



# Starter Pack

For trainees

2014

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# Introduction to BCTTv1 training online

## What is the Behaviour Change Technique Taxonomy v1 (BCTTv1)?

To replicate and implement behaviour change interventions in research and practice, we need an agreed language to report their content, that is, their 'active ingredients'. A reliable method has been developed to specify content in terms of behaviour change techniques (BCTs), the smallest components of behaviour change interventions that on their own in favourable circumstances can bring about change. Several taxonomies, or structured lists of BCTs, have been developed for specific behaviours. This formed the basis of the Behaviour Change Technique Taxonomy project (2010-2013), funded by the UK's Medical Research Council, to develop a consensually agreed, reliable taxonomy that could be used across behaviours, disciplines and areas of interest (e.g. health, the environment). It also developed a training programme and evaluated the taxonomy for coding and reporting interventions engaging more than 400 researchers, practitioners and policymakers in the work.

The resulting BCT Taxonomy v1 (BCTTv1) is a cross-domain, hierarchically structured taxonomy of 93 distinct BCTs with labels, definitions and examples. During the project, two formats of user training were also developed, one day workshops and four session distance group tutorials, and found to improve competence in identifying BCTs in intervention descriptions. Results from an international coding exercise revealed that trained coders reliably coded 80 of the 93 BCTs, successfully identified 14 of the 15 BCTs present in published intervention descriptions, with reliability maintained over one month.

Thus BCTTv1 offers a generally reliable method for specifying, interpreting and implementing the active ingredients of interventions to change behaviours. It is a useable method for both research and practitioner communities. The development and initial evaluation of BCTTv1 is described in the following article:

Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., Wood, C. E. (2013). The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Ann Behav Med*, 46(1), 81-95. doi: 10.1007/s12160-013-9486-6

In addition to the development of this online training programme, this work is being taken forward in two ways:

- Developing a method to link BCTs to theory: Michie S, Johnston M, Rothman AJ, Kelly M, de Bruin M. Developing methodology for designing and evaluating theory-based complex interventions: an ontology for linking behaviour change techniques to theory, funded by the UK Medical Research Council; 2014
- Developing cross-disciplinary research and evidence translation: Via the UCL Centre for Behaviour Change [www.ucl.ac.uk/behaviour-change](http://www.ucl.ac.uk/behaviour-change)
- Developing a framework for designing behaviour change interventions: 'The Behaviour Change Wheel Guide – A guide to designing interventions' is now available in paperback from the UCL Centre for Behaviour Change (website as above) or via [www.behaviourchangewheel.com](http://www.behaviourchangewheel.com)

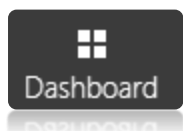
To find out more about the BCTTv1 project, please visit the website: [www.ucl.ac.uk/health-psychology/bcttaxonomy](http://www.ucl.ac.uk/health-psychology/bcttaxonomy)

## About the course

Welcome to the BCTTv1 online training course!

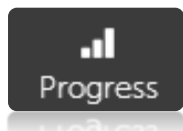
Over six sessions, the course will gradually introduce you to BCTTv1 and provide hands-on experience in identifying 44 behaviour change techniques (BCTs) in a range of intervention descriptions and provide you with experience in describing BCTs from observed interventions as delivered in practice. There are several different sections to the site and a number of tools available which we hope will enable you get the most out of your training experience. These are described in more detail below.

## The 'Dashboard'



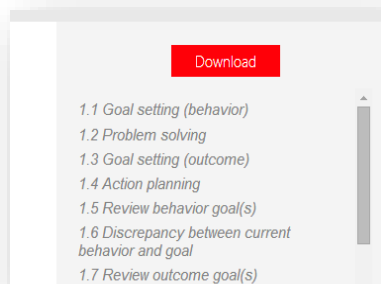
The Dashboard section of the website is where you can see an overview of your training to date. Under 'Your sessions' you can see the sessions you've already completed, sessions in progress and sessions you've yet to start. The 'Shared learning' section shows you who you have connected with during your training (i.e. your buddy and tutor). From the Dashboard you will also be able to see the additional resources we and other users have uploaded to the site and also the Q&A section. You can always return to the Dashboard by clicking the tab at the top of your screen.

## Overall structure



The training course is divided into six sessions, found under the 'Progress' tab. As you work through the course, you will be able to form a good judgment of the definitions and labels you are able to successfully and consistently identify but also which BCTs you tend to find more difficult. In addition, we have built in two assessments to allow you to more formally assess your progress. There is one assessment after session four and then a final course assessment after session six.

Each session introduces a sub-set of BCTs from BCTTv1. Each session begins by outlining the BCTs you will be working with for that session.



A mini-taxonomy of these BCTs can be downloaded from the right hand side of your screen in each session (the file will open in MS Excel – we recommend printing this file or having it open in another screen on your desktop for easy reference). Each session then introduces a 'Learning Principle' and finally, concludes with an interactive coding task for you to complete.

The sessions will sequentially unlock as you progress through the course (i.e. session two will unlock once you have completed session one, session three after completion of session two etc.). As an extra challenge, to unlock sessions five and six you will need to score at least 70% on the first assessment!

You will be given immediate feedback on each task so you will be able to monitor your progress throughout the course.

You can choose the pace at which you work through the sessions however we would recommend completing only one session per week to ensure you have enough time to reflect on what you've learnt and discuss your coding with your buddy (see 'Buddy system' section below).

## Session structure

Each session follows a similar structure. At the beginning of each session you will see:

- A list of learning objectives – skills/concepts that you should have mastered once you have successfully read through and completed the session and task
- A list of the BCTs introduced
- A learning principle – these are guidelines which will help you to accurately and reliably use BCTTv1 to describe the active content of behaviour change interventions

Next, you will find the interactive coding task for the session. Each task comprises of one, two or three coding exercises and involves using the taxonomy to code excerpts taken from real intervention descriptions. From previous training courses, we estimate that each task will take up to one hour to complete however some might find it takes more/less time.

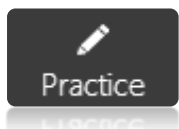
Note that your score for each task is dependent not only on you selecting the correct BCT but also highlighting the appropriate amount of text – too much or too little and you will lose points! Specific instructions are given in each task.



