Section A: CPHE to complete	
Name:	Susan Michie and Robert West
Job title:	Professor of Health Psychology
Address:	Department of Clinical, Educational and Health Psychology University College London
Guidance title:	Behaviour change
Committee:	Programme Development Group (PDG)
Subject of expert testimony:	Behaviour change – effectiveness of specific behaviour change techniques
Evidence gaps or uncertainties:	[Please list the research questions or evidence uncertainties that the testimony should address]

Provide the PDG with an overview of your work on behaviour change techniques (BCTs):

- Types of evidence of effectiveness of specific behaviour change techniques in each of the five behaviours covered in the guidance and strengths and limitations of these approaches
- commentary on the second commissioned evidence Review findings in the light of the above
- discussion of other factors apart from BCTs that are key to effectiveness

Section B: Expert to complete	
Summary testimony:	[Please use the space below to summarise your testimony in 250 – 1000 words – continue over page if necessary]

This document provides testimony on:

1. Types of evidence of effectiveness of specific behaviour change techniques in each of the five behaviours covered in the guidance and strengths and limitations of these approaches
2. commentary on Bazian's Review 2 findings in the light of the above
3. discussion of other factors apart from the BCTs that are key to effectiveness

1. Methods of detecting BCT effectiveness: a critical appraisal

Behaviour change interventions are complex in that they involve multiple interacting components. Progress in developing more effective interventions has been hampered by lack of a methodology for unpacking the "black box" of complex interventions. Specifying intervention content in terms of behaviour change techniques (BCTs) provides a basis for such a methodology.

Behaviour Change Techniques (BCTs) are irreducible components of BCIs targeting one or more mechanisms of change. Several different taxonomies of BCTs have

been proposed to date, some generic and others specific to particular behavioural targets (see Michie et al, 2013). BCIs typically involve 6-24 component BCTs (Michie et al, 2009; Lorencatto et al, in press).

When included within an intervention a BCT of a given type may a) increase the effect in an additive manner, b) act with one or more other BCTs to increase the effect of the intervention, c) make no difference, d) decrease the effect, or e) reduce the effect of one or more other BCTs. Where effects occur these may be larger or smaller than effects arising from inclusion of alternative BCTs, for example those used in control conditions of RCTs.

There is a considerable challenge to determining which of the above is true for a given BCT in a given intervention. Yet the efficient design and implementation of BCIs requires that we have an understanding of what BCTs should be included.

There are, in principle, several ways of attempting to assess BCT effectiveness. Each has strengths and limitations. None are guaranteed to provide a definitive answer but each can increase or decrease confidence that a particular BCT can be effective in a particular kind of intervention for a particular kind of target behaviour in a given population and context (Table 1).

Table 1: Methods of evaluating effectiveness of BCTs and their strengths and limitations

Evaluation methods	**What they involve**	**Strengths**	**Limitations**
Experiments (including RCTs) e.g. providing feedback on expired air carbon monoxide concentrations to aid smoking cessation (Shahab et al, 2011)	Adding or removing one or more BCTs under experimenter control and looking for differences in effectiveness	Provides a high degree of confidence in effectiveness of a specific example of a BCT, implemented in a particular way with a particular population in a given context	Only feasible for evaluating small numbers of BCTs at any one time Can only evaluate specific examples of BCTs implemented in a given way in specific contexts with specific populations (most problematically, populations willing to volunteer for experiments) Can require more time or resources than are available Control conditions may contain effective BCTs (de

			Bruin et al, 2010) Unlikely to be able to detect small but important effects Fidelity of delivery of BCTs may be low or unknown
Meta-analyses of experimental studies e.g. Implementation intentions as actions plans to promote behaviour change (Gollwitzer & Sheeran, 2006)	Statistically pooling the results or two or more experiments evaluating one or more BCTs as above	Can provide highest level of confidence in effectiveness of BCTs. Has the potential to make generalisations concerning effectiveness of BCTs across specific instances, with specific populations and contexts.	Will be very sparse given the resources required by, and limitations of, experiments Results may not generalise beyond contexts, implementation and populations studied May involve pooling of studies that should not be pooled because of heterogeneity of target behaviours, interventions, populations, contexts or methods Control conditions may contain effective BCTs that are not identified in reports Can suffer from 'file drawer' effect Fidelity of delivery of BCTs may be low or unknown or variable
Correlational studies	Using naturally occurring variation in clinical or public	Can make use of very large data sets to identify small	Relies on complete and accurate coding of BCTs

