Understanding and Changing Behaviour: Theories and Techniques

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This talk

1. Social Psychology and Health
2. Behaviour Change: principles and challenges
3. Designing interventions: theory and techniques
4. Illustration: digital interventions

Social Psychology Models applicable to addressing health issues

- Multilevel
  - Influences at one level interact with those at others
- Applicable in multiple contexts
  - Rather than domain specific
- Strengthened by experimentally testing in an applied context, such as health
  - E.g. cognitive dissonance theory, social comparison theory, self-affirmation theory, theory of reasoned action

Klein et al, *Pers & Social Psych Rev*, 2014

However .....

- Of 467 studies
  - in *Pers & Soc Psych Bull*; *J Pers & Soc Psych* in 2012
- only 3.2% addressed health-related topics

Klein et al, *Pers & Social Psych Rev*, 2014

What is holding back social psychology's contribution to health?

- Methodological
  - E.g. infrequent measurement of behaviour
    - *JPSP* – measurement of observable behaviour as outcome decreased from 80% of studies in mid-70's to 20% in 2006
    - Attention shifted to intra-psychic antecedents of behaviour
  - Future: Sensor technology provides huge potential to measure behaviour in real-time and real contexts
- Disciplinary norms and practices
  - E.g. limited emphasis on interdisciplinary research
- Translational focus
  - Limited consideration of what it would take to translate findings and theory into practice and policy

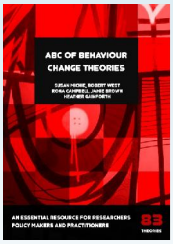
Michie et al, Moving from Theory to Practice and Back in Social and Health Psychology, *Health Psychology*, 2014

Social Psychology is strong in theory: Applying theory to interventions

- Theory: How things relate to each other
  - 'things' - behaviours, thoughts, emotions, environmental and social variables
- In relation to interventions …
  - How they "work"
    - mechanisms of action
    - 'mediators'
  - Why they vary
    - across population, setting, type of target
    - 'moderators' or 'modifying variables'

Applying theory to changing behaviour

- Apply formal theory
  - 83 theories of behaviour change identified in cross-disciplinary review
    - www.behaviourchangetheories.com
    - Davis et al, 2014, *Health Psychology Review*
  - Theory Coding Scheme,
    - Michie & Prestwich, 2010, *Health Psychology*



OR

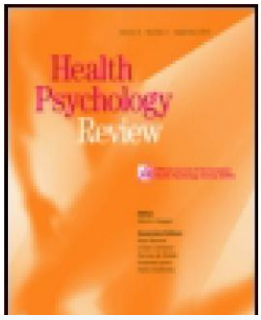
- Use an integrative theoretical framework
  - Behaviour Change Wheel
    - www.behaviourchangewheel.com
    - Michie et al, 2011, *Implementation Science*

What formal theories?

- Interventions to change health-related behaviours often not explicitly ba
- The range of theories dr ed
- For example,
  - A revie tions to increase
    ating (Prestwich et al, 2014, *Health*

Are there potentially useful theories that are under-used?

d theory i.e. almost half did not
ies dominated: Social Cognitive Theory (n=59) & TransTheoretical Model (n=58)
- All other theories: n=45



Health Psychology Review
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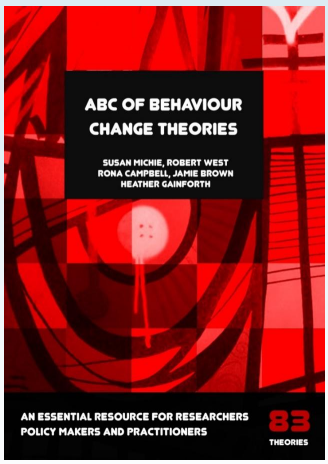
Theories of behaviour and behaviour change across the social and behavioural sciences: a scoping review

Rachel Davis[a], Rona Campbell[b], Zoe Hildon[a], Lorna Hobbs[a] & Susan Michie[a]

Cross-disciplinary literature review with Advisory group from psychology, sociology, anthropology and economics

Findings

- 83 theories
  - Summary of original description
  - List of constructs
    - 1738; mean 19, range 5-84
  - Network diagram of source theories
  - Future: Searchable website



Davis et al, *Health Psychology Review,* 2014
Michie et al, www.behaviourchangetheories.com, 2014

1. Action Theory Model of Consumption
2. Affective Events Theory
3. Aids Risk Reduction Model
4. Behavioural-Ecological Model of Adolescent Aids Prevention
5. CEOS Theory
6. Change Theory
7. Classical Conditioning
8. COM-B System
9. Consumption as Social Practices
10. Containment Theory
11. Control Theory
12. Differential Association Theory
13. Diffusion of Innovations
14. Ecological Model for Preventing Type 2 Diabetes in Minority Youth
15. Extended Information Processing Model
16. Extended Parallel Processing Model
17. Feedback Intervention Theory
18. Focus Theory of Normative Conduct
19. General Theory of Crime
20. General Theory of Deviant Behaviour
21. Goal Directed Theory
22. Goal-Framing Theory
23. Goal Setting Theory
24. Health Action Process Approach
25. Health Behaviour Goal Model
26. Health Behaviour Internalisation Model
27. Health Belief Model
28. Health Promotion Model
29. I-Change Model
30. Information-Motivation-Behavioural Skills Model
31. Information-Motivation-Behavioural Skills Model of Adherence
32. Integrated Theoretical Model for Alcohol and Other Drug Abuse Prevention
33. Integrated Theory of Drinking Behaviour
34. Integrated Theory of Health Behaviour Change
35. Integrative Model of Behavioural Prediction
36. Integrative Model of Factors Influencing Smoking Behaviour
37. Integrative Model of Health Attitude and Behaviour Change
38. Integrative Model of Factors Influencing Smoking And Attitude And Health Behaviour Change
39. Model of Pro-Environmental Behaviour
40. Motivation-Opportunities-Abilities Model
41. Needs-Opportunities-Abilities Model
42. Norm Activation Theory

