Characterising intervention content in terms of behaviour change techniques

Susan Michie

Professor of Health Psychology

Director of Centre for Behaviour Change

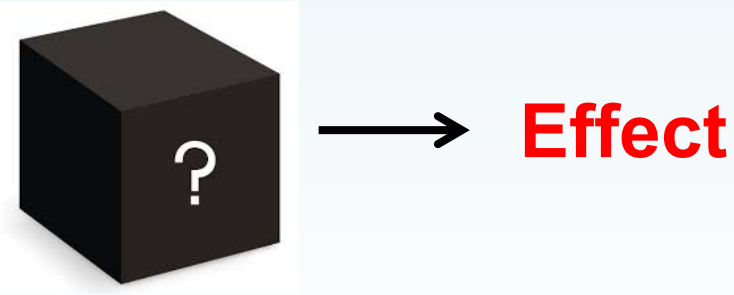
University College London

@SusanMichie

UCL Centre for Behaviour Change

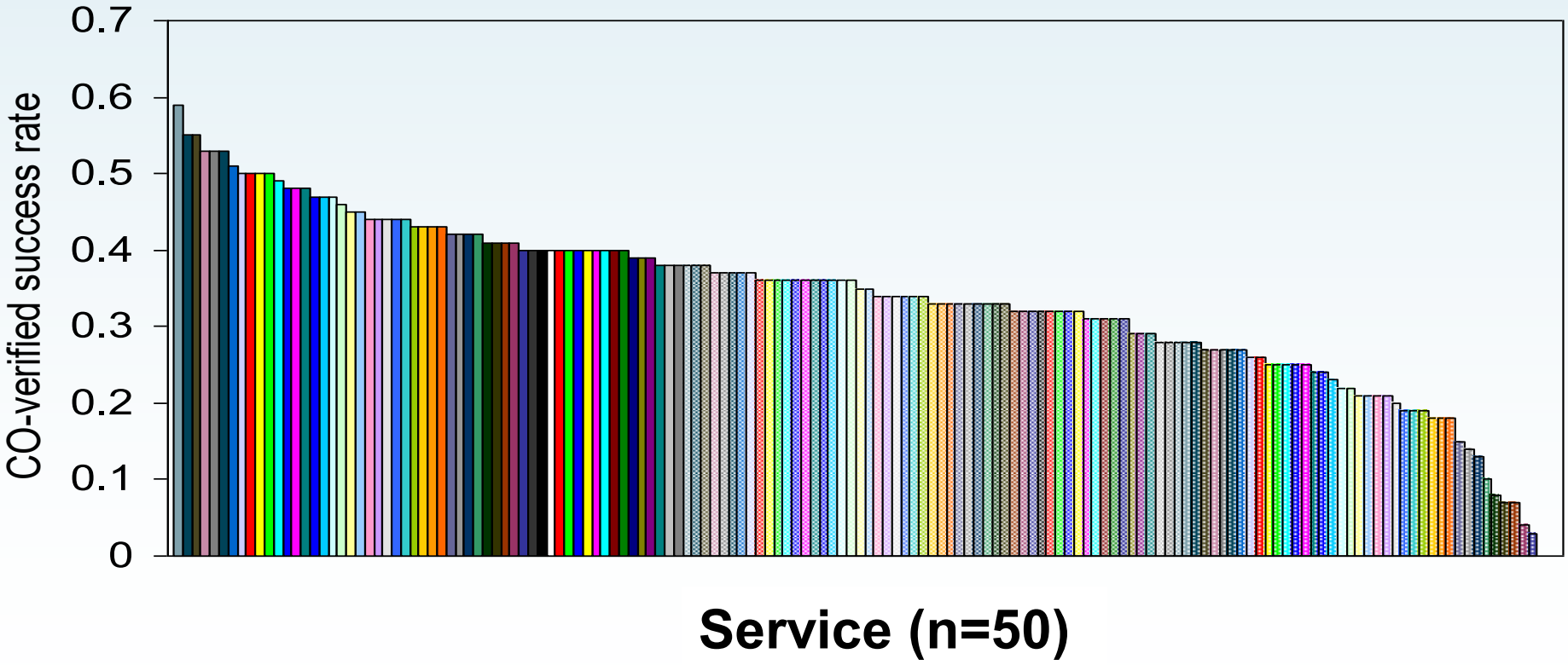
Interventions to change behaviour

- Are complex and have had variable effects
  - *Cochrane database*
- If we are to improve interventions, need to
  - Unpack the black box of interventions
    - What is in the black box?
    - How do components have their effect?
    - How to use this information to design more effective interventions?



Stop Smoking Services: Variability of success rates by service 2008-9

West et al, *British Medical Journal*, 2013



What is in the black box?

- Poor descriptions of interventions
  - Vague and lacking detail
  - Inconsistent and varying terminology
- We need good, clear descriptions
  - Using language that is understood by all
    - Same term used for same component
- Without this, we are limited in our ability to
  - replicate,
  - implement effective interventions,
  - evaluate or
  - improve interventions

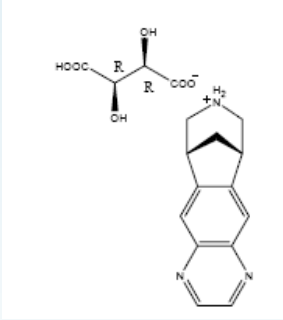
Example of the problem: Descriptions of "behavioural counselling" in two interventions

Title of journal article	Description of "behavioural counseling"
The impact of ***behavioral counseling*** on stage of change fat intake, physical activity, and cigarette smoking in adults at increased risk of coronary heart disease	"***educating*** patients about the benefits of lifestyle change, encouraging them, and suggesting what changes could be made" (Steptoe et al. *AJPH* 2001)
Effects of internet ***behavioral counseling*** on weight loss in adults at risk for Type 2 diabetes	"***feedback*** on ***self-monitoring*** record, ***reinforcement***, recommendations for change, answers to questions, and general support" (Tate et al. *JAMA* 2003)

