Development of a taxonomy of behaviour change techniques used in individual behavioural support for smoking cessation

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ABSTRACT

Objective: Individual behavioural support for smoking cessation is effective but little is known about the 'active ingredients'. As a first step to establishing this, it is essential to have a consistent terminology for specifying intervention content. This study aimed to develop for the first time a reliable taxonomy of behaviour change techniques (BCTs) used within individual behavioural support for smoking cessation.
Method: Two source documents describing recommended practice were identified and analysed by two coders into component BCTs. The resulting taxonomy of BCTs was applied to 43 treatment manuals obtained from the English Stop Smoking Services (SSSs). In the first 28 of these, pairs of coders applied the taxonomy independently and inter-coder reliability was assessed. The BCTs were also categorised by two coders according to their main function and inter-coder reliability for this was assessed.
Results: Forty-three BCTs were identified which could be classified into four functions: 1) directly addressing motivation e.g. providing rewards contingent on abstinence, 2) maximising self-regulatory capacity or skills e.g. facilitating barrier identification and problem solving, 3) promoting adjuvant activities e.g. advising on stop-smoking medication, and 4) supporting other BCTs e.g. building general rapport. Percentage agreement in identifying BCTs and of categorising BCTs into their functions ranged from 86% to 95% and discrepancies were readily resolved through discussion.
Conclusion: It is possible to develop a reliable taxonomy of BCTs used in behavioural support for smoking cessation which can provide a starting point for investigating the association between intervention content and outcome and can form a basis for determining competences required to undertake the role of stop smoking specialist.

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1. Introduction

Treatment to aid smoking cessation, involving a combination of 'behavioural support' and medication, is available in many countries (Raw, McNeill, & Murray, 2010) and has been found in randomised controlled trials to be both effective and cost-effective (US Department of Health and Human Services, 2008; West, McNeill, & Raw, 2000). Behavioural support takes the form of advice, discussion, encouragement and activities designed to help quit attempts to succeed. Unfortunately there has been no evidence of improvements in effectiveness of behavioural support over the past 20 years (Lancaster & Stead, 2005; Stead & Lancaster, 2005). A major barrier to progress has been a lack of a systematic system for labelling the specific behaviour change techniques (BCTs) in the packages that have been evaluated and so no way of establishing which BCTs are most effective. This study attempted for the first time to develop a

taxonomy of BCTs used in behavioural support for smoking cessation that could be reliably applied to treatment manuals. This would provide the first step in determining which components of behaviour support packages are most effective singly or in combination and ultimately to the development of more effective interventions.

Guidance documents for reporting intervention trials (for example, CONSORT (Moher, Schulz, & Altman, 2001) and TREND statements (Des Jarlais, Lyles, & Crepaz, 2004)) call for details of interventions to be given; however, there is no consensus about what details, or how these should be expressed. The importance of using a reliable method with standardised language and detailed BCT descriptions to specify, design and evaluate behavioural interventions has been highlighted by the recent UK Medical Research Council guidance for developing and evaluating complex interventions (Craig et al., 2008).

The lack of a reliable taxonomy of BCTs for smoking cessation is not just hampering advances in treatment; it is also a barrier to effective delivery of behavioural support in practice. Without it, we do not have a basis for specifying what stop smoking practitioners should be doing in their sessions with clients. This means that we do not know what to

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include in clinical treatment manuals nor do we have a sound basis for specifying the competences required by stop smoking practitioners. This is increasingly an issue as behavioural support for smoking cessation is becoming more widely available worldwide. In the UK, the behavioural support element of the treatment is free, open to all and usually delivered in a series of weekly individual or group sessions (McNeill, Raw, Whybrow, & Bailey, 2005) (Raw, Regan, Rigotti, & McNeill, 2009a, b). There are some 600,000 quit attempts recorded using the English Stop Smoking Services (SSSs) and reported success rates are broadly in line with what would be expected from randomised controlled trials (NHS, 2008). However, there is considerable variability in success rates (NHS, 2008) and it is not known what behaviour change techniques (BCTs) are used by the SSSs or which are most effective in helping smokers to stop. The same would be expected to be true for other stop smoking treatment programmes in other countries though data are not generally available.