We have built in two assessments to help you formally monitor your progress; one after session four and one after session six. You will need to pass the first assessment in order to unlock sessions five and six. Once you have passed the final assessment, you will be invited to download a BCTTv1 online training certificate which certifies you as a trained coder.

## The 'Practice Arena'

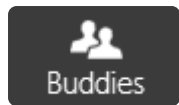
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As for learning any new skill, being able to accurately and reliably apply BCTTv1 requires reflection, discussion and importantly – practice. To help you increase your familiarity with the BCT labels and definitions in BCTTv1, we've built a 'Practice Arena' into the online training site.

Under the 'Practice' tab you will find five interactive exercise areas, each designed to test a different aspect of your knowledge and skill. You will receive immediate feedback after each of the exercises so will be able to see where you've really understood BCT labels / definitions and also where you might need some more practice. There is no limit on the number of times you can complete each of the exercises. We will be regularly adding new exercises to the Arena so check back regularly!

## The 'Buddy system'

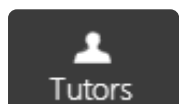


It really helps build your confidence and can improve your accuracy if you have someone you can discuss your coding task with, having worked through each session - so we've built a 'Buddy system' into the online training. The system allows you to add other coders who are working through the training at the same time as you.

Once connected, you can choose to download and print or electronically send your work to your Buddy. Your Buddy will receive a notification that you've shared your coding with them and then it's over to the two of you to discuss how you found the coding task and talk through any parts you found difficult.

*Note: It is also possible to Buddy with someone who has already completed the training. Under the 'Buddies' tab on the website you can simply add a new Buddy by entering their email address. They will not be able to view your profile or assessments unless you change your privacy settings.*

## Tutors



This training is designed to be self-directed. Some evidence shows that tutor-led training leads to greater accuracy of coding BCTs. We are therefore offering the possibility of tutor guidance and opportunities for BCT coding discussions. Under the 'Tutors' tab we will be adding a list of potential tutors. Most queries can be resolved by discussion with your Buddy, by consulting the Q&A section of the website or the additional resources section however if you have a query or question that you want extra help in answering, you can email one of our Tutors displaying a green availability symbol on their profile. All of our Tutors have extensive experience of behaviour change interventions and have all completed full BCTTv1 training.

**Tutor support will incur a fee – more information is available from individual tutors.**

*Note: We ask you to bear in mind that our Tutors are busy people. Every effort will be made to respond to your email as soon as possible, however there may be times where there is a delay in getting back to you. If this does happen, we encourage you to make the most of the buddy system and consult the additional resources available on the site.*

## Resources

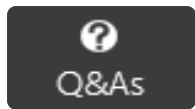


Under the 'Resources' tab you will find a number of useful documents, web links, videos and podcasts which can be downloaded throughout your training. There is also the option for you to share resources you think might be of interest to other trainees using the site. Resources also appear in a scrollable list at the bottom of your Dashboard page.

*Note: We strongly encourage trainees to share resources – all we ask is that resources uploaded adhere to the regulations specified in our terms and conditions (i.e. appropriate, non-spam and non-offensive content). If you are unsure whether your resource meets these criteria, please contact: [bcttaxonomy@ucl.ac.uk](mailto:bcttaxonomy@ucl.ac.uk)*

### Q&As

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The Q&As section is a great place to post questions or queries related to any aspect of your training, questions that have arisen during discussions with your buddy or tutor, or more broadly about use of BCTTv1.

Under the 'Q&A's' tab you can view or search for a specific topic amongst the questions that have already been asked by other trainees. Alternatively, you can ask a new question by clicking 'Ask'. It's always worth having a check through the list first to ensure your question hasn't already been asked! Your question will be sent to the BCT Taxonomy team who will publish your question to the list and post a response.

*Note: We request that trainees check through the Q&A list before posting a new question to ensure it hasn't already been asked. The BCTT team will review submitted questions regularly and will respond to those adhering to the regulations specified in our terms and conditions (i.e. appropriate, non-spam and non-offensive). If you are unsure whether your question meets these criteria, please contact [bcttaxonomy@ucl.ac.uk](mailto:bcttaxonomy@ucl.ac.uk).*

### BCTTv1 – Smartphone App

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The BCTTv1 is an easy-to-navigate and fully searchable version of Behaviour Change Technique Taxonomy v1 (BCTTv1). The app can be downloaded via the App Store if you are an iPhone user or via the Google Play store if you are an Android user (just search for 'BCT Taxonomy'). A web-based version is available for users on other platforms via: [www.bcts.23.co.uk](http://www.bcts.23.co.uk)

### Feedback to the team

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We hope that you will find the course enjoyable and warmly welcome your feedback at any point during your training. If you would like to contact the team, please email [bcttaxonomy@ucl.ac.uk](mailto:bcttaxonomy@ucl.ac.uk).

# Getting started

You're ready to start training!

- **STEP 1: Read two articles**

Before starting with Session one online, we recommend that you read the following two short articles to help fully familiarise you with the need for a standardised language to describe the content of behaviour change interventions. The first article starts on the next page.

- [BCT Taxonomy Project protocol](#)
- [Encyclopaedia entry for behaviour change techniques](#)

Having read through the articles you will understand the rationale for the BCT Taxonomy Project and exactly what we mean by the terms 'behaviour' and 'behaviour change techniques'.

- **STEP 2: Read the 'General Coding Instructions'**

By following these preliminary steps, you'll learn how to use BCTTv1 to accurately and reliably code the BCT content of behaviour change interventions. You will be asked to refer back to these steps when completing the tasks for each of the sessions.

- General coding instructions: preliminary steps

- **STEP 3: Begin Session 1 online!**

Once you've read the two articles and the General Coding Instructions you can begin Session one online.

**The first article starts on the next page.**



# The BCT Taxonomy Project: Strengthening evaluation and implementation by specifying components of behaviour change interventions - a study protocol

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The electronic version of this article is the complete one and can be found online at:

<http://www.implementationscience.com/content/6/1/10>

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## Abstract

### Background

The importance of behaviour change in improving health is illustrated by the increasing investment by funding bodies in the development and evaluation of complex interventions to change population, patient, and practitioner behaviours. The development of effective interventions is hampered by the absence of a nomenclature to specify and report their content. This limits the possibility of replicating effective interventions, synthesising evidence, and understanding the causal mechanisms underlying behaviour change. In contrast, biomedical interventions are precisely specified (*e.g.*, the pharmacological 'ingredients' of prescribed drugs, their dose and frequency of administration). For most complex interventions, the precise 'ingredients' are unknown; descriptions (*e.g.*, 'behavioural counselling') can mean different things to different researchers or implementers. The lack of a method for specifying complex interventions undermines the precision of evidence syntheses of effectiveness, posing a problem for secondary, as well as primary, research.