Biomedicine vs behavioural science …
example of smoking cessation effectiveness

Varenicline *JAMA*, 2006

- Intervention content



- Mechanism of action
  - Activity at a subtype of the nicotinic receptor where its binding produces agonistic activity, while simultaneously preventing binding to a4b2 receptors

Behavioural counselling *Cochrane*, 2005

- Intervention content
  - Review smoking history & motivation to quit
  - Help identify high risk situations
  - Generate problem-solving strategies
  - Non-specific support & encouragement
- Mechanism of action
  - *None mentioned*

Reporting guidelines for trials e.g.

- CONSORT: for randomised trials
- TREND: for non-randomised trials
- SPIRIT: for protocols
- See Equator Network http://www.equator-network.org/reporting-guidelines/

CONSORT

Section/Topic	Item No	Checklist item
Title and abstract		
	1a	Identification as a randomised trial in the title
	1b	Structured summary of trial design, methods, results, an NSORT for abstracts)
Introduction		
Background and objectives	2a	Scientific background and explanation of rationale
	2b	Specific objectives or hypotheses
Methods		
Trial design	3a	Description of trial design (such as parallel, factorial) includ cation ratio
	3b	Important changes to methods after trial commencemen ch as eligibility criteria), with reasons
Participants	4a	Eligibility criteria for participants
	4b	Settings and locations where the data were collect d
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered

What are 'sufficient details'?

Consensus methodology:
Describe content in terms of behaviour change techniques (BCTs)

- "Active ingredients" within the intervention designed to change behaviour
- They are
  - discrete, low-level components of an intervention that on their own have potential to change behaviour
  - observable and replicable

Michie S, Johnston M, Carey R. (2016). Behavior change techniques. In Turner, JR. (Ed.) *Encyclopedia of Behavioral Medicine*. Springer New York.