e.g. Identification of BCTs associated with higher success rates of stop smoking services in England (West et al, 2010a)	health practice in inclusion of BCTs and outcomes to identify associations between BCT inclusion and intervention effectiveness	effect sizes Very inexpensive Provides an estimate of the 'real world' effectiveness, in non-volunteer populations	Relies on sufficient naturally occurring variation in inclusion or exclusion of BCTs, and outcomes Causality has to be inferred (usually by statistical adjustment for potential confounding variables such as mode of delivery, setting, population and other BCTs) Can result in false positives from multiple comparisons May not be able to pick up synergistic or moderating effects of BCTs Fidelity of delivery of BCTs may be low or unknown
Meta-regressions e.g. Identification of self-monitoring, goal setting and actions plans as effective BCTs in promoting physical activity and healthy eating (Michie et al, 2009)	Identifying inclusion vs exclusion of BCTs or their combinations as moderators of effect sizes in meta-analyses of multi-component interventions	May detect effects that are too small to be picked up in individual studies Very inexpensive Uses data collected under reasonably well controlled conditions	Relies on sufficient numbers of studies including and excluding each BCT Relies on sufficient variation in inclusion vs exclusion of BCTs or their combination and outcomes Relies on complete and accurate coding of BCTs

			Causality has to be inferred (usually by adjusting for other potential confounding moderators such as mode of delivery, setting, population and other BCTs) Control conditions may contain effective BCTs that are not identified in reports Can result in false positives from multiple comparisons May not be able to pick up synergistic or moderating effects of BCTs Fidelity of delivery of BCTs may be low, unknown or variable
Characterising effective interventions e.g. identifying BCTs included in effective behavioural support interventions for smoking cessation (Michie et al, 2011a).	Identifying BCTs included in interventions found to be effective in RCTs May vary in implementation from inclusion of BCTs that are present in at least one effective intervention to those that have been present in all effective interventions	Likely to pick up BCTs and BCT combinations that contribute to effective interventions	Suffers from all the limitations of RCTs Depends on complete and accurate coding of BCTs Could include BCTs that do not contribute to effectiveness but tend to get included Could miss BCTs that effective but have not been widely tested

A method is required for combining data from these various sources to arrive at judgements of the likely effectiveness of particular BCTs. Such a method should enable a confidence rating to be given to a statement of the following kind:

'Inclusion of [BCT or BCT combination] in a behaviour change intervention to achieve [behavioural target] in [population] [under given conditions] is expected to increase the effectiveness of that intervention by [effect size/confidence interval].'

The proposed method is as follows:

a. Assess what sources of evidence can be used for the confidence rating
b. Apply these sources of evidence, giving priority to meta-analyses of specific BCTs (for efficacy) combined with adequately powered correlational studies (for generalisability), but these will be rare for the reasons outlined in Table 1
c. Where there are no meta-analyses, prioritise experimental studies of specific BCTs combined with adequately powered correlational studies; again these will be rare
d. Where there are no experimental studies, prioritise adequately powered correlational studies but apply caveats in relation to: a) potentially missed BCTs because of lack of inclusion, variation, or fidelity, b) potentially missed combinations of BCTs, c) false positives because of multiple comparisons (where appropriate); these will also be rare
e. Where there are no correlational studies, and to add further evidence to correlational studies, use meta-regressions applying appropriate caveats from Table 1
f. Where there are no meta-regressions or where meta-regressions cannot address the questions (e.g. because of lack of variability), use studies characterising effective interventions, again apply appropriate caveats from Table 1

This method should not be used in an exploratory way to 'fish' for associations, but to test hypotheses about the effectiveness of specific BCTs or their combinations for which there are grounds for believing they would or would not be effective.

Even with access to large amounts of high quality data, identification of BCT effectiveness will have to take account of the heterogeneity of delivery of the BCT (as demonstrated in the case of the BCT 'goal setting' for smoking cessation (Lorencatto et al, submitted) across a range of target behaviours, populations and contexts. To the extent that such heterogeneity exists, analysis at a finer-grained level than the BCT category is warranted. Progress in this field will be enhanced by development of an ontology of BCTs in which BCT categories of different levels of generality are linked.

