Behavior Change Techniques

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Synonyms

Potentially active element of an intervention to change behavior

Definition

A behavior change technique (BCT) is a systematic procedure included as a potentially active component of an intervention designed to change behavior.

The defining characteristics of a BCT (Michie et al. 2011) are that it is:

- A component of an intervention designed to change a specified behaviour
- The smallest component that can be postulated to be an active ingredient within the intervention
- An observable activity
- Replicable
- Specified by an active verb and clarity about the desired behavior change targeted, with enough detail to achieve good agreement between experts

A BCT is the smallest component of an intervention compatible with retaining the postulated active ingredients and can be used alone or in combination with other BCTs. BCTs meet Heckler and colleagues' criteria for a good intervention module, namely, smallest, meaningful, selfcontained, and repurposable (Hekler et al. 2016). A BCT should be well specified so that effectiveness of the BCT can be evaluated (e.g., in randomized controlled trials, in factorial experimental designs (Collins et al. 2011), or N-of-1 studies). However, the evidence base for effectiveness may or may not have been established. Examples of BCTs are as follows: "prompts/cues," "information about health consequences," "material incentive (behavior)," "goal setting (behavior)," "self-monitoring of behavior," "action planning," "behavioral practice/ rehearsal," "graded tasks," "social support (unspecified)," "salience of consequences," and "habit formation."

BCT definitions specify the minimum content of what must be delivered to constitute that BCT (e.g., feedback must involve providing the target audience with information about their specific behavior). A BCT does not specify the how, that is, 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 digitally or face to face, to groups or to an individual, synchronously (in real time) or asynchronously.

Description

BCTs are the potentially active components determining the effectiveness of behavior change interventions which may include one or more BCTs. Some well-recognized behavior change interventions contain reliable combinations of BCTs,

for example, relapse prevention includes both problem solving and action planning, whereas more general labels may contain variable combinations of BCTs, for example, the contents of "cognitive behavior therapy" are very variable (Gatchel et al. 2007).

In this context, a definition of behavior, 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" (Hobbs et al. 2011). This definition was arrived at via a Delphi exercise of 14 members of a multidisciplinary advisory group, starting with a shortlist of definitions of behavior 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 synthesized from constructs that were included in at least 50 % of the definitions reaching an agreed threshold of perceived usefulness.

Behavior change interventions may influence behavior in several ways: behavior can be initiated or terminated, or increased or decreased in frequency, duration, or intensity. For most behaviors, there is variation within and between people over time in all of these dimensions, influenced by environmental, social, cognitive, and emotional variables. Studies of how behavior varies within and between people have led to an understanding of how to use external factors to modify behavior. Technologies of behavior change have been developed within disciplines of applied psychology (e.g., clinical, educational, health) and adopted and extended in a wide variety of intervention functions and policies, such as commercial advertising and social marketing (Michie et al. 2011). These technologies are made up of individual BCTs.

For full specification of a behavior change intervention, both the potentially active content, that is, the BCTs, and the mode of delivery need to be described (Davidson et al. 2003). The Template for Intervention Description and Replication (TIDieR) (Hoffmann et al. 2014) specifies the information required to describe any intervention, whether behavioral or not; this includes not only the BCTs and mode of delivery but other information such as the rationale or theory, materials used, person delivering the intervention, fidelity of delivery, and scope for tailoring.

Why Are Behavior Change Techniques Important?

The importance of behavior change in improving health is illustrated by the increasing evidence that behavior influences health outcomes (e.g., Kontis et al. 2014; Yoon et al. 2014) and an increasing urgency to develop behavioral change interventions in order to improve these outcomes. As a result, there has been investment by funding governments and scientific bodies in the development and

evaluation of interventions to change population, patient, and practitioner behaviors. An example is the US National Institutes 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 behavioral and social factors often play in illness and health.

Interventions to change behavior are typically complex, involving many interacting components (Craig et al. 2008). BCTs are the potentially active ingredients of these interventions but are often poorly described in research protocols and published reports (Michie et al. 2009). Components may be described in terms that are vague, general, and/or ambiguous and with labels, for example, "behavioral counseling," that can mean different things to different researchers or practitioners. This acts as a barrier to replication, the essential cornerstone for scientific progress. In contrast, biomedical interventions are likely to be more precisely specified (e.g., the pharmacological "ingredients" of prescribed drugs, their dose, and frequency of administration). McCleary and Duncan et al. (2013) found that published reports of behavioral interventions were less likely to include the active components of the intervention in the title and abstract (i.e., materials screened for inclusion in systematic reviews) than was found in descriptions of pharmacological interventions (56 % vs 90 % of published studies).