"Taxonomies" of BCTs

- Smoking cessation: 53 BCTs
  Michie et al, Annals behavioural Medicine, 2010
- Reducing excessive alcohol use:
  Michie et al, Addiction, 2012
- Physical activity/healt 26 BCTs
  Abraham & Michie , 2008
- Physical acti g. 40 BCTs
  Michie et al,
- Cond
  Ab
- G behaviour change: 137 BCTs
  Michie et al, Applied Psychology: An International Review, 2008
- Competence framework: 89 BCTs
  Dixon & Johnston, 2011

Fragmentation rather than integration

ann. behav. med.
DOI 10.1007/s12160-013-9486-6

ORIGINAL ARTICLE

The Behavior Change Technique Taxonomy (v1) of 93 Hierarchically Clustered Techniques: Building an International Consensus for the Reporting of Behavior Change Interventions

Susan Michie, DPhil, CPsychol · Michelle Richardson, PhD · Marie Johnston, PhD, CPsychol · Charles Abraham, DPhil, CPsychol · Jill Francis, PhD, CPsychol · Wendy Hardeman, PhD · Martin P. Eccles, MD · James Cane, PhD · Caroline E. Wood, PhD

Abstract

Background CONSORT guideli… …gredients in an open- reporting of behavior chang… …ment amongst six researchers ous methods of cha… …ition descriptions by BCTs was tions with pr… …s This resulted in 93 BCTs clustered into 16 groups. *Objec*… Of the 26 BCTs occurring at least five times, 23 had adjust- ex… ed kappas of 0.60 or above.

ono… …tax- used… …ques (BCTs)]

Metho… …erse, 14 experts rated la- bels an… …124 BCTs from six published classifica… …ems. Another 18 experts grouped BCTs

Conclusions "BCT taxonomy v1," an extensive taxonomy of 93 consensually agreed, distinct BCTs, offers a step change as a method for specifying interventions, but we anticipate further development and evaluation based on international, interdisciplinary consensus.

Electronic supplementary material The online version of this article (doi:10.1007/s12160-013-9486-6) contains supplementary material, which is available to authorized users.

S. Michie (✉) · M. Johnston · C. E. Wood
Centre for Outcomes Research Effectiveness,
Research Department of Clinical, Educational and Health Psychology,
University College London, 1-19 Torrington Place,
London WC1E 7HB, UK
e-mail: s.michie@ucl.ac.uk

J. Francis
Division of Health Services Research & Management,
City University London,
C332 Tait Building, City University London, Northampton Square,
London EC1V 0HB, UK

W. Hardeman

93 item BCT Taxonomy v1, Annals of Behavioral Medicine, 2013

BCT Taxonomy v1

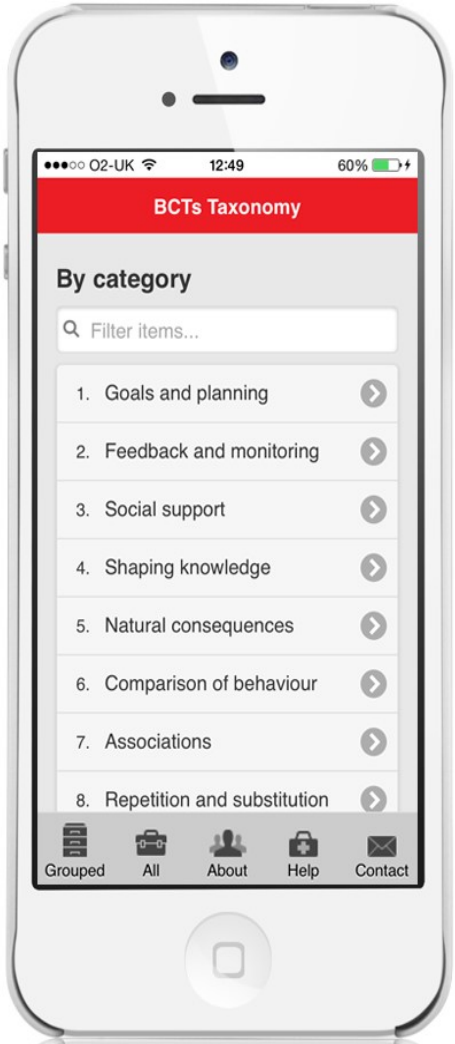
- Developed by 400 experts from 12 countries
- Clearly labelled, well defined, distinct, precise; can be used with confidence by a range of disciplines and countries
- Hierarchically organised to improve ease of use
- Applies to an extensive range of behaviour change interventions