2. Commentary on Bazian's Review 2 findings in the light of the above

Bazian's Review 2 reports on meta-regression analyses attempting to identify effective BCTs from the Michie et al (2013) taxonomy for a) smoking, diet, physical activity, sexual health, and alcohol consumption collectively, and b) each of these target behaviours individually.

The first step in the process of evaluating the results is to assess whether there is

sufficient heterogenity in the meta-analysis to provide a basis for undertaking a meta-regression (Table 2). It is apparent that there is sufficient heterogeneity for all except for sexual health and alcohol.

Table 2: Viability of each target behaviour for meta-regression

Target behaviour	N of studies	Heterogeneity	Viability for meta-regression
All 5 behaviours	197 studies	I2=66.0%, p<0.001	High
Sexual health	15 studies	I2=45.9%, p=0.027	Low
Alcohol	50 studies	I2=24.7%, p=0.062	Low
Smoking	80 studies	I2=68.1%, p<0.001	High
Diet	27 studies	I2=76.1%, p<0.001	High
Physical activity	63 studies	I2=83.9%, p<0.001	High

The observed lack of heterogeneity for alcohol is surprising given that heterogeneity was observed in Cochrane reviews and these have been used in a meta-regression to identify self-monitoring as a BCT that accounted for a significant amount of variance in effect size (Michie et al, 2012).

This raises a question as to the search strategy and it may be helpful to compare the studies identified with relevant Cochrane and high quality reviews where these exist for the target behaviours.

In cases where there is heterogeneity in the meta-analysis, the next step is to establish for each BCT or BCT cluster to be considered:

a. whether it is applicable on grounds of theory or in practice (e.g. pharmacological support is not applicable to the combined behavioural target, physical activity, or sexual health)
b. if it is applicable, whether it is evaluable based on whether there are sufficient studies with and without the BCT (see Table 1). As a suggested rule of thumb, a BCT may not be evaluable if there were fewer than 10 studies in which it was present in the experimental condition but absent in the control condition and 10 studies in which it was absent in both conditions. (If it were present in both experimental and control conditions the study should be omitted from the analysis.)

For BCTs and BCT clusters that are applicable and evaluable (which is likely to be a relatively small subset of all BCTs for any given behavioural target and even smaller for the combined behavioural target), the next step should be to undertake a meta-regression in which effect size is regressed on to each BCT or BCT cluster/intervention function after adjusting for non BCT moderators such as type of sample, mode of delivery, setting etc.

This would create a list of BCTs for each behavioural target for which there was some evidence that its inclusion was associated with increased or decreased effectiveness. This list would include false positives and false negatives for reasons set out in Table 1. However, it would modestly change the confidence ratings given to the key effectiveness statement about the BCT.

A further meta-regression should be conducted for each behavioural target. In that analysis, BCTs found in the previous meta-regression would be entered in a forward stepwise manner. This could build a parsimonious, though not necessarily theoretically coherent, model of BCTs or BCT clusters/intervention functions that may add to intervention effectiveness.

The approach adopted in Bazian's Review 2, does not appear to permit this information to be extracted. The focus on the multi-variate model without presenting

uni-variate results or theory-informed combinations of predictors creates potential for interference between BCTs that tend to appear together. This could lead to failure to detect associations or paradoxical associations because of high collinearity.

Following the analysis strategy proposed above, it will be important to set the meta-regression findings in the context of other research and sources of evidence as set out in Table 1.

Thus, to increase confidence in results of meta-regressions, three approaches are helpful: (i) replication of a finding across studies contributing to the meta-regressions, (ii) the use of "forensic" theory-guided analyses and (iii) triangulation with other sources of evidence.

In the absence of analyses as recommended above in Bazian's Review 2, the following discussion considers the likely validity of their findings in the light of other evidence.

(i) Replication:

One of Bazian Review 2's finding that has been replicated is the identification of **self-monitoring** as an effective BCT. This BCT has been found to be associated with effective interventions in interventions targeting physical activity and healthy eating amongst the general adult population (Michie et al, 2007) and amongst obese adults with co-morbidities (Dombrowski et al, 2012). This has also been identified as an effective BCT in interventions aimed at reducing excessive alcohol consumption (Michie et al, 2012). The replication across review, population and behavioural domain provides enough confidence for this to be a recommended technique in interventions seeking to help individuals to change their health-related behaviours. A similar analysis is being conducted for smoking cessation, but the results will not be available in time to inform this guidance.