This lack of precision, lack of consensually agreed terms, and poor reporting have led 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 BCTs that are effective in changing behavior and understanding the causal mechanisms underlying behavior change. If intervention descriptions are idiosyncratic or ambiguous and cannot therefore be interpreted reliably, it is impossible to aggregate the evidence to ascertain their effectiveness. Additionally, there is no value in evaluating an intervention if one cannot 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 behavior change interventions has hampered the development of effective interventions.

Although the CONSORT Statement for randomized trials of "nonpharmacologic" interventions calls for precise details of interventions in research, including a description of the different intervention components (Boutron et al. 2008), it gives no guidance as to what these details are. The UK Medical Research Council's guidance (Craig et al. 2008) for developing and evaluating complex interventions acknowledges this problem and also the problem of lack of consistency and consensus in use of terminology (Michie et al. 2008). Led by an international collaboration of researchers, methodologists, guideline developers, funders, consumer advocacy groups, service providers, and journal editors, an official

extension of the CONSORT Statement has been developed to improve reporting of complex interventions (Montgomery et al. 2013).

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. They have been developed in relation to different behavior types: physical activity and healthy eating (Abraham and Michie 2008; Michie et al. 2011), smoking (Michie et al. 2011; West et al. 2011), excessive alcohol use (Michie et al. 2012), and condom use (Abraham et al. 2011).

Based on all the previously published domainspecific taxonomies, and in collaboration with more than 400 international experts from 11 countries, Michie and colleagues developed BCT Taxonomy Version 1 (BCTTv1; Michie et al. 2013, 2015). BCTTv1 is an extensive, cross-domain classification system consisting of 93 distinct, clearly labeled and precisely defined BCTs. To increase ease and accuracy of use of the taxonomy, the 93 BCTs are hierarchically organized into 16 groupings; for example, the BCT "goal setting (behavior)" is in a "goals and planning" group. BCTTv1 has been widely used, across a variety of behavioral domains and countries, to specify intervention content (e.g., Young et al. 2015; Webb et al. 2016; Smith et al. 2013) and synthesize evidence (e.g., Gardner et al. 2016; Presseau et al. 2015).

Using such taxonomies with standardized labels and definitions has improved practice by ensuring that a technique is always described by the same label and that a label is always used for the same technique. Previously, the same component techniques within behavioral interventions were often described in protocols and published reports with different labels (e.g., "selfmonitoring" may be labeled "daily diaries"). Conversely, the same labels were often applied to different techniques (e.g., "behavioral counseling" may involve "educating patients" or "feedback, self-monitoring, and reinforcement").

Specifying interventions by BCTs allows for statistical analyses to identify specific BCTs associated with effective interventions (i.e., the "active ingredients"). Heterogeneous, complex interventions have been synthesized to identify effective component BCTs using a variety of methodologies and statistical techniques (Michie et al. under review), including experiments (e.g., NewburyBirch et al. 2014; O'Carroll et al. 2014), metaanalyses of experimental studies (e.g., Arnott et al. 2014; Bishop et al. 2015), correlational studies (e.g., Hankonen et al. 2014; Murray et al. 2013), meta-regression (e.g., Dombrowski et al. 2012; Michie et al. 2009), and meta-CART (classification and regression trees, e.g., Dusseldorp et al. (2013)). Peters and colleagues (2015) have also suggested additional methods which might be used. Finally, BCT effectiveness has been evaluated by

characterizing effective interventions (i.e., by identifying BCTs included in interventions found to be effective). For example, the "active ingredients" have been identified in the English stop smoking services by analyzing protocols for behavioral support for smoking cessation in terms of BCTs and investigating associations with a national database of carbon monoxide-verified quit rates (West et al. 2010).

The process of coding interventions into component BCTs is a highly skilled task requiring familiarity with BCT labels and definitions. Training is required to ensure BCTs can be identified with high levels of reliability and validity. An online training program has been developed (Wood et al. 2014), which has been evaluated as effective for identifying the most frequently occurring BCTs (Abraham et al. 2015).