Taxonomies of BCTs have been developed for health interventions other than smoking cessation. For example, Hardeman, Griffin, Johnston, Kinmonth, and Wareham (2000) identified 19 BCTs from interventions designed to prevent weight gain, such as, "self monitoring", "using graded tasks" and "use of prompts or cues". Inoue et al. (2003) described the content of interventions to increase physical activity in terms of specific BCTs such as "goal setting", "discussing benefits, costs and barriers", and "positive self talk". Similarly, Conn, Valentine, and Cooper (2002) identified 20 specific BCTs, such as "relapse prevention", "self monitoring", and "social support", in a meta-analysis of interventions designed to increase physical activity (Semaan et al., 2002). Albarracin et al. (2005) carried out a meta-analysis of 354 HIV-prevention interventions and reliably identified 10 distinct techniques, such as, "condom use skills training", "providing factual information", and "attitudinal arguments". A reliable and generalisable taxonomy of 26 distinct BCTs has been developed for interventions to increase physical activity and healthy eating, with detailed definitions and a manual to guide the identification of BCTs (Abraham & Michie, 2008). This taxonomy was used as the basis for the one developed in the present study.

It is likely that the taxonomy developed for diet and physical activity interventions would need to be supplemented by BCTs specific to smoking cessation. Guidance documents in this area refer to discussing clients' experiences including difficulties encountered, giving encouragement and support, carbon-monoxide (CO) monitoring, advising on techniques for coping with urges to smoke, and relapse prevention strategies (Raw, McNeill, & West, 1998)(US Department of Health and Human Services, 2008). Therefore, the new taxonomy should include such elements, albeit described in consistent and specific terms.

It is important to have a coherent theoretical basis for any BCT taxonomy. We decided to use the PRIME Theory of motivation for this purpose because it appears to be the only one that accommodates in a single model the different contributions to behaviour made by direct stimulus–impulse associations, drive states, past experiences of pleasure and relief from discomfort, beliefs about what is good or bad, self-conscious intentions and how these arise from associative learning, exposure to social and other cues, communication and identity: all of these seeming to be important in smoking behaviour and needing to be addressed in helping smokers to stop (West, 2009). Under this model, the goal of behavioural support is to change the balance of impulses and inhibitions by reducing impulses to smoke and increasing motivation and capacity to resist those impulses on all relevant occasions. This involves 1) minimising motivation to smoke, for example by challenging beliefs about the benefits of smoking, 2) maximising motivation not to smoke, for example by keeping the reasons for stopping salient, 3) maximising skills and capacity for self-control, for example by avoiding tempting situations and 4) optimising use of stop-smoking medications. This can be achieved in many different ways. These include: helping people to make appropriate plans; changing beliefs about what is good or bad; changing biological drivers of want or need to engage in the behaviour; and changing exposure to stimuli that trigger the impulse to engage in the behaviour. The empirical question to be addressed in this paper is whether such a functional higher order classification of BCTs can be reliably applied.

This study formed the first part of a programme of research carried out by England's National Centre for Smoking Cessation and Training (NCSCT), the goal of which is to establish what constitutes best practice in treatment to aid smoking cessation and the competences required of stop smoking specialists, and to develop and implement assessment and training to ensure that all specialists possess those competences (see www.ncsct.co.uk).

2. Method

Ethical approval was given by University College London Psychology Department Ethics Committee: BSC/2008/9/009.

As a starting point, two key source documents were identified by the authors which it was expected would encompass most if not all the main BCTs that would be likely to be used (McEwen, 2008; McEwen, Hajek, McRobbie, & West, 2006). These were analysed by coders (NH and AW) in terms of component BCTs. BCTs were defined as "any explicit description of intervention content that can alter a participants' smoking behaviour" e.g. not including mode or style of delivery. BCTs varied in the extent to which they directly targeted the behaviour. The most direct were those that addressed motivation or self-regulatory capacity: the least direct addressed adjuvant activities or general aspects of the interaction. BCT identification was aided by a coding manual developed for other types of behavioural intervention (Abraham & Michie, 2008). Each sentence in the source documents was discussed by the coders and, where appropriate, given a BCT label. Detailed and specific definitions were formulated and a draft coding manual developed. The procedure and results were reviewed by the authors in consultation with colleagues who were experts in behaviour change and smoking cessation.

The resulting coding manual was used to code NHS SSS treatment manuals for individual behavioural support. They were obtained by contacting the 144 English SSSs. Ninety-eight SSSs responded (response rate = 68%), returning 43 usable manuals. The other 55 did not have treatment manuals that described session content. Four coders (two with no previous experience of the taxonomy) independently coded the manuals in waves of four at a time using the draft coding manual. The coders were assigned into three pairs with each pair coding the same set of manuals (see Table 2).