43. Operant Learning Theory
44. Precaution Adoption Process Model
45. Pressure System Model
46. PRIME Theory
47. Problem Behaviour Theory
48. Prospect Theory
49. Protection Motivation Theory
50. Prototype Willingness Model
51. Rational Addiction Model
52. Reflective Impulsive Model
53. Regulatory Fit Theory
54. Relapse Prevention Model
55. Risk as Feelings Theory
56. Self-Determination Theory
57. Self-Efficacy Theory
58. Self-Regulation Theory
59. Six Staged Model of Communication Effects
60. Social Action Theory (1)
61. Social Action Theory (2)
62. Social Change Theory
63. Social Cognitive Theory
64. Social Consensus Model of Health Education
65. Social Development Model
66. Social Ecological Model of Behaviour Change
67. Social Ecological Model of Walking
68. Social Identity Theory
69. Social Influence Model of Consumer Participation
70. Social Learning Theory
71. Social Norms Theory
72. Systems Model of Health Behaviour Change
73. Technology Acceptance Model 1, 2 & 3
74. Temporal Self-Regulation Theory
75. Terror Management Theory
76. Terror Management Health Model
77. Theory of Interpersonal Behaviour
78. Theory of Normative Social Behaviour
79. Theory of Planned Behaviour
80. Theory of Triadic Influence
81. Transcontextual Model of Motivation
82. Transtheoretical Model of Behaviour Change
83. Value Belief Norm Theory

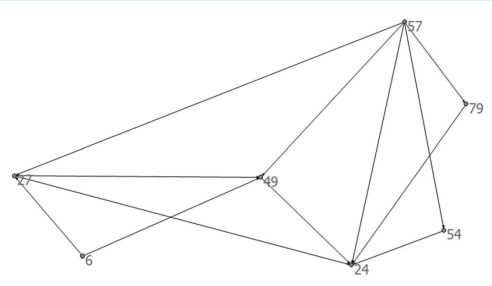
State of formal theories

- Theories
  - often poorly described
  - most are partial accounts
    - 3 of the 83 identified set out to be integrative
  - much overlap
- Constructs
  - often poorly described
  - many appear the same or similar
  - lack of correspondence between labels and definitions
  - relationships between them poorly specified

Example of construct list: Social Cognitive Theory (Bandura, 1986)

- Triadic reciprocality
  - Behaviour
  - Personal and cognitive factors
  - Environment
- Basic capabilities
  - Symbolising capability
  - Forethought capability
  - Vicarious capability
  - Self-regulatory capability
  - Self-reflective capability
    - Perceived self-efficacy

Example of network analysis: Health Action Process Approach (Schwarzer, 1992; 2008)



24. HAPA
27. Health Belief Model
49. Protection Motivation Theory
54. Relapse Prevention Model
57. Self-efficacy Theory
79. Theory of Planned Behaviour

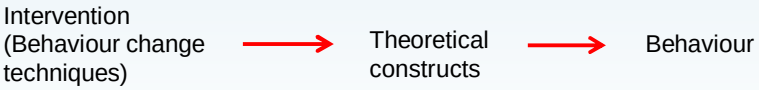
How well is theory applied?

- Theory Coding Scheme: Reliable scale of 19 items covering …
  1. Whether theory mentioned
  2. How theory is directly used in intervention design
  3. How theory indirectly influenced intervention via tailoring or participant selection
  4. How theory explains intervention effects
  5. How theory informs future theory development

Michie et al, *Health Psychology*, 2010

Review of interventions Prestwich et al, 2014

- Of 56% (107 of 190) studies explicitly reporting theory
  - Theory was used partially and inconsistently e.g.



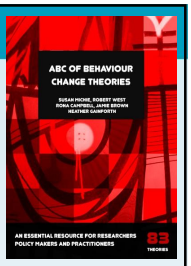
- 90% studies: behaviour change techniques not linked to theoretical constructs
- 91% studies: constructs not targeted by behaviour change techniques

Conclusions: Davis and Prestwich reviews

- There are many (>83) theories to choose from
  - But the field is dominated by a very few
- Most theories are partial accounts
  - 3 of the 83 identified set out to be integrative
- Application of theory to intervention design and evaluation is currently poor
  - **There is room for improvement!**

Improving the reporting of theory

Item	Description
Name	What is the name of the theory (including an acronym if appropriate)?
Brief summary	What is the theory about and what are its main propositions?
Scope	What phenomena does the theory seek to explain?
Target	Is the theory about individuals, populations, or social structures (e.g. organisations)?
Type	What broad type of theory is it? (statistical, realist, dynamic, narrative)
Rationale	Why is the theory needed and how does the theory improve on any previous theories?
Constructs	What are the elements of the theory, indicating in each case whether they are hypothetical constructs?
Relationships	How are the elements of the theory related to each other?
Provenance	What theories does it draw on and how?
Similarity	What theories is this theory most like?
Complementarity	What theories can this one be used alongside?
Operationalisation	How, if at all, are the constructs measured or identified?
Hypotheses	What specific hypotheses does the theory make and how do these differ from other theories?
Uses	What can the theory be used for?



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What is a good theory? Nine criteria

Multidisciplinary consensus, 2014

1. Clarity of constructs
2. Clarity of relationships between constructs
3. Measurability
4. Testability
5. Being explanatory
6. Describing causality
7. Achieving parsimony
8. Generalisability
9. Having an evidence base

Applying theory to changing behaviour

- Apply formal theory
  - 83 theories of behaviour change identified in cross-disciplinary review
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OR

- Use integrative theoretical framework
  - COM-B/ Behaviour Change Wheel
    - www.behaviourchangewheel.com
    - Michie et al, 2011, *Implementation Science*

Working with other disciplines

Understand target behaviour

1. Define problem in behavioural terms
2. Select target behaviour (what you will change to address the problem)
3. Specify target behaviour (what, where, when, how, with whom, in what context…)
4. Understand what needs to change to achieve target behaviour (COM-B and TDF)

Design intervention

Identify:

5. Intervention functions
6. Behaviour Change Techniques

Deliver intervention

Select:

7. Mode of delivery
8. Policy categories

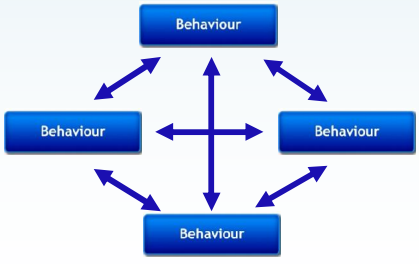
Understand the behaviour in context

- Why are behaviours as they are?
- What needs to change for the desired behaviour/s to occur?