In addition to specifying the BCTs, it will be important to develop shared methods of reporting on both the methods of delivery (Gatchel et al. 2007) and the competence with which they are delivered. A hierarchical taxonomy has recently been developed for the former, which includes more than 150 unique classification codes, reflecting the extent to which modes of delivery vary in intervention reports (Carey et al. in preparation). Frameworks for the latter (i.e., specification of professional competences for the delivery of BCTs) are being developed and have been used to advise national governments (Dixon and Johnston 2010) and as a basis for a national training program (NHS Centre for Smoking Cessation and Training [NCSCT], 2011).

The Benefits of the BCT Approach

1. Developing behavior change interventions: Intervention developers are able to use a comprehensive list of BCTs (rather than relying on the limited set they are aware of) to design interventions.
2. Reporting interventions: Specifying intervention content by BCTs facilitates well-defined, detailed, accurate, replicable descriptions of behavior change interventions. Both intervention and control conditions can be specified using BCTs in randomized controlled trials.
3. Implementing effective interventions in practice: BCT specification facilitates faithful implementation of interventions found to be effective.
4. Replicating interventions and control conditions: Specifying interventions by BCTs aids the replication of both intervention and control conditions in subsequent investigations.
5. Synthesizing evidence: Systematic reviewers can 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 behavior change allows reviewers to investigate possible mechanisms of action (Michie et al. 2009; Dombrowski et al. 2012).
7. Accumulating scientific knowledge about behavior change: A shared terminology for specifying behavior change interventions allows the more efficient accumulation of knowledge and investigations of generalization across behaviors, populations, and settings.

Advancing the Science of Behavior Change

A well-developed system of defining and labeling BCTs allows the science of behavior change to accumulate evidence and advance theory of behavior change. The BCT approach is already providing a method for doing this. Early versions of BCT taxonomies, as well as BCTTv1, have allowed reviewers to synthesize heterogeneous interventions to identify effective component BCTs.

Evaluation of the effectiveness of combinations of BCTs can help test theories of behavior change. While the intervention content describes what is done to change behavior, theory explains how and why behavior change occurs and how components should be combined (Ruiter et al. 2014). The need to systematically apply theory to the design of interventions is reflected in the UK Medical Research Council's Guidance for complex interventions (Craig et al. 2008). So, for example, a finding that interventions with a combination of self-monitoring and feedback are effective would support the mechanisms of change proposed by Carver and Scheier's Control Theory (Carver and Scheier 1982).

Despite the importance of applying theory to the development of interventions, interventions described as "theory based" often differ widely in the extent to which they draw on theory and/or target individual theoretical constructs. This has limited our understanding of the processes of change for individual BCTs, and the extent to which theory can be systematically applied to the design of interventions. There is a clear need for a replicable, transparent methodology for linking intervention content (i.e., BCTs) to the mechanisms of action through which they change behavior.

Building on recent advances in behavioral science, research has begun to systematically examine the mechanisms of action (theoretical constructs and domains) through which individual BCTs are hypothesized to change behavior (Michie et al. 2016). The research draws on the thinking of international experts in the field through syntheses of the literature and expert consensus methodology. This work is an important step toward developing our understanding of how and why active components work within complex interventions which, in turn, is essential for designing more effective interventions.

For these methods to maximize scientific advance, we need a shared system for describing behavior change interventions, including not only the BCTs but mode of delivery, context, etc. 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 ongoing research and practice, in the same way that the labeling of peptides and botanical taxonomies continues to be developed.

Knowledge about how behavior can be changed, and the processes through which this occurs, is at the heart of behavior change science. To integrate this rapidly accelerating knowledge efficiently, an "ontology" (structure for organizing knowledge; see Larsen et al. in press) is being developed through a collaboration between behavioral, computer, and information sciences. The ontology will be used to bring together and interpret published evidence about behavior change techniques, their modes of delivery, mechanisms of action, and target behaviors along with modifying influences of populations and settings to address the question "What works how well, for whom, in what settings, for what behaviors, and why?" (for more information see www. humanbehaviourchange.org).