The Bazian review found that the BCT cluster 'Feedback & self-monitoring' accounted for only 3% of variance in adjusted univariate analysis and was in an unexpected direction, whereas Repetition & substitution accounted for 19.2%. The negative association between Feedback & self-monitoring and outcome suggests that these findings should be carefully checked and the component BCTs and interventions should be examined to try to understand the reason for this discrepant result. It is not possible from the report to link findings with the relevant interventions and examine their characteristics to try and understand the findings.

(ii) Theory guided analyses

In the Michie et al (2007) meta-regression, the BCT of self-monitoring was found to be associated with positive outcomes; a theory of behaviour change was then used to guide the further analysis, one in which self-monitoring is a key construct in people's efforts to self-regulate their behaviour (Control Theory; Carver and Scheier, 1982). A set of BCTs that are theoretically predicted to act together in synergistic fashion in the self-regulation of behaviour were identified. Interventions containing 3 or more of BCTs in this set were compared with those containing 2 or fewer of these BCTs. The former were twice as effective as the latter.

A similar approach (described in Gardner et al, 2010) was used to identify effective BCTs within 'audit and feedback' interventions aimed at improving the performance of professionals. When the Cochrane review of audit and feedback was updated, this theory-guided analysis was conducted with the new finding that the most effective interventions were those that included goal setting and action planning with feedback (Ivers et al, 2012).

These findings across two different behavioural domains and populations suggest that interventions aiming to help people manage their own behaviour should consider including *self-monitoring, goal setting, goal review, feedback* and *action planning*.

(iii) Triangulation with other sources of evidence

An example of triangulation comes from work identifying BCTs associated with effective interventions for smoking cessation. Two sources were used to identify BCTs supported by strong evidence a) inclusion in treatment manuals of programmes that have consistently been found to be effective in clinical trials, and b) inclusion in treatment manuals of stop smoking services that have higher success rates, using Department of Health national quit rate data. Both methods used multi-level modelling. BCTs were identified using a smoking-specific taxonomy of BCTs (Michie et al, 2011b; this preceded and informed BCT Taxonomy v1 used by the Bazian review). Considering these two sources, the BCTs with the strongest overall evidence for effectiveness are: providing information on the consequences of smoking and smoking cessation, rewarding abstinence (usually socially), strengthening ex-smoker identity, assessing expired-air carbon monoxide, providing advice on coping with urges to smoke, setting clear goals, advising on changing routines, advising on effective use of stop smoking medication, asking about experiences of current stop smoking medication, providing options for additional or later support, assessing current and past smoking behaviour, assessing current readiness and ability to quit, offering or directing towards appropriate written materials, and eliciting clients' views.

This evidence is judged sufficiently strong to form the core of behavioural support programmes to aid smoking cessation (Michie et al, 2011a).

Overall, the meta-regression approach adopted in Bazian's Review 2 is a useful first step in piloting a method for assessing whether BCTs or BCT clusters/intervention functions may add to intervention effectiveness, but for the reasons given in Table 1 and the analysis described above, the analytical strategy may be weaker than other studies that have been conducted. To the extent that Bazian's Review 2 arrives at conclusions that are discordant with other studies, these should be viewed with caution.

In these circumstances, it is sensible to include the approach of 'Characterising effective interventions' (Table 1). As suggested by the NICE team, this could translate into identifying BCTs that were "found in studies with only a significant intervention effect and in more than one study (i.e. BCTs coded as A2) and BCTs found in more than one intervention with a significant positive effect, but across studies with positive and negative directions of effect (i.e. BCTs coded as C2). So for example for smoking, it may be possible to recommend that interventions should include, but not necessarily be limited to, the following techniques: Social support – practical (A2), Social support – unspecified (C2), Pharmacological support (C2), Reduce negative emotions (C2), Behaviour practice/rehearsal (A2), Instruction on how to perform a behaviour (A2), Review behaviour goal (A2), Commitment (A2), and Framing/reframing (A2); and providing practical definitions and examples of these techniques (Linked evidence: Review 2, ES 3.2, 3.3)."

