Design and Evaluation of Behaviour-Change Interventions

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Introductory Chapters on Behaviour Change Intervention Design and Evaluation


What will I talk about?

Part 1
Behaviour patterns and public health
What is needed to generate better behavior-change policy?
How to design effective behavior-change interventions –
  Intervention Mapping
Information, Motivation, Behavioural (IMB) Skills Framework
Applications of IMB
Dual Process Models – e.g., Reflective-Impulsive Model
Techniques to alter impulsive mechanisms

Part 2
MINDSPACE – a mnemonic
NUDGE(s)
Policies to combat pre-structured environments
Evaluation – evaluability assessment and process evaluation
Guides to evaluation
An Illustration “HeLP”
Behaviour Patterns are Critical to Health Care

Patients’/ Citizens’ Behaviour e.g.,...
- Screening uptake
- Early symptom reporting
- Adherence to professional advice
- Preventive behaviour patterns
- Maintenance of behaviour change

Health Professionals’ Behaviour e.g.,...
- Persuasive communication and interaction
- Appropriate follow up
- CPD to ensure best practice
- Adherence to best practice guidelines

....but also behaviour of policy makers, managers, teachers, care givers, parents, students etc...
A Brief History of Obesity in the US:
% Obese Adults in 1993

BMI ≥30,
(or ~ 30 lbs. overweight for a 5’ 4” person)

Source: Department of Health and Human Services
Centres for Disease Control and Prevention
http://www.cdc.gov/nccdphp/dnpa/obesity/trend/maps/
Percentage of Obese U.S. Adults 2013

BMI ≥30

CDC
Are We Creating Evidence-Based Interventions Relevant to Government Policy


- Chaired by Baroness Julia Neuberger.

- “Many of the goals to which governments aspire—such as bringing down levels of crime, reducing unemployment, increasing savings and meeting targets for carbon emissions—can be achieved only if people change their behaviour.”

- 32 recommendations and government responses
Lack of Population-Level Trial Data on Long Term Effectiveness of Behaviour Change Interventions

8.2 There is a lack of applied research at a population level to support specific interventions to change the behaviour of large groups of people (including a lack of evidence on cost-effectiveness and long-term impact). This is a barrier to the formulation of evidence-based policies to change behaviour.
8.21. Effective evaluation requires that: evaluation should be considered at the beginning of the policy design process. External evaluation expertise should be sought, where necessary, from the policy’s inception...
Behaviour Change Interventions Can Work
Johnson et al. (2010, Am J Pub Hlth)

- Synthesis of 62 meta analyses, 1,011 primary evaluations
- Interventions targeting-
  - eating, physical activity, sexual behaviour,
  - addictive behaviours, stress management,
  - screening for women and use of health services.
- Targeting women & older people - more effective.
- Shorter interventions - more effective.
- Heterogeneity of small/ medium effect sizes
  \[ ds = .08 - .45. \] Why – what works?
MRC Guidance on Development and Evaluation of Complex Interventions

Key elements of the development and evaluation process

Feasibility and Piloting
- Testing procedures
- Estimating recruitment and retention
- Determining sample size

Development
- Identifying the evidence base
- Identifying or developing theory
- Modelling process and outcomes

Evaluation
- Assessing effectiveness
- Understanding change process
- Assessing cost effectiveness

Implementation
- Dissemination
- Surveillance and monitoring
- Long term follow up

(Craig et al., 2008)
Intervention Mapping: A BCI Design and Evaluation framework

Needs Assessment

Specific Objectives

Processes and Techniques

Intervention Assembly

Adoption and implementation

Evaluation planning


Intervention Mapping

Needs assessment and elicitation research
Define measurable change objectives
Identification of relevant regulatory mechanisms –
   Develop “Logic Model”
Selection of change techniques capable to altering identified mechanisms
Identification of feasible, attractive and sustainable delivery formats,
Co-creation of interventions with those who will deliver and receive them
Planning marketing, adoption and implementation
Planning evaluation – before materials are created!
Twelve Broad Characteristics of Behaviour-Change Interventions