Cross-References

Behavior Change

Behavior Modification

Cognitive Behavioral Therapy (CBT)

Population Health

Randomized Clinical Trial

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References

- Abraham, C., Good, A., Warren, M. R., Huedo-Medina, T., & Johnson, B. (2011). Developing and testing a SHARP taxonomy of behaviour change techniques included in condom promotion interventions. *Psychology & Health, 26*(Suppl. 2), 299.
- Abraham, C., & Michie, S. (2008). A taxonomy of behaviour change techniques used in interventions. *Health Psychology, 27*, 379-387.
- Abraham, C., Wood, CE., Johnston, M., Francis, JJ., Hardeman, W., Richardson, M et al. (2015). Reliability of identification of behaviour change techniques in intervention descriptions, *Annals of Behavioral Medicine,* 49(6), 885-900.
- Arnott, B., Rehackova, L., Errington, L., Sniehotta, F. F., Roberts, J., & Araujo-Soares, V. (2014). Efficacy of behavioural interventions for transport behaviour change: Systematic review, meta-analysis and intervention coding. *The International Journal of Behavioral Nutrition and Physical Activity, 11*, 133.
- Bishop, F. L., Fenge-Davies, A. L., Kirby, S., & Geraghty, A. W. A. (2015). Context effects and behaviour change techniques in randomised trials: A systematic review using the example of trials to increase adherence to physical activity in musculoskeletal pain. *Psychology & Health, 30*(1), 104-121. doi: 10.1080/08870446.2014.953529.
- Boutron, I., Moher, D., Altman, D. G., Schulz, K. F., & Ravaud, P. (2008). Extending the CONSORT statement to randomized trials of nonpharmacologic treatment: Explanation and elaboration. *Annals of Internal Medicine, 148*(4), 295-309.
- Carey, R.N., Evans, F., Horan, M., Johnston, M., West, R. & Michie, S. (in preparation). Mode of delivery of behaviour change interventions: the development of a taxonomic method for describing and reporting.
- Carver, C. S., & Scheier, M. F. (1982). Control theory: A useful conceptual framework for personality-social, clinical, and health psychology. *Psychological Bulletin, 92*(1), 111-135.
- Collins, L. M., Baker, T. B., Mermelstein, R. J., Piper, M. E., Jorenby, D. E., Smith, S. S., et al. (2011). The multiphase optimization strategy for engineering effective tobacco use interventions. *Annals of Behavioral Medicine, 41*(2), 208-226.
- Craig, P., Dieppe, P. A., Macintyre, S., Michie, S., Nazareth, I., & Petticrew, M. (2008). Developing and evaluating complex interventions: The new Medical Research Council guidance. *BMJ, 337*, a1655.
- Davidson, K. W., Goldstein, M., Kaplan, R. M., Kaufmann, P. G., Knatterud, G. L., Orleans, C. T., et al. (2003). Evidence-based behavioral medicine: What is it and how do we achieve it? *Annals of Behavioral Medicine, 26*(3), 161-171.