BCT Taxonomy v1: 93 items in 16 groupings

Page	Grouping and BCTs	Page	Grouping and BCTs	Page	Grouping and BCTs
1	**1. Goals and planning**	8	**6. Comparison of behaviour**	16	**12. Antecedents**
	1.1. Goal setting (behavior) 1.2. Problem solving 1.3. Goal setting (outcome) 1.4. Action planning 1.5. Review behavior goal(s) 1.6. Discrepancy between current behavior and goal 1.7. Review outcome goal(s)		6.1. Demonstration of the behavior 6.2. Social comparison 6.3. Information about others' approval		12.1. Restructuring the physical environment 12.2. Restructuring the social environment 12.3. Avoidance/reducing exposure to cues for the behavior 12.4. Distraction 12.5. Adding objects to the
		9	**7. Associations**		
			7.1. Prompts/cues		

No.	Label	Definition	Examples
1. Goals and planning			
1.1	***Goal setting (behavior)***	Set or agree on a goal defined in terms of the behavior to be achieved *Note: only code goal-setting if there is sufficient evidence that goal set as part of intervention; if goal unspecified or a behavioral outcome, code **1.3, Goal setting (outcome)**; if the goal defines a specific context, frequency, duration or intensity for the behavior, also code **1.4, Action planning***	Agree on a daily walking goal (e.g. 3 miles) with the person and reach agreement about the goal Set the goal of eating 5 pieces of fruit per day as specified in public health guidelines

The BCT smartphone app



- Search by BCT label, BCT category or alphabetically

or

Find by search term: BCTs

www.bct-taxonomy.com

An agreed, standard method to …

- Describe interventions as accurately as possible
  - Replicate interventions to generate evidence
  - Assess fidelity
  - Implement effective interventions
- Evaluate e.g. in reviews or factorial designs
  - Identify active ingredients (what)
  - Investigate mechanisms of action (how)
- Design interventions
  - BCTs linked to broader intervention frameworks

Examples of BCT application

1. Specialist support for smoking cessation
   a. Identification of BCTs associated with quitting as basis for a national training programme
   b. Evaluation of fidelity of delivery
2. Brief interventions for reducing alcohol consumption
   a. Re-analysis of systematic review to identify effective BCTs

Which BCTs are most effective for smoking cessation?

- From the evidence …
  - Randomised controlled trials (Cochrane reviews) and observational evidence (NHS service 4-week quit rates)
- **43** BCTs in behavioural support for smoking cessation
  - Michie et al, 2011, *Addictive Behaviours*
- **16** with good evidence of effectiveness
- **8** 'core' = good evidence + identified as important by experts

8 core BCTs supported by evidence

1. Capability
    1. Facilitate barrier identification and problem solving
    2. Facilitate relapse prevention and coping
    3. Facilitate goal setting
    4. Advise on stop-smoking medication
2. Motivation
    1. Provide information on consequences of smoking and smoking cessation
    2. Measure CO
3. Opportunity
    1. Give options for additional and later support
4. General role
    1. Provide information on withdrawal symptoms

Basis of National Centre for Smoking Cessation and Training's Standard Treatment Protocol (STP)

www.ncsct.co.uk

Fidelity: What is reported and what is delivered? Example of smoking cessation

- BCT analysis of protocols and delivery of behavioural support for smoking cessation
  - Protocols of interventions from Cochrane reviews
  - Delivery in practice
    - 41% of protocol-defined BCTs delivered in 54 behavioural support sessions, Lorencatto et al, 2013, 2014; *J Cons & Clin Psy*
      - reliable measure, Lorencatto et al, 2013, *Imp Sci*
    - <50% of BCTs specified in protocols were reported in publications, Lorencatto et al, 2012, *N&TR*

Excessive alcohol use: what is effective in brief interventions?