3. Discussion of other factors, apart from the BCTs, that are key to effectiveness

Use of Theory

Bazian review 2 only coded interventions in terms of whether they mentioned theory or not; they did not use the Theory Coding Scheme to assess the extent to which theory had been used. It identified that the majority of reports did not mention theory, only two theories had been frequently mentioned (Social Cognitive Theory and the TransTheoretical Model) and there was no association between mention of either of these theories and evidence of effectiveness. These findings are consistent with a recent review of interventions to increase physical activity and healthy eating (Prestwich et al, in press). The only conclusion that can be drawn is that mention of

one of these two frequently used theories in intervention reports is not associated with more effective interventions. Mentioning a theory in a report does not mean that the theory was applied in a systematic or appropriate way to designing the intervention. No conclusions can therefore be drawn about use of theory in intervention development or about associations with mentioning theories in published reports beyond SCT and TTM.

Intervention reporting and fidelity of delivery

In interpreting the findings of evaluations of behaviour change interventions, two methodological limitations need to be borne in mind:

a. Intervention content is poorly reported, with an analysis of smoking cessation interventions finding 75% of BCTs mentioned in the protocol were in the published report (Lorencatto et al, 2013).

b. Fidelity of delivery of the intervention specified in the protocol is rarely assessed; where it is, most delivery is of 1/3 to 2/3 of the planned content (BCTs) (Borelli et al, 2011; Hardeman et al, 2008; Lorencatto et al, 2012). In Hardeman et al's study of an intervention to increase physical activity, fidelity of delivery was 42% of the BCTs specified in the protocol; in Lorencatto et al's study of a smoking cessation intervention, fidelity was 48%.

Thus, there may be very little correlation with the BCTs specified in intervention reports and those actually delivered. For example, if both reporting and fidelity are at 50%, it is hypothetically possible that the 50% BCTs delivered are not those in the published report; in other words, the published report bears absolutely no relation to the delivered intervention. Whilst fidelity is rarely assessed and full protocols are rarely provided, our ability to draw robust conclusions from systematic literature reviews is seriously constrained.

It is therefore very important to recommend that interventions should be documented in protocols (or treatment manuals), including the component BCTs, in sufficient detail to enable faithful replication. These should be publicly available. In addition, the fidelity of delivering the specified BCTs should be assessed and reported.

Quality of delivery of BCTs

For BCTs for which there is confidence about their effectiveness, there is still the question as to how they are delivered; are they delivered to the same standard as those in the trial evidence? For BCTs to be effective, they need to be delivered well. This raised the question as to what "delivered well" means. A mixed methods study of smoking cessation interventions, including multi-level modelling, guidance document analysis and expert consultation, identified competences within general aspects of the interaction necessary for the effective delivery of specific BCTs and adjuvant activities (such as social support, pharmacological intervention) (Michie et al, 2011a). These are:

(a) Delivery of the intervention: adapt the intervention according to the client and context

(b) Information gathering: acquire relevant information

(c) General communication: give relevant information and verbal and non-verbal behaviour underpinning effective delivery of specific behaviour change techniques and adjuvant activities.

Competences for the delivery of BCTs are outlined in much more detail by Johnston and Dixon in their work for the Scottish Government (see expert testimony to PDG).

The importance of considering the *quality* of delivery of BCTs comes from a study of

the delivery of a key BCT in smoking cessation, goal setting, that is, setting a quit date. Lorencatto et al (submitted) found that higher quality of setting a quit date was significantly associated with increased likelihood of smokers quitting as planned on the quit date (p=0.03; OR 1.5, 95% CI: 1.03-2.22). However, the average quality score for its delivery was low: 1.5 out of the possible 7 (range: -1 to 6).

Research recommendations

The above observations suggest that there should be more investment in methodological research to develop and evaluate methods for identifying effective BCTs within complex, multi-component interventions and to investigate their interactions with contextual factors such as mode of delivery, population and setting. Two suggested areas are

1. Experimental methods, where individual BCTs, or groups of BCTs are added in controlled conditions, preferably guided by theoretical assumptions as to the reason for the added value and mechanism of action of a BCT. An example of this approach is the Multiphase Optimisation Strategy, which includes fractionated factorial designs (Collins et al, 2011) or n-of-1 studies (intra-individual RCTs) (Johnston and Johnston, under review).
2. Evidence synthesis methods, where choice and conduct of meta-regression analyses are guided by a theoretical understanding of the target behaviours and of putative mechanisms of action of the BCTs.
3. Optimal use of large observational data sets as the basis for correlational studies where there is rigorous collection of data on participant characteristics, intervention content, contextual factors and outcomes. (West 2010a,b)

A second area of research that would advance behaviour change research is to develop our conceptual and empirical understanding of context: how BCTs interact with each other and with variables such as mode of delivery, population and setting.