- Answering this is helped by a model of behaviour
  - COM-B
  - Behaviour is part of a system and itself is a system

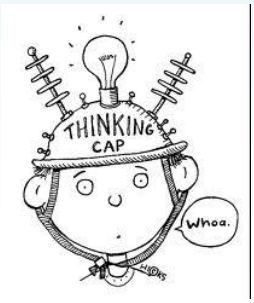
Behavioural interactions

- Each behaviour is part of a larger system of behaviours that facilitate and compete with each other
- Understanding the system of behaviours is necessary to identify where best to intervene and how

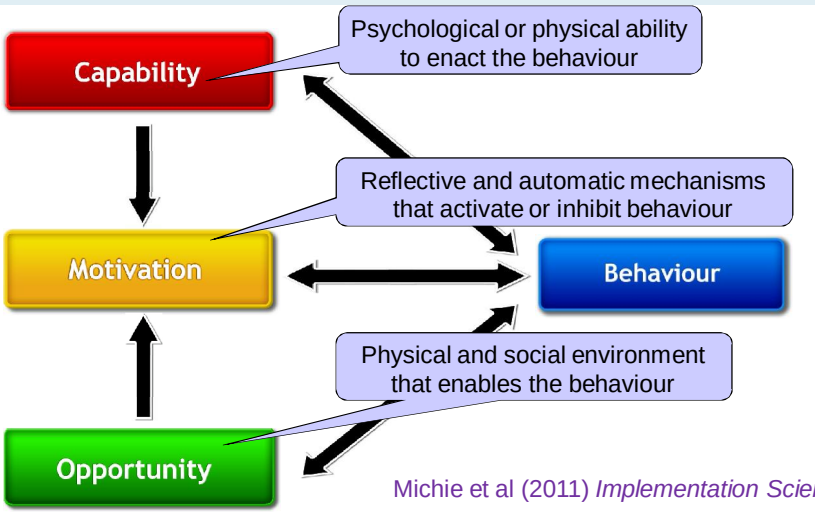


A thought experiment

For behaviour to change, what three conditions need to exist?

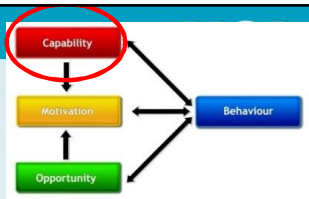


The COM-B system: Behaviour occurs as an interaction between three necessary conditions



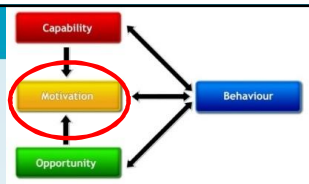
Michie et al (2011) *Implementation Science*

Capability



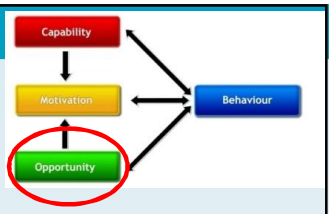
- An individual's ability to engage in a behaviour in terms of:
  - Knowing what to do, how to do it and why it is worth doing
  - Having the necessary information processing skills and degree of self-control
  - Having the necessary anatomical structures, physical skills, strength and stamina

Opportunity: "behaviour in context"



- Access to necessary physical and social resources for the behaviour to occur
- Physical resources consist of:
  - time, finances, materials, prompts
- Social resources consist of:
  - social structures, social support, role models, linguistic/conceptual structures

Motivation



- Brain processes that energise and direct behaviour, consisting of
  - reflective motivation
    - intentions, plans and evaluations
  - 'automatic' motivation
    - desires, impulses and inhibitions, emotions, habits

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COM-B as a guide to intervening

For positive behaviour change …

Capability	**Enhance:**	**educate, train, enable**
Motivation	**Motivate:**	**persuade, incentivise, coerce, role modelling**
Opportunity	**Facilitate:**	**restructure the social and physical environment**

Effective principles of behaviour change

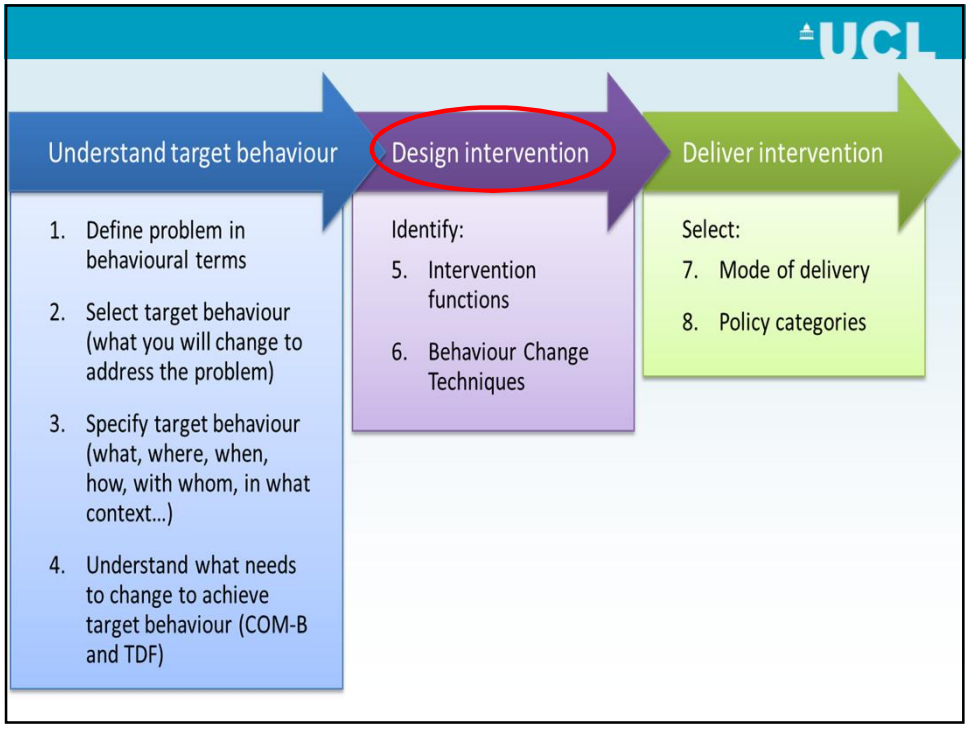
NICE Guidance for Behaviour change (2007)

- Maximise Capability to regulate own behaviour
  - Develop relevant skills (e.g. goal setting, monitoring, feedback)
  - Develop specific plans to change
- Increase Motivation to engage in the desired behaviour
  - Reward change
  - Develop appropriate beliefs
    - E.g. benefits of changing, others' approval, personal relevance, confidence to change
  - Develop positive feelings about changing
- Reduce Motivation to continue with the undesired behaviour
- Maximise Opportunity to support self-regulation
  - Elicit social support
  - Avoid social and other cues for current behaviour
  - Change routines and environment