- Dixon, D., & Johnston, M. (2010). *Health behaviour change competency framework: Competences to deliver interventions to change lifestyle behaviours that affect health (monograph on the Internet)*. Edinburgh: The Scottish Government, (cited 2011 Dec 8). Retrieved 2012, from www.healthscotland.com/documents/4877.aspx
- Dombrowski, S. U., Sniehotta, F. F., Avenell, A., Johnston, M., MacLennon, G., & Araujo-Soares, V. (2012). Identifying active ingredients in complex behavioral 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.
- Dusseldorp, E., van Genugten, L., van Buuren, S., Verheijden, M. W., & van Empelen, P. (2013). Combinations of Techniques That Effectively Change Health Behavior: Evidence From Meta-CART Analysis. *Health Psychology*. Advance online publication. doi: 10.1037/hea0000018
- Gardner, B., Lorencatto, F., Hamer, M., Biddle, S. (2016). How to reduce sitting time? A review of behaviour change strategies used in sedentary behaviour reduction interventions among adults. *Health Psychology Review, 10* (1), 89-112.
- Gatchel, R. J., Peng, Y. B., Peters, M. L., Fuchs, P. N., & Turk, D. C. (2007). The Biopsychosocial approach to chronic pain: Scientific advances and future directions. *Psychological Bulletin, 133*(4), 581-624.
- Hankonen, N., Sutton, S., Prevost, A. T., Simmons, R. K., Griffin, S. J., Kinmonth, A. L., & Hardeman, W. (2014). Which Behavior Change Techniques are Associated with Changes in Physical Activity, Diet and Body Mass Index in People with Recently Diagnosed Diabetes? *Annals of Behavioral Medicine*. doi: 10.1007/s12160-014-9624-9.
- Hekler, E. B., Klasnja, P., Riley, W. T., Buman, M. P., Huberty, J., Rivera, D. E. & Martin, C.A. (2016). Agile science: creating useful products for behavior change in the real world. *Translational Behavioral Medicine, 6* (2), 317-328. doi: 10.1007/s13142-016-0395-7.
- Hobbs, L., Campbell, R., Hildon, Z., & Michie, S. (2011). Behaviour change theories across psychology, sociology, anthropology and economics: A systematic review. *Psychology & Health, 26*(Suppl. 2), 31.
- Hoffmann, T.C., Glasziou, P.P., Boutron, I., Milne, R., Perera, R., Moher, D., Altman, D.G., Barbour, V., Macdonald, H., Johnston, M. and Lamb, S.E., 2014. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *British Medical Journal*, *348*, 1687.
- Kontis V, Mathers CD, Rehm J, et al. Contribution of six risk factors to achieving the 25× 25 non-communicable disease mortality reduction target: a modelling study. *Lancet.* 2014;384(9941).
- Larsen, K. R., Michie, S., Hekler, E. B., Gibson, B., Spruijt-Metz, D., Ahern, D., Cole-Lewis, H., Bartlett Ellis, R. J., Hesse, B., Moser, R. P. &

Yi, J. (In Press). Behavior change interventions: The potential for ontologies for advancing science and practice. *Journal of Behavioral Medicine.*

- McCleary, N., Duncan, EM., Stewart, F., Francis, JJ. (2013). Active ingredients are reported more often for pharmacologic than non-pharmacologic interventions: an illustrative review of reporting practices in titles and abstracts. *Trials, 14,* 146-154.
- Michie, S., Abraham, C., Eccles, M. P., Francis, J. J., Hardeman, W., & Johnston, M. (2011). Strengthening evaluation and implementation by specifying components of behaviour change interventions: A study protocol. *Implementation Science, 6*, 10.
- 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*(6), 690-701.
- Michie, S., Ashford, S., Sniehotta, F. F., Dombrowski, S. U., Bishop, A., & French, D. P. (2011). A refined taxonomy of behaviour change techniques to help people change their physical activity and healthy eating behaviours - the CALO-RE taxonomy. *Psychology & Health*, *26*(11), 1479-1498.
- Michie, S., Carey, R.N., Johnston, M., Rothman, A., de Bruin, M., Kelly, M., & Connell, L.E. (2016). From theory-inspired to theory-based interventions: A protocol for developing and testing a methodology for linking behaviour change techniques to theoretical mechanisms of action. *Annals of Behavioral Medicine,* 1-12. doi: 10.1007/s12160-016-9816-6
- Michie, S., Fixsen, D., Grimshaw, J., & Eccles, M. (2009). Specifying and reporting complex behaviour change interventions: The need for a scientific method. *Implementation Science, 4*, 40.
- Michie, S., Hyder, N., Walia, A., & West, R. (2011). Development of a taxonomy of behaviour change techniques used in individual behavioural support for smoking cessation. *Addictive Behaviors, 36*(4), 315-319.
- Michie, S., Johnston, M., Francis, J., Hardeman, W., & Eccles, M. (2008). From theory to intervention: Mapping theoretically derived behavioural determinants to behaviour change techniques. *Applied Psychology*, *57*, 660-680.
- Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., … Wood, C. (2013). The behaviour change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Annals of Behavioral Medicine, 46*(1), 81-95. doi: 10.1007/s12160-013-9486-6
- Michie, S., van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science, 6*, 42.
- Michie, S., West, R., Sheals, K., & Godinho, C. (under review). Evaluating the effectiveness of behaviour change techniques in health-related behaviour: a review of methods used.