After each wave, inter-rater reliability for identifying the same BCTs from the same text in the manual was assessed, using percentage agreement. If one coder identified a BCT in a section of text, the coding from the other coder was examined. If this identified the same BCT,
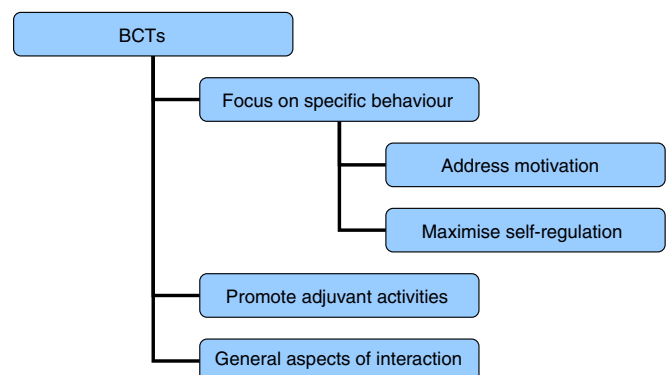

Fig. 1. Framework for classifying BCTs by function.

Table 1
The 44 behaviour change techniques categorised according to function.

BCT Code[a]	Label	Description
Specific focus on behaviour (B) and addressing motivation (M)		
BM1	Provide information on consequences of smoking and smoking cessation	Give, or make more salient, information about the harm caused by smoking and the benefits of stopping; distinguish between the harms from smoking and nicotine; debunk myths about low tar and own-roll cigarettes and cutting down
BM2	Boost motivation and self efficacy	Give encouragement and bolster confidence in ability to stop
BM3	Provide feedback on current behaviour	Give feedback arising from assessment of current self-reported or objectively monitored behaviour (e.g. expired-air CO) and/or progress towards becoming a permanent non-smoker
BM4	Provide rewards contingent on successfully stopping smoking	Give praise or other rewards if the person has not smoked
BM5	Provide normative information about others' behaviour and experiences	Give information about how the smoker's experience compares with other people's
BM6	Prompt commitment from the client there and then	Encourage the smoker to affirm or reaffirm a strong commitment to start, continue or restart the quit attempt
BM7	Provide rewards contingent on effort or progress	Give praise or other rewards for the effort the smoker is making and if the smoker has engaged in activities such as correct use of medication that aid cessation
BM8	Strengthen ex-smoker identity	Explain the importance of regarding smoking as something that is 'not an option', including the 'not a puff' (NAP) rule, encourage the smoker to re-evaluate the attraction to smoking, and construct a new identity as someone who 'used to smoke'
BM9	Identify reasons for wanting and not wanting to stop smoking	Help the smoker to arrive at a clear understanding of his or her feelings about stopping smoking, why it is important to stop and any conflicting motivations
BM10	Explain the importance of abrupt cessation	Explain why it is better to stop abruptly rather than cut down gradually if at all possible
BM11	Measure CO	Measure expired-air carbon monoxide concentration
Specific focus on behaviour (B) and maximising self-regulatory capacity/skills (S)		
BS1	Facilitate barrier identification and problem solving	Help the smoker to identify general barriers (e.g. susceptibility to stress) that might make it harder to stay off cigarettes and develop general ways of addressing these
BS2	Facilitate relapse prevention and coping	Help the smoker understand how lapses occur and how they lead to relapse and to develop specific strategies for preventing lapses or avoiding lapses turning into relapse
BS3	Facilitate action planning/develop treatment plan	Work with smoker to generate a clear quit plan including preparations for the quit attempt (e.g. obtaining medication)
BS4	Facilitate goal setting	Help the smoker to set a quit date and goals that support the aim of remaining abstinent
BS5	Prompt review of goals	Review how far the smoker has achieved the main goal of abstinence and any other goals that are supportive of it (e.g. putting in place plans to avoid triggers)
BS6	Prompt self-recording	Help the smoker to establish a routine of recording potentially useful information (e.g. situations or times when urges are strong and less strong)

Table 1 (*continued*)