References (if applicable):

Borrelli, B. (2011). The assessment, monitoring, and enhancement of treatment fidelity in public health clinical trials. *Journal of Public Health Dentistry*, 71, S52-S63.

Carver CS & Scheier MF (1982). Control theory: A useful conceptual framework for personality-social, clinical and health psychology. *Psychological Bulletin*, 92, 111–135.

Collins LM. Baker TB, Mermelstein RJ, Piper ME, Jorenby DE, Smith SS, Schlam TR, Cook JW & Fiore MC (2011). The Multiphase Optimization Strategy for engineering effective tobacco use interventions. *Annals of Behavioral Medicine, 41,* 208-226.

De Bruin M, Wolfgang V, Schaalma HP, Kok G, Abraham C, Hospers HJ (2010). Standard Care Impact on Effects of Highly Active Antiretroviral Therapy Adherence Interventions: A Meta-analysis of Randomized Controlled Trials. *Arch Intern Med.* 170, 240-250.

Dombrowski SU, Sniehotta FF, Avenell A, Johnston, M, MacLennan G & Araujo-Soares V. (2012). Identifying active ingredients in complex behavioural interventions for obese adults with obesity-related co-morbidities or additional risk factors for co-morbidities: A systematic review. *Health Psychology Review*, *6*, 7-32

Gardner B, Whittington C, McAteer J, Eccles MP, Michie S. (2010). Using theory to synthesise evidence from behaviour change interventions: the example of audit and feedback. *Social Science and Medicine, 70*, 1618-1625.

Gollwitzer PM & Sheeran P. (2006) Implementation intentions and goal achievement: A meta-analysis of effects and processes. *Advances in Experimental Social Psychology*. 38, 249-268.

Hardeman W, Michie S, Fanshawe T, Prevost AT, McLoughlin K, Kinmonth AL. (2008). Fidelity of delivery of a physical activity intervention: predictors and consequences. *Psychology & Health, 23*, 11-24.

Ivers N, Jamtvedt G, Flottorp S, Young JM, Odgaard-Jensen J, French SD, O'Brien MA, Johansen M, Grimshaw J, Oxman AD. (2012) Audit and feedback: effects on professional practice and healthcare outcomes. *Cochrane Database Syst Rev*; 6:CD000259.

Johnston DW, Johnston M (under review) Useful theories should apply to individuals. *British Journal of Health Psychology*

Lorencatto F, West R, Stavri Z, Michie S (2012) How well is intervention content described in published reports of smoking cessation interventions? *Nicotine and Tobacco Research (online).*

Lorencatto F, Wes, R, Bruguera C, & Michie S. (submitted) Methods for assessing fidelity and quality of delivery of smoking cessation behavioural support.

Michie S, Abraham C, Whittington C, McAteer J, Gupta S. (2009). Effective techniques in healthy eating and physical activity interventions: a meta-regression. *Health Psychology*, 28, 690-701.

Michie S, Churchill S, West R. (2011a). Identifying evidence-based competences required to deliver behavioral support for smoking cessation. *Annals of Behavioral Medicine, 41*, 59-70.

Michie S, Hyder N, Walia A, West R. (2011b). Development of a taxonomy of behaviour change techniques used in individual behavioural support for smoking cessation. *Addictive Behaviors*, 36, 315-319

Michie S, Whittington C, Hamoudi Z, Zarnani F, Tober G, West R. (2012). Identification of behaviour change techniques to reduce excessive alcohol consumption. *Addiction*, 107, 1431-1440.

Prestwich A, Sniehotta FF, Whittington C, Dombrowski SU, Lizzie Rogers L & Michie S. (in press) Does theory influence the effectiveness of health behavior interventions? Meta-analysis. *Health Psychology.*

Shahab L, West R, McNeill A (2011) A randomised controlled trial of adding expired carbon-monoxide feedback to brief stop smoking advice: evaluation of cognitive and behavioural effects. *Health Psychology*, 30, 49-57.

West R, Evans A, Michie S (2010b) Behaviour change techniques used in group-based behavioural support by the English Stop-Smoking Services and preliminary assessment of association with short-term quit outcomes. Nicotine & Tobacco Research, 12(7), 742-747

West R, Walia A, Hyder N, Shahab L, Michie S. (2010a). Behaviour change techniques used by the English Stop Smoking Services and their associations with short-term quit outcomes. *Nicotine and Tobacco Research*, 12, 742-7