We aim to develop a reliable method of specifying intervention components ('techniques') aimed at changing behaviour.

### Methods/Design

The research will be conducted in three phases. The first phase will develop the nomenclature. We will refine a preliminary list of techniques and definitions. Using a formal consensus method, experts will then define the key attributes of each technique and how it relates to, and differs from, others. They will evaluate the techniques and their

definitions until they achieve an agreed-upon list of clearly defined, non-redundant techniques. The second phase will test the nomenclature. Trained experts (primary researchers and systematic reviewers), equipped with a coding manual and guidance, will use the nomenclature to code published descriptions of complex interventions. Reliability between experts, over time, and across types of users will be assessed. We will assess whether using the nomenclature to write intervention descriptions enhances the clarity and replicability of interventions. The third phase will develop a web-based users' resource of clearly specified and non-redundant techniques, which will aid the scientific understanding of, and development of, effective complex interventions. Dissemination throughout the project will be through stakeholder meetings, targeted multidisciplinary workshops, conference presentation, journal publication, and publication in an interactive web-based platform (a Wiki).

## Discussion

The development of a reliable method of specifying intervention components aimed at changing behaviour will strengthen the scientific basis for developing, evaluating, and reporting complex interventions. It will improve the precision of evidence syntheses of effectiveness, thus enhancing secondary, as well as primary, research.

## Background

Behaviour change interventions (*e.g.*, to increase physical activity, adherence behaviours, screening attendance) are typically complex, involving many interacting components. We need methods of specifying and reporting complex interventions in order to strengthen the knowledge base required for such interventions to be more effective, replicable, and implementable. The complexity of interventions to change behaviour is determined, in part, by the number of components involved. Components include the techniques to facilitate behaviour change that constitute the active ingredients of the intervention and procedures for delivery of those techniques. Procedures for delivery include who delivers the intervention, to whom, how often, for how long, in what format, and in what context [1]. The UK Medical Research Council's guidance [2] for developing and evaluating complex interventions acknowledges the need for improved methods of specifying and reporting intervention content. The CONSORT statement for randomised trials of non-pharmacologic interventions calls for precise details of the intervention, including a description of the different intervention components [3]. It is important to specify and report both the active techniques and procedures for delivery. This protocol focuses on the former, that is, methods for specifying what is delivered, rather than on how it is delivered. It addresses techniques that target the behaviour of individuals but that may be delivered in a variety of ways (*e.g.*, prompts or reminders delivered by a 'buddy', telephone call from a healthcare professional, postal leaflet, or environmentally, such as hand-washing signs). By technique, we mean a replicable component of an intervention designed to alter or redirect causal processes that regulate behaviour; that is, a technique is proposed to be an 'active ingredient' (*e.g.*, feedback, self-monitoring, and reinforcement). Techniques also have specified criteria for their operationalization, that is, minimum delivery specifications that would allow identification of that technique (*e.g.*, feedback must involve providing the target audience with information about their behaviour). The identification of behaviour change techniques (BCTs) is critical to understanding how organisational change and national policy changes (including policies around access and price) have their effects on individuals' health-related behaviours.

Despite the considerable investment in randomised controlled trials (RCTs) of complex interventions and in systematically reviewing their effects, interventions tend to be poorly described and reported. There is no consensus on terminology, and descriptions of interventions lack the specificity required for replication [2,4-6]. When secondary data analyses are conducted to ascertain which types of interventions are effective, many are too poorly specified to be included [7]; there is no consensus on how to classify content, and, therefore, each analysis develops its own classification system [1,8]. This results in much wasted effort since there is no common method for synthesising the findings of primary studies in a conceptually coherent way. Further, unless we can specify the active BCTs delivered within the standard care or control group, replication and accurate implementation is difficult or even impossible, and effect sizes for new interventions will continue to be un-interpretable [9]. These problems are evident across a wide variety of large, expensive trials of public health [10-12] and implementation interventions [13]. This impedes the accumulation of knowledge and implementation of effective behaviour change interventions [14]. In a 2008 address, the President of the Association for Psychological Science stated, 'For psychological research to flourish and develop into an increasingly cumulative basic science, there are some fundamental requirements. It's essential to develop and

use common shared tools and a common language, so that replication, and building on solid work, becomes accepted practice and is valued (<http://www.psychologicalscience.org/observer/getArticle.cfm?id=2430>).

Scientific advance requires an agreed-upon and reliable method of specifying and labelling BCTs[15]. Behavioural science has provided us with myriad potential BCTs [5,15,16], but there is no agreement on how they are labelled and identified. The same technique may be described by different labels (e.g., 'self-monitoring' may be labelled 'daily diaries'), and the same labels may be applied to different BCTs (e.g., 'behavioural counselling' may involve 'educating patients' or 'feedback, self-monitoring, and reinforcement' [17]). Imprecise labelling may lead to misleading conclusions in evidence synthesis. As a result of under-specification, behavioural medicine researchers and practitioners have been found to report low confidence in their ability to replicate highly effective interventions for diabetes prevention [5]. This problem needs to be solved to strengthen behavioural science and improve behaviour change intervention effectiveness.