NICE Guidance for Behaviour change (2014)

Designing effective interventions

1. Understand the behaviour you are trying to change
   - Make a "behavioural diagnosis"
2. Consider the full range of options open to you
3. Use a systematic method for selecting behaviour change techniques
4. Evaluate interventions so it is possible to accumulate evidence to inform future interventions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Understand target behaviour
Design intervention
Deliver intervention
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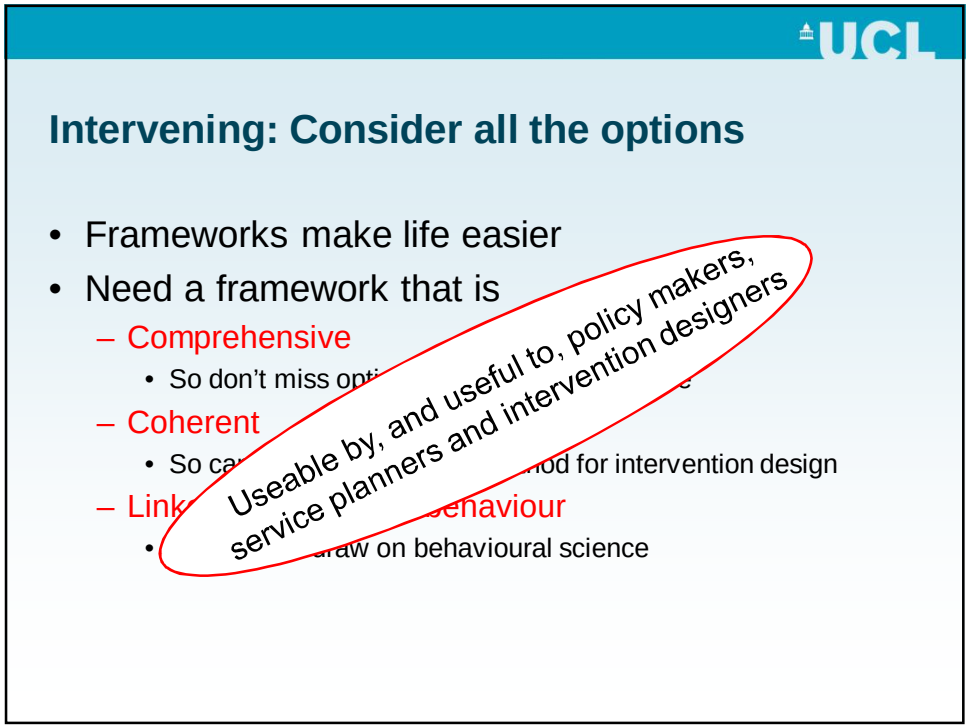
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Intervening: Consider all the options
• Frameworks make life easier
• Need a framework that is
– Comprehensive
• So don't miss opti
– Coherent
• So ca
hod for intervention design
– Link
ehaviour
• raw on behavioural science
Useable by, and useful to, policy makers, service planners and intervention designers

Do we have such a framework?

- Systematic literature review identified 19 frameworks of behaviour change interventions
  - related to health, environment, culture change, social marketing etc.
- None met all our three criteria
- So …. Developed a synthesis of the 19 frameworks

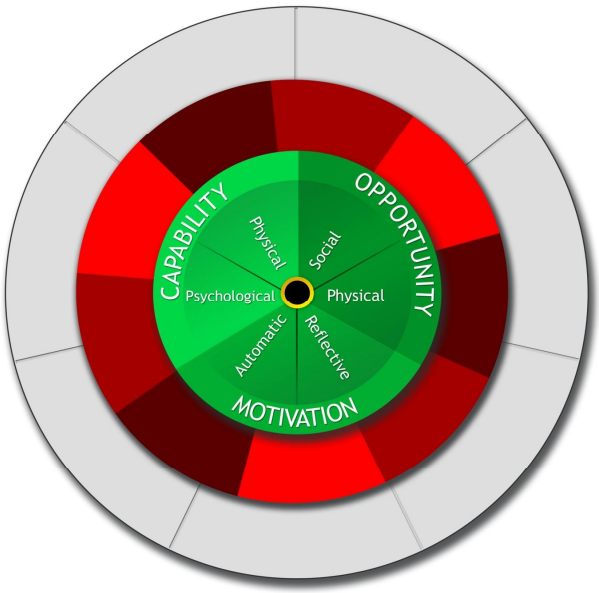
Michie et al (2011) The Behaviour Change Wheel: a new method for characterising and designing behaviour change interventions, *Implementation Science.*

Behaviour at the hub …. COM-B

Sources of behaviour

Intervention functions

Policy categories



Interventions

Sources of behaviour

Intervention functions

Interventions: activities designed to change behaviours

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Using rules to reduce the opportunity to engage in the behaviour (or to increase behaviour by reducing opportunity to engage in competing behaviours)

Increasing knowledge or understanding

Using communication to induce positive or negative feelings to stimulate action

Changing the physical or social context

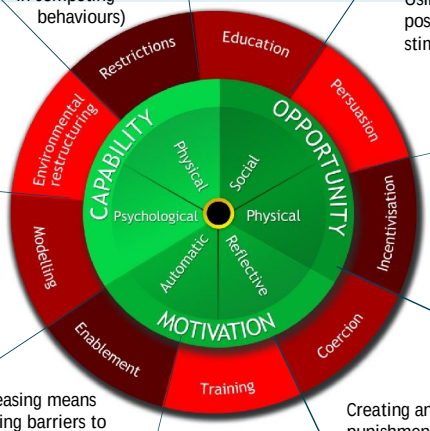
Creating an expectation of reward

Provide an example for people to aspire to or emulate

Increasing means or reducing barriers to increase capability (beyond education or training) or opportunity (beyond environmental restructuring)