- 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. doi:10.1111/j.1360-0443.2012.03845.xs
- Michie, S., Wood, C., Johnston, M., Abraham, C., Francis, J., & Hardeman, W. (2015). Behaviour Change Techniques: The Devlelopment and Evaluation of a Taxonomic Method for Reporting and Describing Behaviour Change Interventions. *Health Technology Assessment, 19*(99). doi: 10.3310/hta19990
- Montgomery, P. Mayo-Wilson, E., Hopewell, S., Macdonald, G., Moher, D. & Grant, S. (2013). Developing a reporting guideline for social and psychological intervention trials, *American Journal of Public Health,* 103(10), 1741-1746.
- Murray, R. L., Szatkowski, L., & Ussher, M. (2013). Evaluation of a refined, nationally disseminated self-help intervention for smoking cessation ("quit kit-2"). *Nicotine and Tobacco Research*, 15(8), 1365-1371. doi: 10.1093/ntr/nts286
- Newbury-Birch, D., Coulton, S., Bland, M., Cassidy, P., Dale, V., Deluca, P., . . . Drummond, C. (2014). Alcohol screening and brief interventions for offenders in the probation setting (SIPS Trial): A pragmatic multicentre cluster randomized controlled trial. *Alcohol and Alcoholism, 49*(5), 540-548.
- NHS Centre for Smoking Cessation and Training (NCSCT) [homepage on the Internet]. UK: NCSCT; c2011 (cited 2011 Dec 8). Retrieved from http://www.ncsct.co.uk/
- O'Carroll, R. E., Chambers, J. A., Dennis, M., Sudlow, C., & Johnston, M. (2014). Improving medication adherence in stroke survivors: Mediators and moderators of treatment effects. *Health Psychology*, *33*(10), 1241-1250.
- Peters, G. J. Y., de Bruin, M., & Crutzen, R. (2015). Everything should be as simple as possible, but no simpler: towards a protocol for accumulating evidence regarding the active content of health behaviour change interventions. *Health Psychology Review*, *9*(1), 1-14.
- Presseau, J., Ivers, N.M., Newham, J.J., Knittle, K., Danko, K.J., Grimshaw, J. (2015). Using a behaviour change techniques taxonomy to identify active ingredients within trials of implementation interventions for diabetes care. *Implementation Science, 10* (55), 1-10.
- Ruiter, R. A., Kessels, L. T., Peters, G. J. Y., & Kok, G. (2014). Sixty years of fear appeal research: Current state of the evidence. *International journal of psychology*, *49*(2), 63-70.
- Smith S, Fielding S, Murchie P, Johnston M, Wyke S, Powell R, Devereux G, Nicolson M, Macleod U, Wilson P, Ritchie L. Reducing the time before consulting with symptoms of lung cancer: a randomised controlled trial in primary care. Br J Gen Pract. 2013 Jan 1;63(606):e47-54.
- Webb, J., Foster, J., Poulter, E. (2016). Increasing the frequency of physical activity very brief advice for cancer patients. Development of an

intervention using the behaviour change wheel. *Public Health*, 1-12, 10.1016/j.puhe.2015.12.009.

- West, R., Evans, A., & Michie, S. (2011). Behavior change techniques used in group-based behavioral support by the English Stop-Smoking Services and preliminary assessment of association with short-term quit outcomes. *Nicotine & Tobacco Research*, *13*, 1316-1320.
- West, R., Walia, A., Hyder, N., Shahab, L., & Michie, S. (2010). Behavior change techniques used by the English Stop Smoking Services and their associations with short-term quit outcomes. *Nicotine & Tobacco Research, 12*(7), 742-747.
- Wood, CE., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W. et al. (2014). Applying the Behaviour Change Technique (BCT) Taxonomy v1: a study of user training. *Transl. Behav. Med.* 5, 134-148.
- Yoon PW, Bastian B, Anderson RN, Collins JL, Jaffe HW. Potentially preventable deaths from the five leading causes of death-United States, 2008-2010. *MMWR Morb Mortal Wkly Rep.* 2014;63(17):369-374.
- Young, M.D., Plotnikoff, R.C., Collins, C.E., Callister, R., Morgan, P.J. (2015). Impact of a male-only weight loss maintenance programme on social-cognitive determinants of physical activity and healthy eating: A randomized controlled trial. *British Journal of Health Psychology, 20*, 724-744).