Despite recommendations for describing intervention components [2,3], no rigorous and widely accepted methodology for doing this has been suggested. We propose to develop a systematic, referenced nomenclature (a system of technical terms used in a science, such as the periodic table of elements in chemistry or the biological classification) of BCTs with fully operationalized definitions to enable replication. This will form the basis of a future hierarchical classification (or 'taxonomy'). Describing behaviour change intervention content by a systematically produced, reliable nomenclature will strengthen the following:

1. Knowledge base: Published reports of intervention studies will be able to provide more detail on the BCTs, making effective interventions easier to replicate in primary research. They will also be able to specify 'standard care', thus ensuring that evaluated interventions are actually different from standard care comparator conditions. Systematic reviewers will be able to use a reliable method for extracting information about intervention content, thus identifying and synthesising discrete, replicable, potentially active ingredients associated with effectiveness. A shared language has allowed us and other reviewers to use an early version of a technique nomenclature to synthesise heterogeneous interventions and use meta-regression to determine which component BCTs are effective [8,9,15,18,19]. For example, a systematic review of 122 evaluations of interventions to increase physical activity and healthy eating [7] found that the technique 'self-monitoring' explained the greatest amount of among-study heterogeneity (13%). Interventions that combined self-monitoring with at least one other theoretically derived technique were significantly more effective than the other interventions (pooled effect sizes of 0.42 vs. 0.26, respectively). Another example of a study using this method reanalysed a Cochrane review of audit and feedback interventions and allowed the investigation of the separate effects of goal setting, monitoring, and action plans [20].

2. Evaluation and implementation: In RCTs evaluating behaviour change interventions, effect sizes will be interpretable in the context of clear specification of both intervention and control groups. Intervention developers will be able to use a comprehensive list of BCTs (rather than relying on the limited set they are aware of) to produce guidelines about how to operationalise the BCTs in protocols for implementation.

## Development of a preliminary list of BCTs

As a first stage, we have reliably identified a set of 26 BCTs from 195 published descriptions of behaviour change interventions to increase physical activity and healthy eating [15], demonstrating the feasibility of a method for developing standardised labels and definitions of BCTs included in complex interventions and specifying behaviour change interventions in terms of a defined list of BCTs. We subsequently extended this list to a wider range of behaviours, drawing on systematic reviews [21] and an analysis of relevant textbooks, reliably identifying 54 BCTs [5]. Further work is needed to extend the list to a wider range of types of behaviour and to improve the definitions of approximately 50 additional BCTs that were poorly specified (some similar BCTs were referred to by a variety of labels, and some labels were unclear or overlapping). More recently, we, and others, have extended the list to techniques designed to change other behaviours (e.g., smoking) and populations (e.g., obese patients) [18,19]. At this stage, we are limiting the project to behaviour change interventions targeting individual behaviours because of the time and resources required, while recognising the need to extend this to other types of complex interventions that target different levels of healthcare systems [22].

## Anticipating uptake

Few systematic reviews of behaviour change interventions use nomenclature systems [21,23,24]. Our preliminary BCT list, developed and evaluated using systematic methods to assess interrater reliability, has been widely used internationally, within a short period of its publication (2008), to report interventions [17], synthesise evidence [9,18,19], and design interventions [25]. Subsequently, we were invited to write journal editorials that have influenced editorial policy, requiring specification of complex intervention components to be based on reliable methods (e.g., in *Addiction* and *Implementation Science*), and a group of 12 international journal editors have built on this to widen the call for developing reporting methods, forming the Workgroup for Intervention Development and Evaluation Research (WIDER, [http://interventiondesign.co.uk/?page\\_id=9](http://interventiondesign.co.uk/?page_id=9) [webcite](#)). This evidence of uptake supports the need for, and usability of, a nomenclature system.

Given the impact of our initial work, it is important to extend, consolidate, and enhance the generalisability of this method by building a wider, international consensus and disseminating and evaluating the nomenclature.

## Aims

Our goals for this project are as follows:

1. To develop a reliable and generalisable nomenclature of BCTs as a method for specifying, evaluating, and implementing complex behaviour change interventions
2. To lay a foundation for
  - a. a comprehensive methodology that can be applied to many different types of complex interventions, including organisational and community interventions
  - b. a fully developed, hierarchically organised taxonomy of BCTs
3. To achieve multidisciplinary and international acceptance and use to allow for its continuous development

## Objectives

Our objectives for this project are as follows:

1. Development: Generate an extensive list of clearly labeled, defined, nonredundant BCTs as the basis of the nomenclature (phase 1).
2. Evaluation: Test the reliability and usability of the preliminary nomenclature across different behaviours and populations (phase 2).
3. Prototype nomenclature: Produce a nomenclature with definitions and guidance on its use, evidence of consensus, evidence of reliability, and usability of each BCT, illustrated with examples from effective interventions (phase 3).
4. Implementation and dissemination: Make the nomenclature and its method of development widely accessible through a systematic dissemination plan (cross-phase).

## Methods

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### Phase 1: addressing objective 1: consensus development

#### Phase 1a: recruiting experts and leaders (two months)

We have had an extremely positive response to our invitations to participate: 20 US, European, and UK multidisciplinary experts and six research centers, comprising about 30 experts, are motivated to work with us in

developing the nomenclature. We have identified a further 20 leaders in the field of interventions; since we need a total of 74, we will also 'snowball' via our collaborators and research and professional networks. Experts include members of the US National Institutes of Health's Behaviour Change [26] and Health Maintenance Consortia (<http://hmcrc.srph.tamhsc.edu/default.html> [webcite](#); accessed 25.6.09).

## Phase 1b: developing the nomenclature: clarifying and refining the list using a Delphi survey of expert users (eight months)

### Objective

Our objective for this phase was to refine and clarify the preliminary list of 54 BCTs [5] and develop the nomenclature.

### Participants

Participants will comprise expert users, including researchers who design and evaluate complex behaviour change interventions, and practitioners who apply the BCTs. Whilst for this method a (homogeneous) panel size of 12 optimises efficiency and reliability [27], we will allow a slightly larger group to ensure representation of a range of disciplinary perspectives. We will also allow for an increase in the number of people surveyed at subsequent stages of the survey as appropriate.