Imparting skills

Creating an expectation of punishment or cost



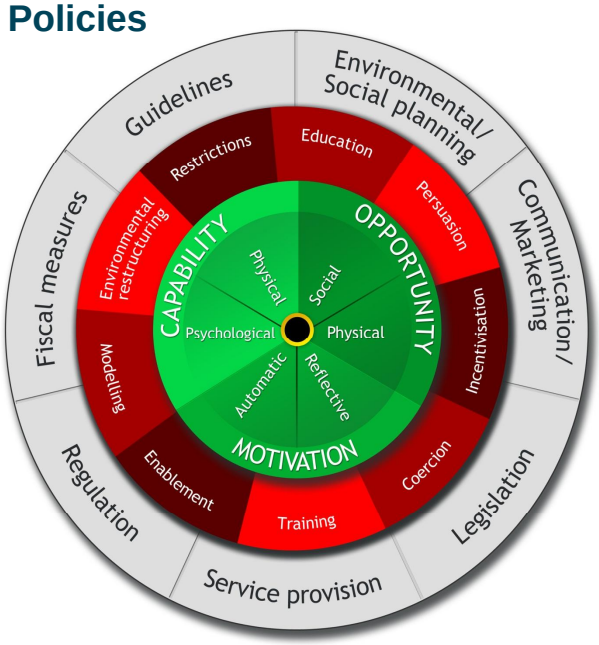
Policies

Sources of behaviour

Intervention functions

Policy categories

Policies: decisions made by authorities concerning interventions



Michie et al (2011) The Behaviour Change Wheel: a new method for characterising and designing behaviour change interventions *Implementation Science*

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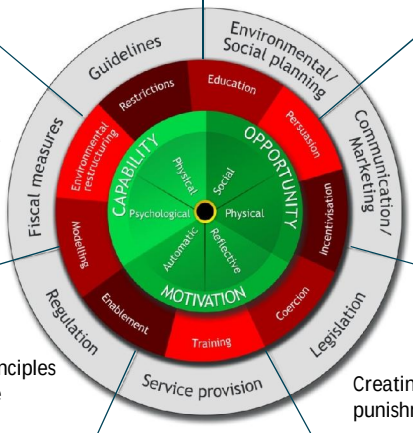
Creating documents that recommend or mandate practice. This includes all changes to service provision

Designing and/or controlling the physical or social environment

Using the tax system to reduce or increase the financial cost

Using print, electronic, telephonic or broadcast media



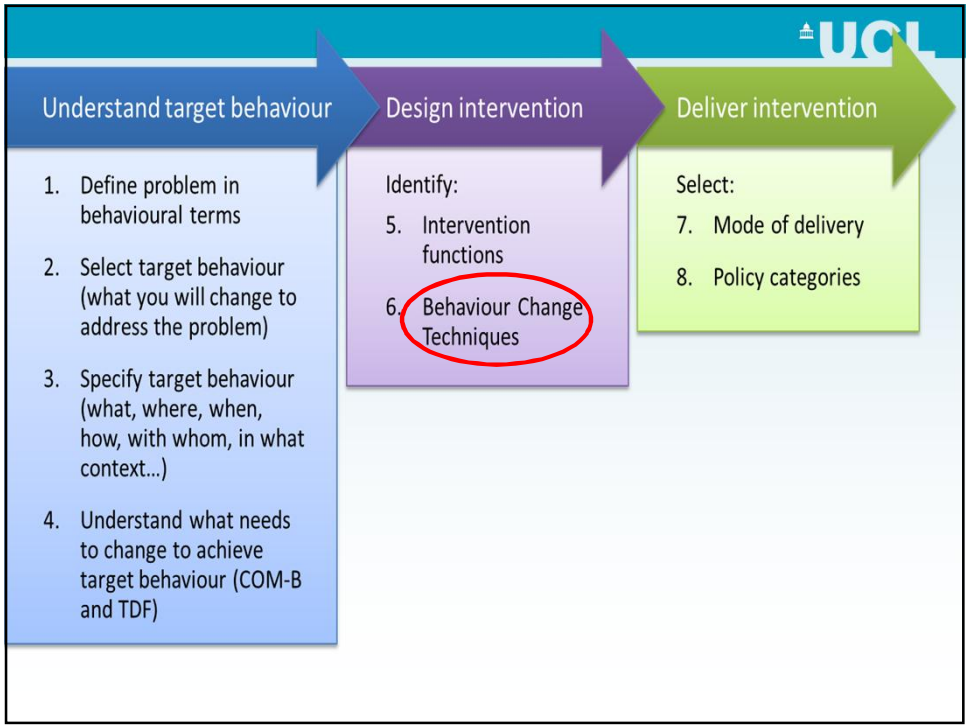
Establishing rules or principles of behaviour or practice

Creating an expectation of punishment or cost

Delivering a service

Use the Behaviour Change Wheel to …

1. Design interventions and policies
   - COM-B links to intervention functions links to behaviour change techniques
2. "Retrofit" – identify what is in current interventions and policies
3. Provide a framework for evaluation
   - How are interventions working?
4. Structure systematic reviews



Interventions are complex

- Several, potentially interacting, techniques
- Vary in
  - 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)
  - content or elements of the intervention

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

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Interventions to change behaviour

- 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?

→ **Effect**

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

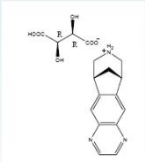
Example of the problem: Descriptions of "behavioural counselling" in two interventions

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*

New methodology: describe content in terms of behaviour change techniques (BCTs)

- "Active ingredients" within the intervention designed to change behaviour
- They are
  - observable,
  - replicable and
  - discrete, low-level components of an intervention that on their own have potential to change behaviour
- Can be used alone or in combination with other BCTs

An early reliable taxonomy to change frequently used behaviours

1. General information
2. Information on consequences
3. Information about approval
4. Prompt intention formation
5. Specific goal setting
6. Graded tasks
7. Barrier identification
8. Behavioural contract
9. Review goals
10. Provide instruction
11. Model/ demonstrate
12. Prompt practice
13. Prompt monitoring
14. Provide feedback

Involves detailed planning of what the person will do including, at least, a very specific definition of the behaviour e.g., frequency (such as how many times a day/week), intensity (e.g., speed) or duration (e.g., for how long for). In addition, at least one of the following contexts i.e., where, when, how or with whom must be specified. This could include identification of sub-goals or preparatory behaviours and/or specific contexts in which the behaviour will be performed.

23. Relapse prevention
24. Stress management
25. Motivational interviewing
26. Time management

The person is asked to keep a record of specified behaviour/s. This could e.g. take the form of a diary or completing a questionnaire about their behaviour.

