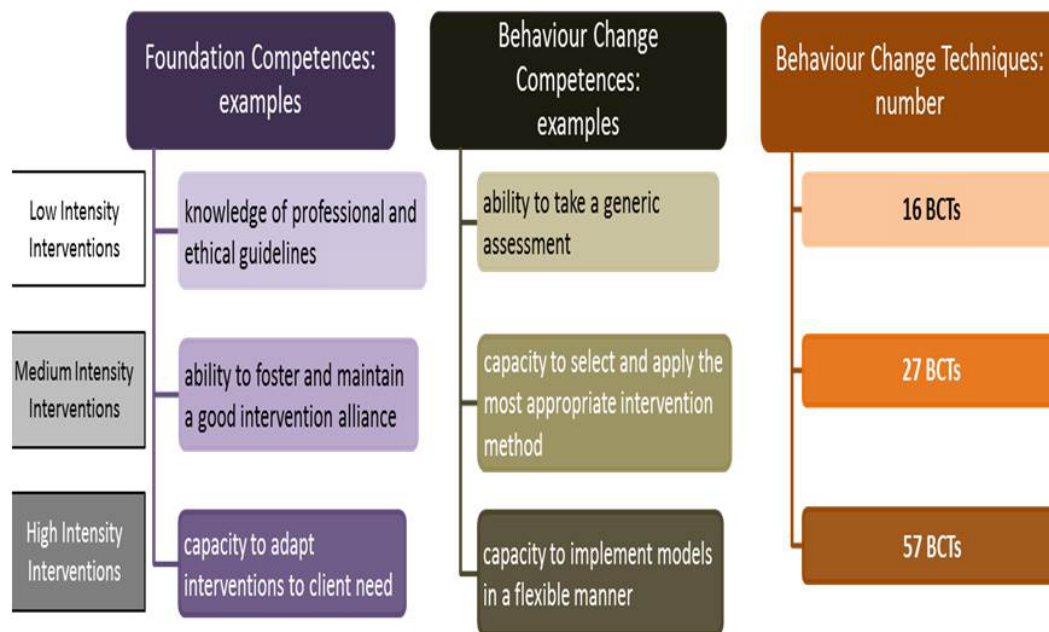


Figure 4: The Health Behaviour Change Competency Framework: Three domains and three levels of intensity

topics are listed in Table 4 with an indication of the number of competences included within each topic. So for example, Foundation Competence topic 6 (Ability to work with groups of clients) consist of 11 competences including:

- Ability to apply professional and ethical standards when working with groups
- Ability to engage the group
- Ability to encourage group discussions/didactic presentations
- Ability to communicate rules governing the group
- Ability to establish a closed group
- Ability to communicate group member identities

Behaviour Change topic 12 (ability to plan for maintenance of behaviour change after the end of the intervention) has 2 competences:

- Ability to help clients identify and elaborate their concerns about termination (e.g. worry that that they need support to manage on their own, or that they will relapse).

- Ability to help clients identify other resources that might help them maintain their behaviour change (e.g. weightwatchers, websites, gym membership).

The HBCC Framework has been used to specify the competence required for specific BCIs and to inform training programmes developed by Scottish Government. In addition, an online self-assessment has been developed and found to discriminate between health psychologists at different levels of qualification (Bull, Dixon, & Johnston, 2012).

Conclusions

Good reporting of interventions is essential both in implementation in practice and in creating a cumulative science. Historically BCIs have not been reported with sufficient completeness, precision and transparency to achieve these aims, largely due to lack of a methodology for reporting. However current and continuing progress in developing methods for

Table 4: *Foundation and Behaviour Change Competence topics (numbers indicate the number of competences within each topic)*

Foundation Competences	Behaviour Change Competences
1. Professional and ethical guidelines: 7	1. Knowledge of health behaviour and health behaviour problems: 9
2. Supervision: 4	2. Ability to undertake a generic assessment: 7
3. Knowledge of and ability to work with difference: 3	3. Knowledge of a model of behaviour change and the ability to understand and employ the model in practice: 4
4. Ability to communicate and work with individuals, groups and communities: 1	4. Ability to agree goals for the intervention: 2
5. Ability to engage client: 8	5. Capacity to implement behaviour change models in a flexible but coherent manner: 2
6. Ability to work with groups of clients: 11	6. Capacity to select and skilfully to apply the most appropriate behaviour change intervention method: 1
7. Ability to foster and maintain a good intervention alliance and to grasp the client's perspective: 8	7. Capacity to implement behaviour change in a manner consonant with its underlying philosophy: 6
8. Capacity to adapt interventions in response to client feedback: 3	8. Ability to structure consultations: 5
9. Ability to manage expectations of the intervention: 3	9. Ability to use measures and self-monitoring to guide behaviour change intervention and to monitor outcome: 6
10. Ability to deliver information: 4	10. Ability to carry out health behaviour problem solving: 9
11. Capacity to structure consultations and maintain appropriate pacing: 3	11. Capacity to manage obstacles to carrying out behaviour change: 1
12. Ability to recognise barriers to and facilitators of implementing interventions: 1	12. Ability to end the intervention in a planned manner and to plan for long-term maintenance of gains after intervention ends: 2

specifying what needs to be reported, how active ingredients of BCIs can be interpreted from reports and what competence is required to deliver an intervention should make this task easier in future.

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