### Method

The Delphi method [28], a consensus development method that uses two-way, iterative information exchange, will be used. The study material will be prepared by the project researcher, who will agree with the investigators on initial working definitions for the 54 BCTs reliably extracted from textbooks. We will ask panellists to read the list, identify redundancy in the behaviour change techniques, clarify any remaining techniques that are unclear as far as possible by redefinition or adding or subtracting components, and identify any omitted BCTs. We will then present panellists with the refined list of techniques, with each technique having its key definitional attributes highlighted. In a formal questionnaire survey, we will ask them to rate (on a 1 to 9 scale) the following: (a) for each highlighted attribute within each technique, whether it is necessary; (b) whether there are any attributes that are missing, and if so, what they are; (c) for each overall technique as a whole, whether it is clear, precise, and distinct; (d) if their answers to (c) are ratings of 6 or lower, they will be asked whether their scores on (a) and (b) explain their low score on (c). This will allow us to amend technique definitions. Any technique that is rated by the panel as being appropriately defined, having no missing attributes, and being clear, precise, and distinct (as judged by ratings of 7 or more) will be judged to be defined. The remaining techniques will be elaborated on and/or refined in response to the first round of scoring and will then be sent to the panel again, with the same questions asked. BCTs that are still not viewed as being defined adequately after this second round will be examined to ascertain whether a further round is likely to generate a consensual definition. Techniques with scores from 4 to 9 may be subject to a further round. BCTs that attract a wide range of ratings (particularly in the 1 to 6 range), with no obvious agreement, will be regarded as indefinable. We estimate that this task will take each expert two hours for the first round and one hour for subsequent rounds.

### Analyses

The ratings will allow the key definitional characteristics of each technique to be identified. Group scores of the ratings for clarity, precision, and distinctiveness and indices of spread will be calculated. The investigators will complete further work on poorly understood or poorly defined BCTs to split them into component parts, reliable them, or reject them as indefinable.

### Product

The result of this analysis will be a refined list of distinct, clearly and precisely defined BCTs (*e.g.*, 'graded task' might be defined as '1. set easy tasks to perform; 2. set increasingly difficult tasks; 3. until target behaviour is performed'). On the basis of redundancy and overlap in preliminary searches, we anticipate that fewer than 90 BCTs will be defined through this process.

## Phase 2: addressing objective 2: evaluating the nomenclature

## Phase 2a: nomenclature training resource materials (six months)

Using the results of phase 1, we will prepare the materials needed for phase 2, a preliminary nomenclature manual that includes the list of labels and definitions, and develop the instructions for phases 2b and 2c and training videos for phase 2c.

## Phase 2b: decoding/interpreting behaviour change intervention protocols (four months)

This phase will generate empirical data to examine whether the list of BCTs leads to reliable identification of BCTs that can be generalised to a range of behaviours and populations.

## Research questions

1. Do researchers agree about BCTs used in published descriptions of behaviour change interventions?
2. Are these judgments reliable over time?
3. Are the proposed labels and definitions acceptable to research users?

## Participants

Participants will be 48 expert coders (half systematic reviewers, half primary researchers), each coding 20 protocols.

## Materials

We will use 40 published behaviour change intervention protocols (to allow a range of interventions sampled across health, illness, and healthcare). We will sample protocols from journals that meet the criteria of being interdisciplinary, high profile, including interventions targeting three groups (people who are healthy, ill, and health professionals), and targeting a broad range of behaviours. We propose to include protocols published between 2006 and 2008: *BMC Public Health* (51 protocols published between 2006 and 2008), *BMC Health Services Research* (33 protocols published between 2006 and 2008), *Implementation Science* (33 protocols published between 2006 and 2008), plus protocols from studies published in the *Annals of Behavioral Medicine* and the *British Medical Journal*.

## Procedure

Coders will be trained to use the nomenclature and be contacted to discuss any questions raised by it. For each of 40 interventions, each coder will indicate where a technique was used, which technique was used, and rate their confidence that it was used correctly. Coders will be asked to return all materials; one month later, they will be asked to repeat the coding task for the same intervention protocols (this will involve each expert for up to two days). There will be 12 randomly allocated pairs of coders, so that each protocol will be separately coded by 24 researchers, giving 12 sets of interrater reliability statistics for each of 40 protocols. The 480 reliability data points (12 pairs × 40 protocols) generated are sufficient to assess reliability with a 0.2 confidence interval[29].

## Analyses

For each protocol, we will establish whether the two experts agree on which BCTs have been used and whether each expert identifies the same BCTs at a second time point. Agreement will be measured by a series of kappa statistics to assess interrater reliability of technique identification at time 1 and at time 2 and within-rater test-retest reliability (<http://www.psychassessment.com.au/webcite> [accessed 5.5.08]). The sample size needed was calculated using the goodness-of-fit approach for sample size estimation [29]. For a null hypothesis of a kappa of 0.6 (*i.e.*, substantial agreement using the Landis and Koch classification [30]) versus an alternative hypothesis of kappa not equal to 0.6, a probability of rating success of 0.1, alpha = 0.05, power = 0.80, the required sample size was calculated to be 51. We will examine reliability ranges across type of coder (primary researcher, systematic reviewer) and type of protocol (target population, behaviour, length, etc.), using intraclass correlations (ICCs). No data are available to allow the calculation of an ICC for coders. However, we anticipate that the impact of clustering, if present, will be small. We will calculate an ICC on the data that we gather in order to inform the interpretation of the data.

## Acceptability/usability of the methodology

The experts will rate their experience of using the nomenclature to interpret behaviour change interventions (time taken, level of difficulty, and specific problems encountered) and will use rating scales to rate their attitude towards,



confidence in, and intention to use the nomenclature. They will be asked to identify BCT definitions that remain unclear. This information will be used to clarify and refine the presentation and definitions of the nomenclature. Any ambiguities reported by the experts will inform the rewording of the technique descriptions to enhance clarity.

## Phase 2c: encoding/writing behaviour change intervention protocols (six months)

### Research questions

1. Does using the nomenclature lead to clearer, more replicable protocols?
2. Do experts independently rate the intervention to be the same when different people write the protocol?
3. Is the nomenclature acceptable to users?

### Materials

We will use three videos showing sections of behaviour change interventions, with two people (practitioner and participant) role-playing a range of BCTs.

### Participants

Twenty-six expert intervention designers that were not involved in phase 2b will participate: 20 will write, and 6 will rate intervention protocols (estimated time per expert: one day).

### Procedures

The 20 writers will be randomly allocated to use the nomenclature ( $n = 10$ ) or not ( $n = 10$ ) and will each be presented with videos of three interventions incorporating a range of BCTs. They will be asked to write a description of each intervention's content in such a way that the intervention could be understood and replicated by others, resulting in 60 descriptions (20 for each intervention). The six raters will each receive a random sample of 20 of the 60 descriptions and be asked to sort them into groups that describe the same intervention using Q sort (this method enables one to detect shared ways of thinking and is especially suited where items are complex and partially overlapping) [31]. Raters will also judge each intervention description on rating scales measuring (a) ease of understanding, (b) adequacy of information required to undertake a replication, and (c) ease of identification of discrete BCTs. Acceptability will be evaluated as in phase 2b.