Abraham & Michie, 2008, *Health Psychology*

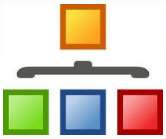
"Taxonomies" of BCTs

- Physical activity/healthy eating/mixed : 26 BCTs
  Abraham & Michie , 2008
- Physical activity & healthy eating: 40 BC
  Michie et al, Psychology & Health, 2011
- Smoking cessation: 53 BCT
  Michie et al, Annals behavioural Me
- Reducing excessi 2 BCTs
  Michie et al, Addicti
- Condom
  Abraham et a
- General behaviour change: 137 BCTs
  Michie et al, Applied Psychology: An International Review, 2008
- Competence framework: 89 BCTs
  Dixon & Johnston, 2011

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

BCT Taxonomy v1

- Applies to an extensive range of behaviour change interventions
- Agreed by an international consensus to be potential active components of interventions
  - 400 participants 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 Cane et al, *BJHP*, 2014

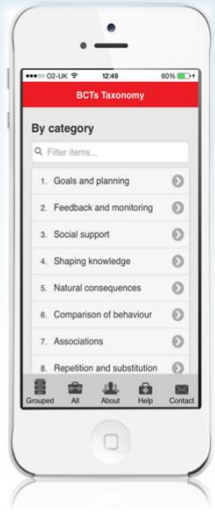


BCT Taxonomy v1: 93 items in 16 groupings

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 BCTTv1 smartphone app



- Fully searchable version of BCTTv1
- Search by BCT label, BCT grouping or alphabetically
- Increases familiarity with the taxonomy
- Increases speed and recall of BCT labels and definitions

Search for: BCTs

Search for: BCTs*

bcts.23.co.uk*

bcts.23.co.uk*

* You'll need an internet connection to use the app

www.bct-taxonomy.com

BCT methodology used to ….

- Identify effective BCTs and theoretically coherent combinations of BCTs in reviews
  - e.g. Michie et al, 2009; Dombrowski et at, 2012; Ivers et al, 2014
- Digital interventions: Investigate content
  - e.g. Webb et al, 2010, *Journal of Medical Internet Research*
  - Michie, Free & West (2013) Characterising the 'Txt2Stop' smoking cessation text messaging intervention in terms of behaviour change techniques. *Journal of Smoking Cessation*

- Digital interventions: Develop
  - Brown, Michie et al. Randomised trial of an internet-based smoking cessation intervention (StopAdvisor) in smokers with higher and lower socioeconomic status. *Lancet Respiratory Medicine*.

Combining BCTs and theory

Translational Behavioral Medicine
September 2012, Volume 2, Issue 3, pp 263-275

Development of StopAdvisor

Susan Michie DPhil, Jamie Brown PhD, Adam W A Geraghty PhD, Sascha Miller BSc, Lucy Yardley PhD, Benjamin Gardner DPhil, Lion Shahab PhD, Andy McEwen PhD, John A Stapleton MSc, Robert West PhD

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ELSEVIER

Addictive Behaviors
Volume 37, Issue 12, December 2012, Pages 1365–1370

A pilot study of StopAdvisor: A theory-based interactive internet-based smoking cessation intervention aimed across the social spectrum

Jamie Brown[a], Susan Michie[b, c], Adam W.A. Geraghty[d], Sascha Miller[d], Lucy Yardley[d], Benjamin Gardner[a], Lion Shahab[a], John A. Stapleton[a], Robert West[a, c]

Current work 2014-17

MRC Medical Research Council

BCT Theory

Theories and Techniques of Behaviour Change

Susan Michie[1],
Marie Johnston[2], Alex Rothman[3], Mike Kelly[4], Marijn de Bruin[2]

2014-2017

- To develop a methodology for linking BCTs to theoretical mechanisms of action
  - Systematic review: what does the literature tell us?
  - Expert consensus
  - Triangulation

1 UCL 2 University of Aberdeen 3 University of Minnesota 4 University of Cambridge

UCL

The Team:

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BCT Theory

Summary

- Social psychology
  - has an important contribution to improving health and
  - is likely to benefit from engaging with health psychology
- Room for improvement in developing and applying our theories
- Developing interventions to change behaviour strengthened by
  - theoretical frameworks
  - specifying in terms of behaviour change techniques
  - linking behaviour change techniques to theoretical mechanisms of action

Acknowledgements

- Key collaborators in this work
  - Prof Robert West, UCL
  - Prof Marie Johnston, Aberdeen
  - Prof Rona Campbell, Bristol
  - Dr Andy Prestwich, Leeds
  - Health Psychology Research Group
- Key funders





MRC Medical Research Council

NHS National Institute for Health Research

CANCER RESEARCH UK

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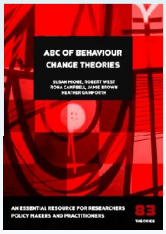


- Books
  - www.behaviourchangewheel.com
  - www.behaviourchangetheories.com

- UCL Centre for Behaviour Change
  - www.ucl.ac.uk/behaviour-change
  - Summer School 2015

ADDITIONAL SLIDES

Digital interventions …

- Present enormous opportunities to support behaviour change
  - Allow interventions that are
    - in "real" time and context
    - tailored to the individual, setting and the moment
    - interactive and adaptive
    - engaging and rewarding
  - Generate large amounts of data
    - continuous and rapid cycles of testing and adaptation

Can target the key drivers of behaviour …

Capability

e.g. self-regulatory skills such as goal setting, self-monitoring, action planning, distraction

Motivation

e.g. messages to boost self-confidence, make long-term rewards more immediate and vivid, show progress

Opportunity

e.g. provide social support, online advice, up-to-date information about cycle routes, food calories …

However, if the potential of such opportunities is to be maximised, these opportunities must be underpinned by behavioural science

Smartphone apps

- Approx 1/5 smartphone users use an app to change their behaviour
- Tend not to be based on theory nor evaluated scientifically
  - Cowan et al, 2013; Pagoto et al, 2013
- Analysis of 167 top-ranked apps for physical activity into behaviour change techniques
  - Cowan et al, *Am J Prev Med*, 2014
  - 1-13 BCTs; mean 4.2 (sd 2.4); median 4

Table 1. Prevalence of behavior change techniques in top-ranked physical activity apps in the "health and fitness" category

Behavior change technique	*n*	Proportion
Provide instruction on how to perform behavior	111	0.66
Model/demonstrate the behavior	88	0.53
Provide feedback on performance	83	0.50
Goal setting—behavior	63	0.38
Plan social support/change	61	0.37
Information about others' approval	46	0.28
Goal setting—outcome	40	0.24
Prompt review of behavioral goals	31	0.19
Facilitate social comparison	25	0.15
Prompt review of outcome goals	22	0.13
Set graded tasks	22	0.13
Provide information on where and when to perform the behavior	18	0.11
Prompt self-monitoring of behavior	17	0.10
Prompt self-monitoring of behavioral outcomes	16	0.10
Teach to use prompts/cues	11	0.07
Prompt rewards contingent on effort or progress toward behavior	10	0.06
Provide rewards contingent on successful behavior	10	0.06
Action planning	6	0.04
Information on consequences of behavior to the individual	6	0.04
Prompting focus on past success	5	0.03
Information on consequences of behavior in general	4	0.02
Stimulate anticipation of future rewards	4	0.02
Environmental restructuring	2	0.01
Normative information about others' behavior	1	0.01
Relapse prevention/coping planning	1	0.01
Shaping	1	0.01