- Have small but clinically significant effect with high heterogeneity of effect (Kaner et al, Cochrane, 2007)
- Little is known about the ‘active ingredients’ within these multi-faceted interventions
- This limits the capacity to design more effective interventions

BCT analysis of 2007 Cochrane review

- Identified 42 BCTs used in brief interventions
  - 34 from guidance documents and 8 from treatment manuals (Michie et al, 2012)
- Meta-regression of 18 trials
- A cluster of self-regulation BCTs explained variation in effect sizes between studies
- Prompting self-monitoring of alcohol consumption was significantly associated with outcome ($p=0.002$).

Michie, Whittington, Hamoudi, Zarnani, Tober, West (2012) *Addiction*

Summary

- We have a reliable, shared method of describing intervention content by BCTs
- Allows us to
  - Specify interventions to enable replication and accurate implementation of effective interventions
  - Identify effective BCTs within complex interventions
    - from systematic literature reviews
    - by linking treatment protocols to routine outcomes
  - Monitor effects of training and fidelity of intervention delivery

MSc in Behaviour Change

www.ucl.ac.uk/behavior-change

- Cross-disciplinary
- Taught by world experts
- Links to placements

Course Directors:
Prof Susan Michie & Dr Paul Chadwick

- Register now for September 2017
- Open to students from diverse backgrounds
- Full-time or part-time

ADDITIONAL SLIDES

Examples of behaviour change techniques

- Capability
  1. Goal-setting
  2. Self-monitoring
  3. Action planning
- Opportunity
  1. Social support
  2. Environmental restructuring
  3. Prompts/ cues
- Motivation
  1. Incentives
  2. Graded tasks
  3. Focus on past success

Behavioural support: smoking cessation & reduction of excessive alcohol consumption

- Behaviour change interventions are complex
- Effective development and evaluation requires
  1. Good description
  2. Identifying effective component techniques
     - evidence synthesis
     - primary research
  3. Linking techniques to mechanisms of action

Interventions are complex

- Several, potentially interacting, techniques
- Vary in
  - content or elements of the intervention
  - delivery of the intervention
    - the mode of delivery (e.g., face-to-face)
    - the intensity (e.g., contact time)
    - the duration (e.g., number sessions over a given period)
    - characteristics of those delivering the intervention
    - characteristics of the recipients,
    - characteristics of the setting (e.g., worksite)
  - adherence to delivery protocols

Davidson et al, *Annals of Beh Med*, 2003

Reporting guidelines for interventions

TIDieR
Template for Intervention Description and Replication

The TIDieR (Template for Intervention Description and Replication) Checklist*:

Information to include when describing an intervention and the location of the information

12 items

Item number	Item	Where located **	
		Primary paper (page or appendix number)	Other † (details)
	BRIEF NAME		
1.	Provide the name or a phrase that describes the intervention.		
	WHY		
2.	Describe any rationale, theory, or goal of the elements essential to the intervention.		
	WHAT		
3.	Materials: Describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers. Provide information on where the materials can be accessed (e.g. online appendix, URL).		
4.	Procedures: Describe each of the procedures, activities, and/or processes used in the intervention, including any enabling or support activities.		
	WHO PROVIDED		
5.	For each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given.		
	HOW		
6.	Describe the modes of delivery (e.g. face-to-face or by some other mechanism, such as internet or		

***BMJ* 2014;**
Hoffmann, Glasziou, Boutron, Milne, Perera, Moher, Altman, Barbour, MacDonald, Johnston, Lamb, Dixon-Woods, McCulloch, Wyatt, Chan, Michie