1. specific behaviour change/s targeted
2. modifiable processes (or mechanisms) operating at different levels that regulate relevant behaviour patterns
3. change techniques known to alter identified regulatory process/mechanisms
4. the modes or formats of delivery to be used (e.g., face-to-face meetings, telephone calls, interactive online programmes, leaflet distribution etc.)
5. intervention components, that is, the materials used
6. the setting in which the intervention will be delivered (e.g., worksite, school etc.)
7. the fit between intervention components and the cultural and practical context in which it will be used
8. characteristics, qualifications and training of the those delivering the intervention (e.g., relationship to recipients, skill bases etc.)
9. intensity (e.g., contact time in each session)
10. duration (e.g., number sessions and overall period of intervention)
11. fidelity of delivery (e.g., were lessons/meetings delivered as designed)
12. evaluation, including outcome, process and economic evaluations
Identifying and Reporting Characteristics
Distinguishing Between Group-Based Interventions

**Intervention Design**
- Intervention source/development method
- General setting
- Venue characteristics
- Total number of group sessions
- Length of group sessions
- Frequency of group sessions
- Duration of the intervention

**Intervention Content**
- Change mechanisms or theories of change
- Change techniques used
- Session content
- Sequencing of sessions
- Participants’ materials
- Activities during the sessions
- Methods for checking fidelity of delivery

**Participants**
- Group composition
- Methods for group allocation
- Continuity of participants’ group membership
- Group size

**Facilitators**
- Number of facilitators
- Continuity of facilitators’ group assignment
- Facilitators’ professional background
- Facilitators’ personal characteristics
- Facilitators’ training in intervention delivery
- Facilitators’ training in group facilitation
- Facilitators’ materials
- Intended facilitation style

The Ecological Model: Identifying Intervention Level/s
Identification of behaviours is *crucial*

- What does the person need *to do* to perform the behaviour?

- Sequence of smaller, necessary steps,

- i.e., ..essential subparts of the behaviour,

- that informs outcome/ outcome measures
**PERFORMANCE OBJECTIVES FOR CONDOM USE?**

- *Plan* condom use
- *Acquire* condoms
- *Carry* condoms regularly
- *Negotiate* with partners
- *Use* condoms correctly and consistently
- *Use* condoms in steady relationships
- *Maintain* condom use over time
Theory-Based Intervention Design?

Psychological theories are usually very limited in the regulatory mechanisms they specify.

So interventions based on single theories...

*may* omit regulatory processes important to real-world health-relevant, behaviour patterns.

Intervention design must be *mechanism-based*

but not necessarily based on particular theories.
Defining Behaviour Change Techniques
Abraham & Michie (2008)

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. Behavioral contract
9. Review goals
10. Provide instruction
11. Model/ demonstrate
12. Prompt practice
13. Prompt self monitoring
14. Provide feedback
15. General encouragement
16. Contingent rewards
17. Teach to use cues
18. Follow up prompts
19. Social comparison
20. Social support/ change
21. Role model
22. Prompt self talk
23. Relapse prevention
24. Stress management
25. Motivational interviewing
26. Time management

Person is asked to keep a record of specified behaviour/s. e.g. using diary/ questionnaire.

Reliability of technique identification and frequency of use tested using 195 published descriptions in journal articles, across behavioural domains - and 13 manual article pairs.
Identifying Mechanisms of Change
Information, Motivation, Behaviour Skills Model: An Initial Grouping of Behavioural Determinants

Information:
Daily Energy Deficit Calculations

1. How many calories should an adult eat a day?

2. How many calories are contained in a standard (not jumbo) energy-dense chocolate bar?

3. How long would it take you to “burn” these calories while walking?
Information: Key Conclusions

To influence action, information must be…

- easily understood and remembered
- relevant to current goals,
- readily available in the moment of decision or action.
Information, Motivation, Behaviour Skills Model
Modifiable Determinants of Motivation

More likely to intend if you...

- believe *advantages* (e.g., benefits) outweigh the disadvantages (e.g., costs) of behaviour – attitude,
- anticipate a *positive emotional reaction* to the behaviour,
- see more *social* (normative) pressure,
- perceive behaviour to be consistent with *self-image*,
- and believe you are capable of performing the behaviour in a range of circumstances i.e., *high self-efficacy.*
Those with higher self efficacy…

1. set higher goal standards
2. adopting flexible approaches to solving problems
3. show greater effort/ persistence
4. experience lower anxiety/ stress during performance
Getting the Message Right: Evidence-Based Health Promotion

i.e., formulating messages that relate directly to mechanisms regulating behaviour patterns in the target audience....
Examined 44 measures taken from 121 empirical studies of correlates of condom use
Do Messages in Leaflets Promoting Condom Use Target Modifiable Determinants of Condom Use?