Conclusions

- limited number of BCTs
- educational and motivational, rather than self-regulatory e.g. action planning

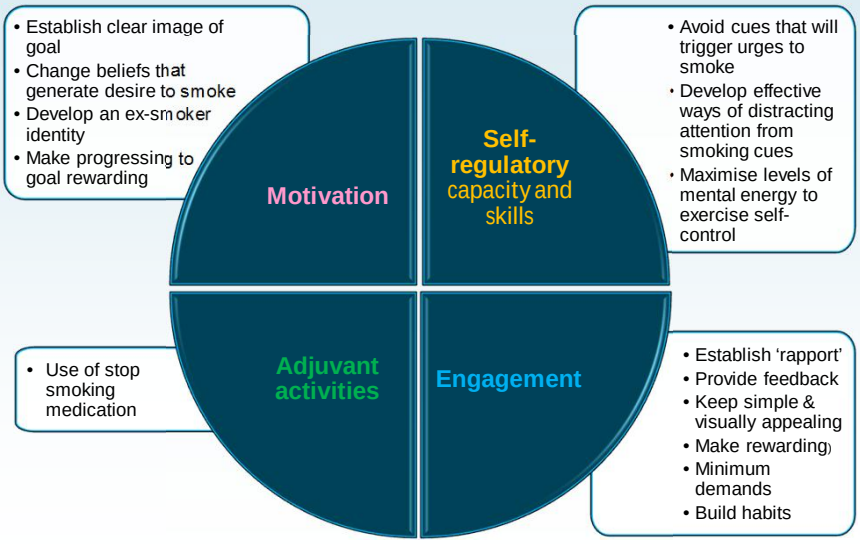
Smartphone apps for smoking cessation

- There is a burgeoning of smartphone apps available for smokers wanting help stopping
  - **179** smoking cessation apps on iTunes App Store alone (2012)
    - iTunes 30% app market
  - **One** published RCT
    - Buller et al Telemed J E Health. 2014;20:206-14

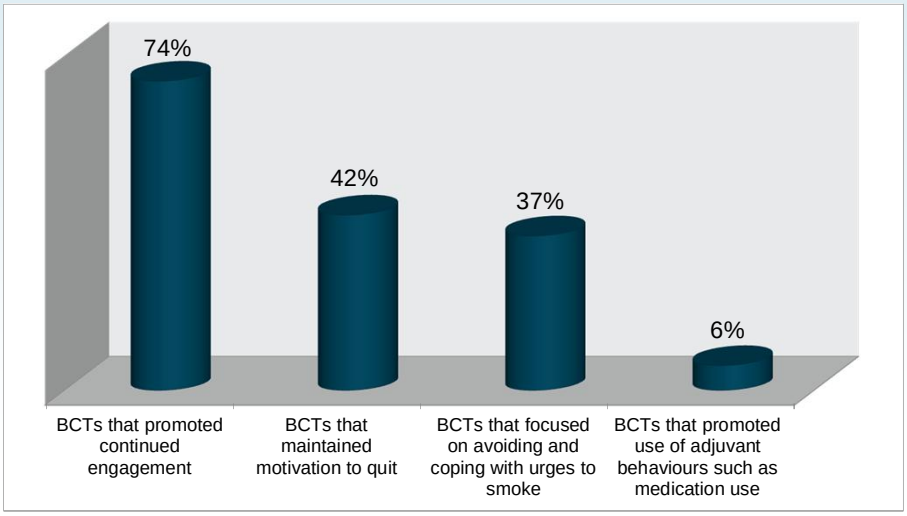
What behaviour change techniques do they use?

- Content independently coded for 54 features
  - 19 BCTs, 26 design features, 9 engagement features
- 75%-85% agreement between coders on inclusion of features
  - discrepancies readily resolved

Examples of BCTs by their function



Results: analysis by behaviour change technique



Text Messaging:
Txt2Stop: effective intervention

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The Lancet, Volume 378, Issue 9785, Pages 49 - 55, 2 July 2011
doi:10.1016/S0140-6736(11)60701-0 Cite or Link Using DOI
This article can be found in the following collections: Public Health; Respiratory Medicine (Respiratory medicine-other)
Published Online: 30 June 2011

< Previous Article | Next Article >

Smoking cessation support delivered via mobile phone text messaging (txt2stop): a single-blind, randomised trial

Dr Caroline Free PhD, Rosemary Knight RGN, Steven Robertson BA, Robyn Whittaker MPH, Phil Edwards PhD, Weiwei Zhou MSc, Prof Anthony Rodgers PhD, Prof John Cairns PhD, Prof Michael G Kenward PhD, Prof Ian Roberts PhD

We know it was effective but why? First step is to identify component BCTs

Txt2Stop BCT analysis

- 899 texts delivered 34 BCTs
  - **218 (24%)** aimed to maintain **motivation** to remain abstinent
  - **87 (10%)** to enhance **self-regulatory capacity or skills**
  - **39 (4%)** to promote use of **adjuvant behaviours** such as using stop-smoking medication
  - **24 (22%)** were general **communication** techniques
  - ***552 (61%)** to maintain **engagement with the intervention***

Michie, Free & West (2013) Characterising the 'Txt2Stop' smoking cessation text messaging intervention in terms of behaviour change techniques. *Journal of Smoking Cessation.*

StopAdvisor : an internet-based intervention to help smokers to stop

The Study Team

UCL: Robert West, Susan Michie, Jamie Brown, Ben Gardner, Lion Shahab

University of Southampton: Lucy Yardley, Adam Geraghty, Sascha Miller

Why Develop a New Internet Intervention?