### Analysis

Analyses of variance will be used for each of the three rating scale outcomes to identify whether (as predicted) availability of the nomenclature leads to better-written intervention descriptions. The Q-sort data will be analysed to ascertain whether there is greater agreement about the similarity of different descriptions of the same intervention in the nomenclature group than in the non-nomenclature group. One hundred and twenty data points (20 writers  $\times$  three videos  $\times$  two raters) are adequate for analysis: For analysis of variance, the required number of data points for nomenclature versus no nomenclature and two replications (each protocol is judged by two raters) is 90 for a between-rater correlation = 0.4 (or  $N = 116$  for correlation = 0.8) and power = 0.8, with alpha = 0.05 and medium effect size = 0.25. For Q-sort methods, five raters would give reliability = 0.83, assuming correlation between raters of 0.5 [32].

## Phase 3: addressing objective 3: prototype nomenclature (two months)

The outputs of phase 2 will be used to select the BCTs with demonstrable reliability (our preliminary work showed > 90% BCTs were reliable) for both identifying and reporting behaviour change interventions. We will produce a manual including the nomenclature with definitions and guidance on its use, evidence of consensus, evidence of reliability, and usability of each BCT, illustrated with examples from effective interventions. Members of the team have developed this type of manual, with different content, for researchers to use (see <http://www.rebeqi.orgwebcite>). This previous manual was disseminated using some of the strategies described below under 'Dissemination and Implementation' and has subsequently been downloaded from the host website over 25,000 times since 1 January 2006.

## **Cross-phase stream: addressing objective 4: dissemination and implementation of the prototype nomenclature (eight months over the whole three years of the study)**

Our goal is to maximise awareness, understanding, and use of the nomenclature in the development, evidence synthesis, and reporting of complex interventions. This will be achieved by disseminating evidence about the benefits of the nomenclature and how to use it, promoting change in current practice, and developing the nomenclature further.

### **Stakeholders**

Within the first year, we will convene a meeting/teleconference with representatives from all stakeholders to optimise our implementation and dissemination strategy and build alliances with key initiatives to raise the profile of the nomenclature (*e.g.*, US Society of Behavioral Medicine's Evidence Based Medicine initiative).

### **International advisory group**

We will establish an international advisory group to provide input and advice at key points over the three years of the study. Members will be leading experts in researching behaviour change methods.

### **Publications**

Throughout the study, we will increase awareness about the nomenclature and its benefits to researchers, practitioners, policy makers, academic and professional bodies, funders, and journal editors through conference presentations, editorials, and peer-reviewed publications in academic and professional journals and *MRC Network*. We will also provide updates to stakeholders after each phase.

### **Resources**

We will increase understanding and use of the nomenclature among scientists, intervention designers, and practitioners by providing (a) a web-based handbook and resources for skills training (*e.g.*, video recordings of simulated interventions) and (b) training and engagement workshops providing supervised experience and recruiting through charities (*e.g.*, Cancer Research UK, British Heart Foundation), academic bodies (*e.g.*, UK Society for Behavioural Medicine), professional bodies (*e.g.*, Royal College of General Practitioners), and the National Institute for Health and Clinical Excellence's Centre for Public Health Excellence.

### **Networking**

We will promote action by funders and journal editors through our personal, professional and scientific networks (*e.g.*, WIDER).

### **Wiki**

We will promote further development of the nomenclature by upgrading and disseminating relevant evidence and asking the wider complex-interventions scientific community to provide feedback on their experiences of using it on an interactive web-based platform (Wiki) that allows on-going iterative development by user feedback and interaction.

We have already begun working with journal editors to change editorial policy (*e.g.*, *Implementation Science* and *Addiction*) so that detailed specification of intervention content is required for publication [33-36].

We have started the development of a Wiki of BCTs to provide a web-based interactive resource to facilitate future collaboration and consensus development in refining the tools beyond the life of the proposed research. A pilot doctoral project has engaged 21 participants, providing very useful and relevant data (see [interventiondesign.eu](http://interventiondesign.eu)).

### **Ethics and research governance**

The conduct of the study will conform to relevant ethical and legal guidelines covering consent, confidentiality, and the storage of data. Ethics approval was obtained from University College London (Number: CEHP/2010A/005).



## Data preservation for sharing

All data will be preserved and its availability for use by other research teams will be publicised via the website resource and as part of our dissemination work. The data will be suitable for further analysis both in primary research and in meta-analyses. The data will be prepared to allow independent usage. We will institute an automatic registration system to track usage of the database.

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# Entry to Encyclopaedia of Behavioral Medicine

Michie, S. & Johnson, M. (2013). Behaviour Change Techniques. In MD Gellman & J Rick Turner, *Encyclopaedia of Behavioral Medicine* (pp 182-187). New York: Springer.

## What is a behaviour change technique?

A behaviour change technique is a systematic procedure included as an active component of an intervention designed to change behaviour.

The defining characteristics of a BCT [1] are that it is:

- Observable
- Replicable
- Irreducible
- a component of an intervention designed to change behaviour<sup>1</sup>
- a postulated active ingredient within the intervention.

It is thus the smallest component compatible with retaining the postulated active ingredients, i.e. the proposed mechanisms of change, and can be used alone or in combination with other BCTs. A BCT should be well-specified so that effectiveness of the BCT can be evaluated (e.g. in randomised controlled trials, in factorial experimental designs [3] or N-of-1 studies. However, the evidence base for effectiveness may or may not have been established. Examples of BCTs are: '*Prompts/cues*', '*Information about health consequences*', '*Incentive*', '*Goal setting*', '*Self-monitoring*', '*Action planning*', '*Behavioral rehearsal/practice*', '*Graded tasks*', '*Social support/encouragement*', '*Persuasive communication*' and '*Habit formation*'.

BCTs specify the minimum content of *what* must be delivered, that is, minimum content that would allow identification of that technique (e.g., feedback must involve providing the target audience with information about their specific behaviour). A BCT does not specify the *how* i.e. the mode of delivery and it is possible for a given BCT to be delivered in many different ways. For example feedback may be delivered by letter or face-to-face, to groups or to an individual, on one occasion or frequently, by a therapist or by an automatic electronic message.