- 36 UK and 35 German nationally-available leaflets
- What messages are used and how frequently?
- Sophisticated message coding system developed
- Does message content reflect evidence on modifiable correlates of condom use?

Mismatch Between Motivational Targets and Leaflet Content

Halpern et al. (Prime Minister’s Strategy Unit, 2004). 

![Graph showing mismatch between motivational targets and leaflet content](image-url)
Writing Health Communication: An Evidence-Based Guide

Abraham C & Kools M (Eds. 2012)
London, SAGE Publications Ltd.
Provide commonly requested information.

Emphasise potential susceptibility.

“The good news is there are things you can do to reduce your risk.” Bolster self-efficacy

“Book a diabetes eye check now” Prompt short-term goal setting.

Australian Centre for Behavioural Research in Diabetes and Vision 2020

Using Fear Appeals to Enhance Motivation

Should consist of....

**Threat Message**
- The threat is severe (perceived severity)
- You are susceptible to it (perceived susceptibility)

**Response Message**
- There is an effective protection (response efficacy)
- You are able to do this (self efficacy)
Who Should Receive Fear Appeals?

- **Want to stop**: 70%
- **Intend to stop in next year**: 50%
- **Try to stop each year**: 30%
- **Succeed in stopping**: 2%
The Parallel Process Model

- Message
  - Danger Control
  - Fear Control
    - Message Denial
    - Message acceptance
"Response Messages: Offering Helpful Services"

The average smoker needs over five thousand cigarettes a year.

Get unhooked. Call 0800 169 0 169 or visit getunhooked.co.uk

Motivation: Key Conclusions

Understand modifiable determinants of motivation for a specific behaviour pattern for a specific target populations .....target these in interventions.
From Motivation to Behaviour


Median %
- Intenders who acted = 53%
- Non-intenders who acted = 7%

Intention is a good predictor of behaviour...
... but this “gap” highlights the need for a psychology of enactment.
Information, Motivation, Behaviour Skills Model
When motivation is established... check behaviour-specific skills e.g....

**Motor skills**
Instruction, demonstration, practice and feedback are often used in interventions to develop such skills.

**Social skills**
Demonstration, practice and feedback – e.g., role play are often used in interventions to develop such skills.

**Self-regulatory skills**
Goal setting, planning and rehearsal, self monitoring, provision of feedback and goal review are often used in interventions to develop such skills.
Two Systems Regulate Behaviour: Dual Process Models

Reflective and Impulsive model (RIM)

Borland (2014) Context Executive and Operational System (CEOS) model

**Reflective:**
Top-down. Mindful. Conscious awareness and monitoring, including awareness of impulsive system “urges”. Language-based, goal-directed, capable of evaluation and one-time learning – long-term memory and self representation important. Can override impulsive regulation.

**Impulsive:**
Bottom up. Mindless. Default system functioning in response to eternal cues without reflective initiation. Thought to be largely associative with growing neural activation resulting in priority of action through initiation of well-learnt (potentially complex) motor routines.
Reflective and Impulsive Control of Behaviour
(adapted from Strack & Deutsch, 2004, *Per & Social Psych Review*)

- **Perception**
- **Knowledge** (values, probabilities)
- **Reasoning**
- **Behavourial Schemata**
- **Intending**
- **Reflective Control**
- **Impulsive Control**

**Diagram:***
- Perception → Associative Store → Referring, Categorising, Reasoning
- Knowledge (values, probabilities) → Reasoning
- Behavioural Decision → Intending → Behavioural Schemata
- Spreading Activation

*Note: Diagram visualizes the relationship between cognitive processes and behavior, highlighting reflective and impulsive control mechanisms.*
Addiction as a Failure of Regulation
Due to Reprogramming Over Time

Impulsive control means that behaviour is often initiated and sustained with little conscious monitoring.