- Reviews noted heterogeneity in efficacy, quality and design e.g. Civljak et al, 2010; Myung et al, 2009; Shahab & McEwen, 2009; Etter, 2006
- Health inequalities: smoking hits low SES harder
- Scope for improvement
  - Lack of data relating to long-term abstinence with biochemical verification
  - Little usability testing by potential users
- Need for the 'black box' of internet-based smoking interventions to be opened e.g. Strecher, 2008

Developed on the basis of …

1. Evidence from smoking and behavioural science on efficacy of particular BCTs
   - Shabab & McEwen, 2009; Michie, Churchill & West, 2010; reviews and observational data from the NHS Stop Smoking Services
2. Theoretical principles from PRIME theory
   - West & Brown, 2013
3. Principles of website design identified by study team
4. Usability testing with lower SES smokers

Intervention Content

- Offers ongoing automated behavioural support for smoking cessation
  - an automated advisor to help smokers stop using structured quit plan and a ready source of information
  - delivers up to 33 evidence- or theory-based BCTs (Michie et al, 2012)
  - e-mail reminders and texts that help them in stressful and social situations, and to sign-in regularly for new online support sessions

Principle / BCT	Intervention content	Website design
Construct personal rule to generate strong resolve /BM8 Strengthen ex-smoker identity	Introduction of motto: 'Not a puff, no matter what' & image to support	Image attractive; simple motto; interactive – use site, emails & texts to deliver

Evaluation in an RCT

- Randomised to
  - intervention or information-only control condition
- >4600 smokers
  - 38% never used any form of support
    - behavioural or pharmacological
  - 48% from low 'Routine and manual' occupational groups
- Primary outcome measure
  - self-report of 6 months of continuous abstinence verified in subsample by expired-air CO or saliva cotinine

UCL

Primary outcome: 6 months abstinence

	StopAdvisor	Brief advice control	Adj. relative risk (95% C.I.)	%-point difference (95% C.I.)	P-value
Higher SES	11·9% (147/1233)	12·6% (156/1238)	0·97 (0·78 to 1.19)	-0·68 (-3·27 to 1·91)	0·75
Lower SES	8·3% (90/1088)	6·1% (64/1054)	**1·43** (1·05 to 1.96)	2·20 (0·02 to 4·38)	**0·02**

Usage	StopAdvisor (N=2321)	Brief advice control (N=2292)	Mean difference (95% C.I.)
	Mean (SD)		
Log-ins			
Higher SES	5·0 (6·2)	1·4 (0·7)	3·6 (3·2 to 3·9)***
Lower SES	4·1 (5·7)	1·3 (0·6)	2·9 (2·5 to 3·2)***
Total time (mins)			
Higher SES	26·9 (38·9)	1·3 (3·2)	25·6 (23·5 to 27·8)***
Lower SES	22·1 (34·4)	1·1 (2·5)	21·1 (19·0 to 23·1)***
Total page views			
Higher SES	93·1 (119·8)	6·1 (5·2)	87·0 (80·3 to 93·7)***
Lower SES	75·5 (105·0)	5·3 (4·1)	70·2 (64·0 to 76·5)***

The interactive StopAdvisor website …

- Is effective as an aid to smoking cessation among lower but not higher SES smokers
- Results in greater usage as compared with a static, brief advice website

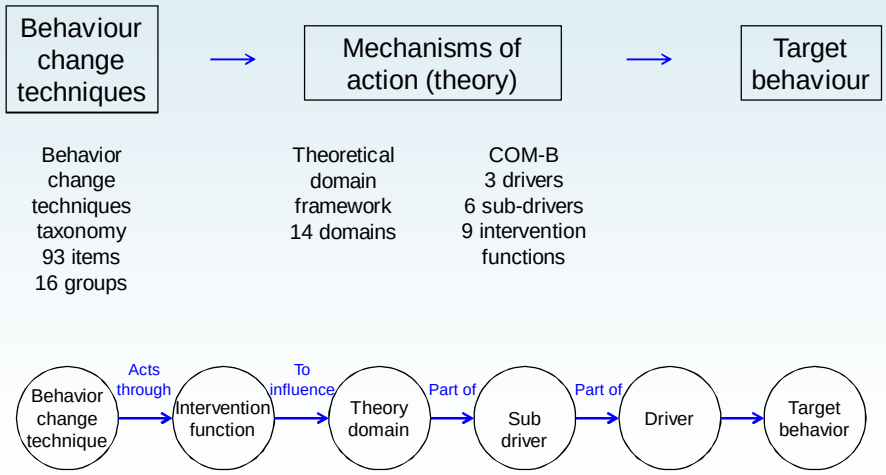
Conclusions

- Interventions, including digital interventions, have great potential to support behaviour change
- This potential will only be realised if development and evaluation are informed by the science of behaviour change
  - evidence about what works, for whom, in what circumstances
  - theoretical principles of motivation, self-regulation and engagement
  - specifying component techniques so they can be replicated

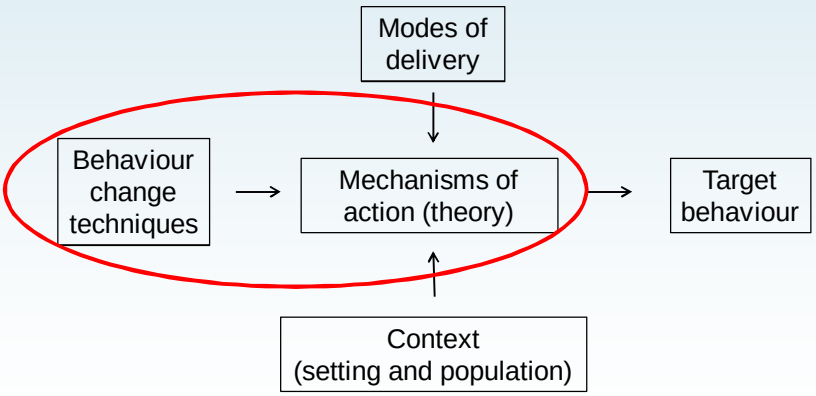
Building an Ontology of Behaviour Change

- A structure that systematically represents and organises the essential elements of behaviour change interventions
  - Codifies our collective knowledge
  - Reflects consensus on concepts, terms, relationships
  - Specifies and formalises them
    - Collaboration with information and computer scientists

Ontology of Behavior Change, SBM, 2014



An Ontology of Behaviour Change: 5 key domains



Michie, Johnston, Rothman, Kelly, de Bruin. 2014-17. MRC.

Next steps

- Develop a Behaviour Change Ontology
- Establish an integrated human-computer expert network to continuously advance and update knowledge using the BC Ontology
- Using the BC Ontology,
  - create an open-access, systematised ‘clearinghouse’ of continuously updated evidence-based intervention components
    - that can be used to rapidly develop and optimise real-world behaviour change interventions