BCT Code[a]	Label	Description
Specific focus on behaviour (B) and maximising self-regulatory capacity/skills (S)		
BS7	Advise on changing routine	Advise on ways of changing daily or weekly routines to minimise exposure to smoking cues
BS8	Advise on environmental restructuring	Advise on ways of changing the physical environment to minimise exposure to smoking cues (e.g. removing ashtrays from the house)
BS9	Set graded tasks	Set small achievable goals where appropriate (e.g. take one day at a time)
BS10	Advise on conserving mental resources	Advise on ways of minimising stress and other demands on mental resources (activities that require mental effort)
BS11	Advise on avoiding social cues for smoking	Give specific advice on how to avoid being exposed to social cues for smoking (e.g. explaining to friends that you have stopped)
Promote adjuvant activities (A)		
A1	Advise on stop-smoking medication	Explain the benefits of medication, safety, potential side effects, contra-indications, how to use them most effectively, and how to get them; advise on the most appropriate medication for the smoker and promote effective use
A2	Advise on/facilitate use of social support	Advise on or facilitate development of social support from friends, relatives, colleagues or 'buddies'
A3	Adopt appropriate local procedures to enable clients to obtain free medication	Enact the necessary procedures to ensure that the smoker gets his/her medication easily and without charge where appropriate
A4	Ask about experiences of stop smoking medication that the smoker is using	Assess usage, side effects and benefits experienced of medication(s) that the smoker is currently using
A5	Give options for additional and later support	Give information about options for additional support where these are available (e.g. websites, self-help groups, telephone helpline)
General aspects of the interaction (R) focusing on delivery of the intervention (D)		
RD1	Tailor interactions appropriately	Use relevant information from the client to tailor the behavioural support provided
RD2	Emphasise choice	Emphasise client choice within the bounds of evidence based practice
General aspects of the interaction (R) focusing on information gathering (I)		
RI1	Assess current and past smoking behaviour	Assess amount smoked, age when started, pattern of smoking behaviour
RI2	Assess current readiness and ability to quit	Assess current level of motivation to stop and confidence in success
RI3	Assess past history of quit attempts	Assess number and duration of past quit attempts and experiences related to these, including factors that led back to smoking
RI4	Assess withdrawal symptoms	Assess the presence and severity of nicotine withdrawal signs and symptoms
General aspects of the interaction (R) focusing on general communication (C)		
RC1	Build general rapport	Establish a positive, friendly and professional relationship with the smoker and foster a sense that the smoker's experiences are understood
RC2	Elicit and answer questions	Prompt questions from the smoker and answer clearly and accurately
RC3	Explain the purpose of CO monitoring	Explain to the smoker the reasons for measuring CO at different time points, e.g. before and after the quit date
RC4	Explain expectations regarding treatment programme	Explain to the smoker the treatment programme, what it involves, the active ingredients and what it requires of the smoker

Table 1 (continued)

BCT Code[a]	Label	Description
General aspects of the interaction (R) focusing on general communication (C)		
RC5	Offer/direct towards appropriate written materials	Distinguish what are, and are not, appropriate written materials and offer/direct clients to these in ways that promote their effective use
RC6	Provide information on withdrawal symptoms	Describe to smokers what are, and are not, nicotine withdrawal symptoms, how common they are, how long they typically last, what causes them and what can be done to alleviate them
RC7	Use reflective listening	Adopt a style of interaction that involves listening carefully to the smoker and where appropriate reflecting back to the smoker key elements of what s/he is saying
RC8	Elicit client views	Prompt the client to give views on smoking, smoking cessation and any aspects of the behavioural support programme
RC9	Summarise information/confirm client decisions	Provide a summary of information exchanged and establish a clear confirmation of decisions made and commitments entered into
RC10	Provide reassurance	Give general reassurance to the smoker that his/her experiences are normal and time limited, and provide positive expectations of success based on experience with other smokers in the same situation

[a] BCT code is based on a function that the BCT performs; B focuses specifically on behaviour change, A focuses on promoting adjunctive activity, R relates to general aspects of the interaction, M focuses on addressing motivation, S focuses on maximising self-regulatory capacity or skills, D refers to development of intervention, I refers to information gathering, and C refers to general communication.

the agreement was registered. If no BCT was identified or a different BCT was identified, disagreement was registered. In addition, for each treatment manual the number of times each BCT was mentioned was recorded by both raters and Spearman's Rho (r) was calculated to assess the level of concordance between these figures. Discrepancies were discussed after each wave and BCT definitions refined if necessary. Inter-rater agreement was scrutinised after each wave until it reached the reliability level found in the published taxonomy referred to above (Abraham & Michie, 2008) (this level of reliability had been found to generalize across coders). After this level was reached, the remaining manuals were coded by a single coder. A final version of the BCT wording was agreed through discussion among the authors.

The final set of BCTs was grouped into higher-order functions by two of the authors (RW and SM) (Fig. 1). Starting with the theoretical model described in the introduction (West, 2009), they categorised each BCT into its main function until a consensus was achieved with regard to the descriptions of all the functions. This occurred after consideration of 19 of the 43 BCTs (see below). RW and SM then independently categorised the remaining 24 BCTs into the functions and percentage agreement between them was calculated.