Repeated associations between

- (1) cue and behaviour
- (2) behaviour and reward (physiological and emotional)

results in automatic impulsive responses ("conditioning")

- cognitive (what we think)
- affective (what we feel)
- behavioural (what we do).

Cues ("stimuli") – prompt automatic responses & behaviour – without decisions– so behaviour may conflict with and override motivation.
Addictions are distinctive – e.g., nicotine, alcohol, cocaine, heroine have their own distinctive biological effects.

BUT – many behaviour patterns are maintained by similar biologically-based, brain-function “disregulation”.

In this sense, eating, gambling, video gaming, violence, using pornography, sexual behaviour and other patterns share important similarities with traditional “addictions”.

See David Kessler’s (2009) book... “The End of Overeating”

see too Gearhardt et al. (Addiction, July 2011).
1. Awareness of the cue-brain response
   Recognise and avoid high risk (cue-laden) environments.

2. Learn competing behaviours
   Learn, cognitively rehearse and practice new substitute behaviour
   Set absolute rules – change anticipation… “rules of disengagement”

3. Learn competing thoughts
   Learn and rehearse immediate alternative responses – including self
   instruction - rejecting automatic psychological responses.
   Over time, reconceptualise the meaning of the cue – change attitudes
   beliefs and norms – may take time – requires cognitive rehearsal.
Managing “Food Rehab”:
Kessler’s Recommendations: The “Treatment” II

4. Social support

Sharing with others and making commitments can be very helpful – others can also undermine “rehab”.

5. Emotional learning

We invest behavioural responses with anticipated affect – “it will be soo nice (even if naughty)”.. “it will feel fantastic”... Etc.

Such associations strengthen the impulsive impact of cues.

Unlearning affective associations is important - the things we want/crave are not so special and often leave us unsatisfied.

Replacing advertising messages with automatic negative evaluations.

“Once I thought a big plate of food was what I wanted and needed to feel better. Now I see it for what it is… fat of fat on sugar on fat that will never provide lasting satisfaction and only keeps me coming back for more…”
Helping Motivated, Overweight and Obese Woman to Lose Weight

Research Question
Does action and if-then planning help motivated people lose weight?

Sample
Randomised Controlled Trial of 45 women attending Weight Watchers classes.

Intervention
Single session add-on “planning” session (including if-then planning)

Outcome.
Weight loss two months later.

Luszczynska, Sobczyk & Abraham, 2007

Results – 2 Months Later

**Clinically significant reduction of weight (5%)**:

- **54.2%** of Intervention participants
- **8.3%** of Control participants
Automaticity: Key Conclusions

Identify and avoid cues.
Nurture premonitionary urges recognition.
Practice Immediate conscious rejection.
Develop easy, rewarding alternatives.
Seek social support.
Practice, practice, practice.....
A Useful Checklist?
IMB + Automaticity Development

Information  (I know about X)

Motivation  (I want to do X)

Behavioural Skills  (I am able to do X)
May include undermining automaticity in conflicting behavioural patterns.

Automaticity-Enhancing Skills  (I do X without thinking)
Resulting in maintenance.
Thank You!

Questions?
Design and Evaluation of Behaviour-Change Interventions

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Exeter, October 13th 2015
MINDSPACE: Influencing behaviour through public policy

http://www.instituteforgovernment.org.uk

MINDSPACE is a guide for policy makers produced by the Institute for Government and authored by Paul Dolan and colleagues. It...

Provides a checklist of potentially effective behaviour change techniques summarised by a acronym and mnemonic.

Relates behaviour change techniques to current policy challenges and includes UK case studies.

Shows how government can build behavioural theory into its current policy-making practices

Explores issues around the need for public permission and the role of personal responsibility
## MINDSPACE OVERVIEW