Stop Smoking Services

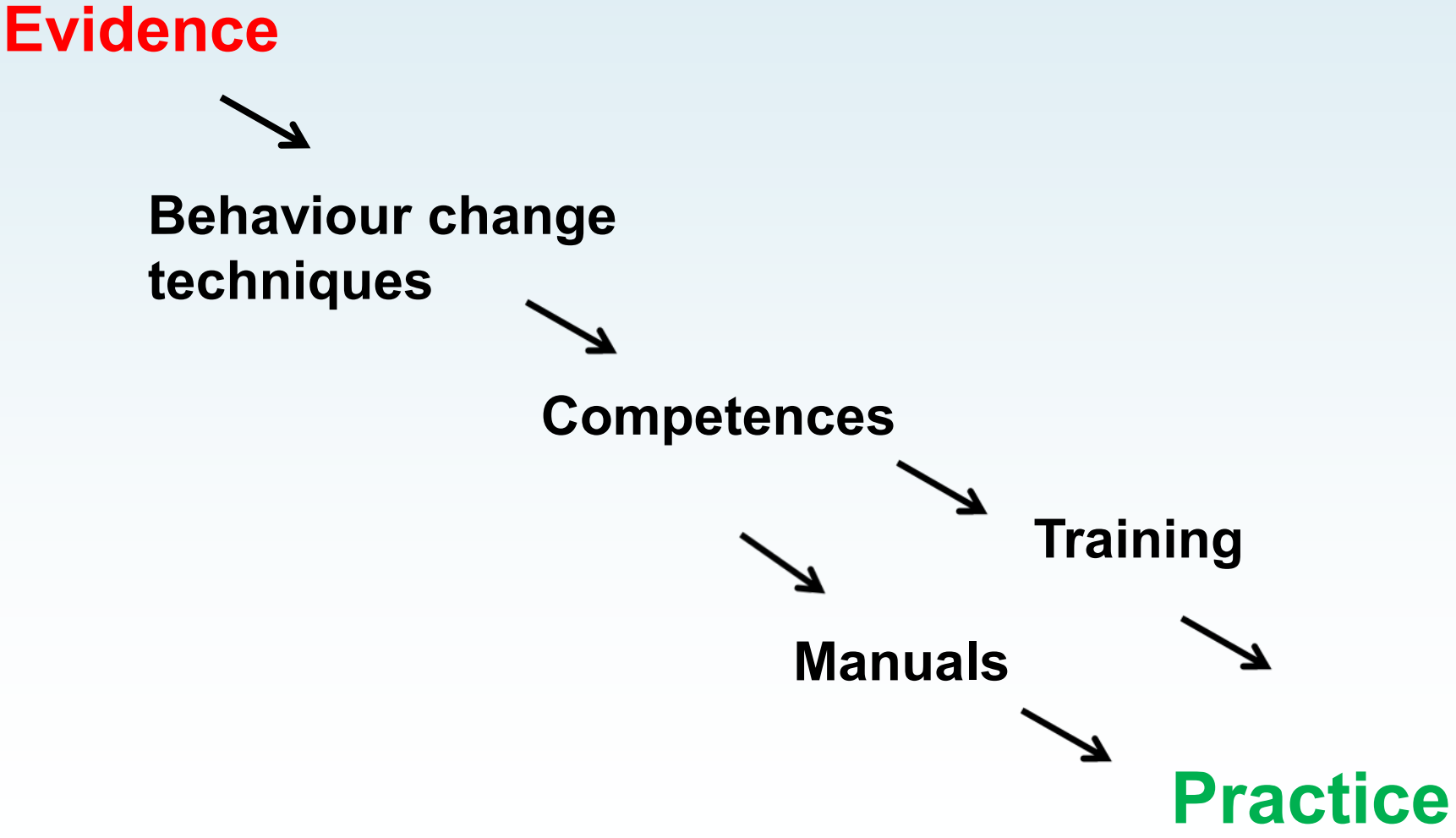
- Question
  - What is the association between intervention content and outcome in the Stop Smoking Services?
- Method
  - BCT analysis of treatment manuals from 43 primary care organisations
  - 4 week quit rates obtained from DH for >100,000 smokers in those services