3. Results

Analysis of the guidance documents yielded 43 BCTs. Twelve BCTs were similar to those identified in physical activity and healthy eating interventions (Abraham & Michie, 2008). The final set of BCT labels and descriptions is shown in Table 1. The inter-rater reliability (Table 2) for identifying BCTs in treatment manuals for the 28 manuals examined ranged from r = 0.65 to 0.96 with a mean value of 0.84 (SD = 0.086) and percentage agreement ranged from 86% to 95%. Reliability was equally high with newly trained coders as with the original two coders. After 28 manuals were coded, the level of

Table 2
Spearman's Rho correlations and percentage agreement of responses between coders.

Coder	Trial of coding	Spearman's Rho correlation coefficient (r_s)[a] Inter-rater reliability score over all four manuals together (each manual separately)	Percentage agreement (%)
NH & AW	1	.86 (.79, .74, .75, .73)	86
	2	.90 (.85, .90, .87, .76)	92
	3	.94 (.95, .83, .84, .93)	93
NH & FH	4	.83 (.87, .77, .81, .78)	90
	5	.93 (.91, .91, .90, .96)	95
AW & AE	6	.86 (.89, .80, .79, .65)	86
	7	.92 (.81, .71, .96, .88)	92

[a] All Spearman's Rho associations significant at $p<0.0001$.

agreement was sufficiently high for the remaining manuals to be coded by a single coder.

Percentage agreement in categorising BCTs according to higher-order functions was 91% (see Table 1) and discrepancies were readily resolved through discussion.

4. Discussion

A taxonomy of behaviour change techniques used for individual behavioural support for smoking cessation was developed and it was found that it could be used reliably to code the treatment manuals of SSSs in England. A higher-order functional classification was also developed and this could be reliably applied to the BCTs.

Twelve of the BCTs in the present taxonomy were the same as those for interventions to increase physical activity and healthy eating (Abraham & Michie, 2008) suggesting that it may be feasible to develop a set of BCTs using a common language to describe interventions across a range of health-related behaviours. This is the focus of an ongoing research programme to identify key BCTs in interventions to change a range of health-related behaviours, including excessive alcohol use. The research programme is also using these BCTs to establish the competences required by behaviour change practitioners in a similar to manner to that achieved with Cognitive-Behaviour Therapy (Roth & Pilling, 2008).

Defining interventions in terms of specific techniques allows the investigation of which components of interventions work, and how they work. Mechanisms of action can be identified and theoretical associations between interventions, hypothesised mediators and outcomes can be studied using mediation analyses in experimental study designs or using meta-regression in evidence syntheses (Michie, Abraham, Whittington, McAteer, & Gupta, 2009). The latter has established that, across heterogeneous interventions to increase physical activity and healthy eating, the technique of self-monitoring was effective and its effect was increased in combination with other techniques theoretically predicted to increase effectiveness (e.g. goal-setting and action planning).

This study is only a starting point in the labelling and classification of BCTs for smoking cessation. The list was identified and analysed using guidance documents and treatment manuals from just one country and represented the current practice in that country. It is possible that different techniques may be used in other contexts or added in the future. In order to reduce the amount of interpretation required, and hence potential observer bias, the language was kept as close as possible to the original descriptions. This meant that the BCTs varied considerably in terms of breadth and specificity. It is possible that some of the BCTs in this list could usefully be separated into smaller categories and that others might be combined to form larger ones. It will also be important to determine how far different coders can use the taxonomy and how well it can be applied to descriptions of BCTs in randomised controlled trials. A question arises as to whether activities such as information gathering should be

considered as BCTs as we have done or labelled, perhaps, 'supportive activities' or something similar. We decided to label them as BCTs because they were specific activities that contribute, or could contribute, to achieving behaviour change.

Finally, it must be recognised that the value of this exercise is predicated on there being sufficient homogeneity within the content of the BCTs for these to form useful constructs in predicting the success of behavioural interventions. Two studies that have attempted this so far, one in smoking (West, Walia, Hyder, Shahab, & Michie, 2010) and one in healthy eating and physical activity (Michie, Abraham, et al., 2009), have successfully shown associations between use of BCTs classified in this way and success rates of interventions. This is a promising line of research but one that requires good specification of interventions in published reports (Michie, Fixsen, Grimshaw, & Eccles, 2009).

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