## E. Description

For full specification of a behaviour change intervention both the active content i.e. the BCTs, and the mode of delivery need to be described [4]. Behaviour change interventions include one or more BCTs. Some well-recognised behaviour change interventions contain reliable combinations of BCTs, e.g. relapse prevention includes both '*problem solving*' and '*action planning*'. Whereas more general labels may contain variable combinations of BCTs e.g. the content of 'cognitive behaviour therapy' are very variable [5].

Behaviour change interventions may influence behaviour in several ways: behaviour can be initiated or terminated; or increased or decreased in frequency, duration or intensity. For most behaviour, there is variation between people and

<sup>1</sup> A definition of behaviour, agreed across disciplines of psychology, sociology, anthropology and economics, is "Anything a person does in response to internal or external events. Actions may be overt (motor or verbal) and directly measurable, or covert (activities not viewable e.g. physiological responses) and indirectly measurable; behaviours are physical events that occur in the body and are controlled by the brain" [2]. This was arrived at via a Delphi exercise of 14 members of a multidisciplinary advisory group, starting with a shortlist of definitions of behaviour was compiled through library catalogue searching and using key reference sources such as the *American Psychological Association Dictionary* and the *Oxford Concise Dictionary of Sociology*. The definition was synthesised from constructs that were included in at least 50% of the definitions reaching an agreed threshold of perceived usefulness.

within individuals over time in all of these dimensions, influenced by environmental, social, cognitive and emotional variables. Studies of how behaviour varies within and between people have led to an understanding of how to use external factors to modify behaviour. Technologies of behaviour change have been developed within disciplines of applied psychology (e.g. clinical, educational) and adopted and extended in a wide variety of intervention functions and policies, such as commercial advertising and social marketing [6]. These technologies are made up of individual BCTs.

## Why are behaviour change techniques important?

The importance of behaviour change in improving health is illustrated by the increasing evidence that behaviour influences health outcomes and increasing investment by funding governments and scientific bodies in the development and evaluation of interventions to change population, patient, and practitioner behaviours. An example is the US National Institute of Health's Office of Behavioral and Social Sciences Research (OBSSR) which was founded in 1995 with a budget of \$27 million a year, in recognition of the key role that behavioural and social factors often play in illness and health.

Interventions to change behaviour are typically complex, involving many interacting components [7]. BCTs are the active ingredients of these interventions but are often poorly described in research protocols and published reports [8]. Components may be described in terms that are vague, general and/or ambiguous and with labels e.g. 'behavioural counselling', that can mean different things to different researchers or practitioners, thus acting as a barrier to replication, the essential cornerstone for scientific progress. In contrast, biomedical interventions are precisely specified (e.g., the pharmacological 'ingredients' of prescribed drugs, their dose and frequency of administration).

This lack of precision and lack of consensually agreed terms lead to problems in replication in primary research, in evidence synthesis in systematic reviews and in implementation in practical applications. It also undermines the task of establishing which are effective in changing behaviour and understanding the causal mechanisms underlying behaviour change. If intervention descriptions are idiosyncratic or ambiguous, and cannot therefore be interpreted reliably, then it is impossible to aggregate the evidence to ascertain their effectiveness. Additionally, there is no value in evaluating an intervention if one can't accurately identify and describe what is being evaluated and how competently it was delivered; it would be impossible to implement if shown to be effective. The absence of an internationally agreed method to specify and report the content of behaviour change interventions hampers the development of effective interventions.

Although the CONSORT statement for randomised trials of 'non-pharmacologic' interventions calls for precise details of interventions in research, including a description of the different intervention components [9], it gives no guidance as to what details. The UK Medical Research Council's guidance [7] for developing and evaluating complex interventions acknowledges this problem and also the problem of lack of consistency and consensus in use of terminology [10].

## The development of a method of specifying BCTs

These problems have been addressed by the development of systematically generated and applied collections or "taxonomies" of BCTs. These have been constructed by identifying BCTs within written reports of the interventions, or texts describing interventions, in a bottom-up, inductive fashion and, to date, their hierarchical structures have not been established. They have been developed in relation to different behaviour types: physical activity and healthy eating [11-12], smoking [13-14], excessive alcohol use [15], and condom use [16].

Using such taxonomies with standardised labels and definitions will improve current practice by ensuring that, when the taxonomy is used, a technique is always described by the same label and that a label is always used for the same technique. In current practice, the same component techniques within behavioural interventions may be described in protocols and published reports with different labels (e.g., 'self-monitoring' may be labelled 'daily diaries'). Conversely, the same labels may be applied to different techniques (e.g., 'behavioural counselling' may involve 'educating patients' or 'feedback, self-monitoring, and reinforcement'.

Specifying interventions by BCTs allows multivariate statistical analysis to identify specific BCTs associated with effective interventions, the “active ingredients”. Heterogeneous, complex interventions have been synthesised to identify effective component BCTs in systematic reviews using the statistical technique of meta-regression. This has been conducted for physical activity and healthy eating [17-18], smoking cessation [19] and HIV prevention behaviours [20-22]. “Active ingredients” have also been identified in the English Stop Smoking Services by analysing protocols for behavioural support for smoking cessation in terms of BCTs and investigating associations with a national database of carbon monoxide verified quit rates [23].

Since the first taxonomy with demonstrated reliability was published in 2008 [11], this method has been widely used internationally, for example, to specify interventions [24], synthesise evidence (see above), and design interventions [25]. However further development is necessary for maximal usefulness. The number of BCTs included, the BCTs relevant for changing a wider range of behaviours, the precise and unambiguous specification of each BCT, the acceptability and feasibility of using the methods, as well as the need for a structure that goes beyond a list to develop a true taxonomy are required. Therefore, this work is being taken forward using consensus methods on an international basis [1, 26].

In addition to specifying the BCTs, it will be important to develop shared methods of reporting on both the methods of delivery [4] and the competence with which they are delivered. Frameworks for the specification of professional competences for the delivery of BCTs are being developed and have been used to advise national Governments [27] and as a basis for a national training programme [28].