West, Walia, Hyder, Shahab & Michie, 2010

Results

- Mean of 22 BCTs
  - range 9-37
- 9 BCTs associated with both self-reported and CO-verified 4-week quit rates e.g.
  - strengthen ex-smoker identity
  - provide rewards contingent on abstinence
  - advise on medication
  - measure CO
- Further 5 BCTs associated with CO-verified but not self-reported quit rates e.g.
  - advise on/facilitate use of social support
  - provide reassurance

Investigation of evidence into practice



Two further questions investigated

- Do practitioners follow manuals?
  - 'Fidelity'
- How well are behaviour change techniques delivered?
  - 'Quality'

Fidelity of delivery: UK telephone quitline

- Manual analysed by BCTs
- Transcripts of 64 sessions delivered by 6 counsellors coded by BCT
  - 27 Pre-quit sessions
  - 16 Quit-day sessions
  - 21 Post-quit sessions
- Inter-rater reliability of coding high: average 87%

Lorencatto et al, 2014, *J Cons & Clin Psy*

Results

SESSION TYPE	NUMBER OF BCTS IN MANUAL	AVERAGE NUMBER (%) MANUAL BCTs DELIVERED	SD/RANGE
PRE-QUIT (n=27)	22	10 (46%)	SD 16.9 Range: 14-82%
QUIT-DAY (n=16)	25	9 (35%)	SD 14.8 Range: 8-60%
POST-QUIT (n=21)	28	12 (42%)	SD 16.3 Range: 8-82%
ACROSS SESSIONS	**25 (average)**	**10.3 (41%)**	-

Fidelity: <50% = 'low fidelity'

8 core BCTs: how well are they delivered?

1. Provide information on consequences of smoking and smoking cessation
2. Measure CO
3. Facilitate barrier identification and problem solving
4. Facilitate relapse prevention and coping
5. Facilitate goal setting
6. Advise on stop-smoking medication
7. Give options for additional and later support
8. Provide information on withdrawal symptoms

Michie et al (2011) *Annals of Behavioral Medicine*

Quality of delivery: UK telephone quitline

- Reliable measure of quality of delivery
  - 10-item measure of the quality of delivery of a key BCT, setting a quit date (i.e. goal-setting)
- Transcripts of 85 audio-recorded pre-quit behavioural support sessions
- Outcome
  - whether client made a quit attempt as planned
    - assessed by self-report at following session (yes/no)

0	Absence of goa
+1	Prompts goal se
+1	Agrees clear qu
+1	Agreed quit dat
+1	Quit date allows
+1	Advice why cutt
+1	Emphasise goal is smoke a single cigarette/puff
+1	Provide relevant normative information and examples
-1	Inappropriate goal setting (i.e. unclear date, incorrect time frame)
-1	Encourages or reinforces cutting down
-1	Undermines client commitment to quit date (i.e. imply flexibility)

Points allocated for appropriate delivery

Points deducted for inappropriate delivery

Score range: -3 to 7

Higher score implies more comprehensive + appropriate delivery

Results

- Average quality score low: **1.6** (SD 1.2; scale range: -3 to 7)
- Does quality predict increased likelihood of quit attempt?
  - Logistic regression
  - Higher quality goal setting increased likelihood of making quit attempt: Odds Ratio **2.60** p<.001
  - Setting a clear quit date (dd/mm/yy) predicted making quit attempt: Odds Ratio **36.9**, p<.001

Conclusions: fidelity and quality

- Evidence-based manuals only partially delivered
  - need for better training?
  - need for better manuals?
- Good outcomes depend on not just which BCTs delivered, but how well they are delivered
- To know how best to improve practice, need to
  - Collect data to monitor outcomes
  - Conduct research to build evidence about what works for whom