## The benefits of the BCT approach

1. **Developing behaviour change interventions:** intervention developers will be able to use a comprehensive list of BCTs (rather than relying on the limited set they are aware of) to design interventions and will be able to report the intervention content in well-defined and detailed ways.
2. **Reporting interventions:** specifying intervention content by BCT will facilitate the accurate, replicable description of behaviour change interventions. Both intervention and control conditions can be specified using BCTs in randomised controlled trials.
3. **Implementing effective interventions in practice:** BCT specification will facilitate faithful implementation of interventions found to be effective.
4. **Replicating interventions and control conditions:** specifying interventions by BCTs will help the replication of both intervention and control conditions
5. **Synthesising evidence:** systematic reviewers will be able to use a reliable method for extracting information about intervention content, thus identifying and synthesizing discrete, replicable, potentially active ingredients associated with effectiveness.
6. **Linking to theory:** linking BCTs with theories of behaviour change allows reviewers to investigate possible mechanisms of action [8, 17].
7. **Accumulating scientific knowledge about behaviour change:** a shared terminology for specifying behaviour change interventions allows the more efficient accumulation of knowledge and investigations of generalisation across behaviours, populations and settings

## Advancing the science of behaviour change

A well-developed system of defining and labelling BCTs would allow the science of behaviour change to accumulate evidence and advance theory of behaviour change. The BCT approach is already providing a method for doing this. Early versions of BCT taxonomies, have allowed reviewers to synthesise heterogeneous interventions to identify effective component BCTs. Evaluation of the effectiveness of combinations of BCTs can help test theories of behaviour change. So for example, finding that interventions with a combination of self-monitoring and feedback were effective is supportive of the mechanisms of change proposed by Carver & Scheier’s Control Theory [29]. Further evidence is needed to develop theory. If we are to better understand both the effects and processes of behaviour change interventions, we need to develop a method to link BCTs to mechanisms of action.

For these methods to maximise scientific advance, a shared system for describing behaviour change interventions is necessary and this will require collaborative work to develop agreed labels and definitions and reliable procedures for their application across disciplines and countries. Even the ‘best’ taxonomy is inevitably a work-in-progress as new BCTs are likely to continue to emerge from on-going research and practice, in the same way that the labelling of peptides and botanical taxonomies continue to be developed.

## Acknowledgments

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## G. References and Further Reading

Suggestions for further reading have been asterisked.

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## General coding instructions: Preliminary steps

1. Familiarise yourself with BCTs (*e.g., read labels, definitions and examples*).
2. Read and re-read BCT definitions as many times as needed i.e. so you have a good understanding of what must be specified in the intervention description in order for the BCT to be coded
3. Read the entire intervention description before coding; re-read as many times as needed i.e. so you understand which behaviour / population the intervention targeted
4. Assess how certain you are of the identification of the BCT. Some behaviour-change descriptions are poor so you may not always be sure about your identification. Record how certain you are for each BCT identification, noting whether you think the BCT is probably present (with a “+” symbol) or definitely present (“++”).

+ BCT present in all probability

++ BCT present beyond all reasonable doubt

*An illustration using the BCT: ‘Demonstration of the behaviour’:*

“The presenter also demonstrated the proper way to put a condom on a partner by using a penile model”

**[BCT: Demonstration of the behaviour ++]**

In the text above, the coder has begun to identify BCTs in the intervention description and has started with the BCT ‘**Demonstration of the behaviour**’. (S)he has identified a phrase reporting demonstration of how to use a condom and has recorded an identification of this BCT. Since this is a clear instance of demonstration of the behaviour ‘condom use’ the identification has been rated present beyond all reasonable doubt, clear evidence available (++).

5. Only identify a BCT once in any intervention description but base your confidence rating of BCT inclusion on your reading of the overall description. We are not asking you to judge the frequency or intensity of use of BCTs. You need only identify whether (or not) each BCT was included. There is no need to count references to BCTs.

If a behaviour-specific BCT is mentioned again after you initially identify it, this may make you more certain of your identification. You should, therefore, reassess your certainty of identification of this BCT (e.g., you might change a “+” rating to a “++”).

*An illustration using the BCT: ‘Self-monitoring of behaviour’:*

You might judge that ‘participants recorded their food intake’ to be evidence that the BCT ‘**Self-monitoring of behaviour**’ was **probably** used to promote exercise in this intervention. If, you then read that,

'participants were asked to record and review the food diary that they had been prompted to complete by the end of each week', this second reference may make you **more certain (++)** of your initial identification  
[BCT: Self-monitoring ++]

*Identifying the behaviour to which a BCT is applied*

In the example above '**Self-monitoring of behaviour**' is applied to **eating** behaviour. Some interventions target more than one behaviour. For example, a weight loss intervention may use '**Self-monitoring of behaviour**' in relation to both eating and physical activity.

In the coding exercises, **we will specify a particular target behaviour** in which we are interested. You will be asked to identify only BCTs applied the target behaviour and you need only identify each BCT applied once. You will not be asked to identify different behaviours to which BCTs are applied.

## 6. BCTs are relevant to behaviours at both **individual** and **group** levels

*An Illustration using the BCT: 'Social comparison':*

In the text below, the first example targets behaviour change at the individual level whereas the second example targets behaviour change at a group level. Both are examples of the same BCT.

Example 1. "Individual medical practitioners compared their number of patient referrals with the number made by their colleagues" [BCT: Social comparison ++]

Example 2. "The number of referrals made by the health practice was compared with that of other health practices locally" [BCT: Social comparison ++]

## 7. There may be multiple BCTs in a sentence. Any particular BCT may only be identifiable by several sentences in a narrative description.

*An illustration using the BCTs: 'Behavioural practice/rehearsal' and 'Social comparison':*

In the sentence reported below, the BCTs '**Behavioural practice/rehearsal**' and '**Social comparison**' are both present:

"Participants were asked to practice and compare their stretching techniques" [BCT: Social comparison ++  
AND BCT: Behavioural practice / rehearsal ++]

In the text below, the BCT '**Social comparison**' is described using two sentences. Initially "group classes" are referred to. However, our definition of "social comparison" requires a more explicit description of this BCT. So, it is not until one reads that "class facilitators directed participants to watch an expert model during class exercises" that one can certainly identify this BCT. Both sentences are required for BCT identification.

Group classes were used to teach exercise routines. Class facilitators directed participants to watch an expert model during exercises [BCT: Social comparison ++]