<table>
<thead>
<tr>
<th>Messenger</th>
<th>We are heavily influenced by who communicates with us</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentives</td>
<td>Our responses are shaped by predictable mental shortcuts such as strongly avoiding losses</td>
</tr>
<tr>
<td>Norms</td>
<td>We are strongly influenced by what others do</td>
</tr>
<tr>
<td>Defaults</td>
<td>We ‘go with the flow’ of pre-set options</td>
</tr>
<tr>
<td>Salience</td>
<td>Our attention is drawn to what was novel and seems relevant to us</td>
</tr>
<tr>
<td>Priming</td>
<td>Our acts are influenced by sub-conscious cues</td>
</tr>
<tr>
<td>Affect</td>
<td>Our emotional associations can powerfully shape our actions</td>
</tr>
<tr>
<td>Commitments</td>
<td>We seek to be consistent with our public promises and reciprocate acts</td>
</tr>
<tr>
<td>Ego</td>
<td>We act in ways that make us feel better about ourselves</td>
</tr>
</tbody>
</table>
Six E’s: Government should –
Explore, Enable, Encourage, Engage Exemplify & Evaluate
Our environments contain many cues and messages...

Thaler & Sunstein (2009) define a Nudge as..

“...any aspect of the choice architecture that alters people’s behaviour in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates. Putting the fruit at eye level counts as a nudge. Banning junk food does not.”
People are most likely to act in their best interests when the “decision making architecture” is matched to action control.

1. Provide iNcentives for the best choices (price & accessibility).

2. Understand the difficulties in mapping gradations/ distinctions onto meaningful differences in terms of goals.

3. Make the best choice the easiest or Default choice.

4. Give early feedback on the consequences of their choices.

5. Acknowledge that Errors occur because, for example, habitual behaviours are difficult to change.

Our Pre-Structured Environment
Shapes Conscious/ Unconscious Control

Dal Cin et al (2009)
Adolescents who watch movies with alcohol content - drink more - and differences in beliefs about others’ drinking explains this relationship.

Alcohol Concern - investigated alcohol advertising and audience profiles for the 12A rated Batman film, Dark Knight, released in 2008. It found:

Almost half of the total advertising loop (9/19) was made up of alcohol advertisements by Carlton Screen Advertising, which covers 65% of UK screenings.

810,000 7-14 year olds were exposed to nine alcohol adverts prior to watching the Batman film, with up to a further 590,000 likely to have been exposed.
Policy Options

Provide health education for the general public.
Improve food and health education in schools.
Improve communal and school sports facilities.
Provide further training for health professionals.
Provide accessible mandatory, informative food labelling e.g., the traffic light system.
Control food and drink advertising e.g., ban advertisement of obesity-promoting foods.
Tax obesity-promoting foods and subsidise healthy foods.
EVALUATING INTERVENTIONS

What are the key questions....?
EVALUATING INTERVENTIONS

Outcome Evaluation

Does it work?
Efficacy vs. effectiveness.
Observed differences and validity – power crucial.

How well does it work?
Effect size and clinical relevance.

Economic Evaluation

How much does it cost – is it cost effective?

Process Evaluation (see 2014 UK MRC guidance)

How does it work?
Mechanisms and techniques – mediators.

For whom does it work and in what settings?
e.g., group and setting – moderators.
Evaluability Assessment

1. What kind of expected outcomes – e.g., population health versus local experiment.

2. How will evaluation affect policy decisions?

3. What reach and impact?

4. Contribution to science..?

5. Practicality – measures/ time..?

Validity of Evaluations

Internal validity
Is the study able to answer the question it posed?

External validity
To what extent do the results apply beyond the sample studied?
Internal Validity Threatened by…

Adequate Measures
  validated, reliable

“History” and selection effects
  randomly allocated or matched control group

➢ Differential attrition
  “Intention to treat” analysis

➢ Researcher effects
  blinding
External Validity Maximises Sustainability and Impact

Reach
   Participation rate, representativeness and exclusion rate

Effectiveness
   Intended and unintended (inc. adverse) consequences

Adoption
   Extent to which intervention adopted by implementers

Implementation
   Whether components delivered as intended; time and cost

Maintenance
   By both organisations and participants

External Validity Threatened by…

**Selection:** only sub-group benefit

**Setting:** only those in certain environments benefit

**History:** only effective under particular circumstances

- RCTs increase internal validity but *can* reduce external validity because of exclusion criteria and poor reach.
Process Evaluation (MRC)

Investigates delivery fidelity of implementation
Explores the logic model (or theory of change) – see IM and identifies mechanisms of change (mechanisms)
Clarifies for whom and in what context the intervention is effective
Typically uses quantitative and qualitative methods
Why is Process Evaluation Important?

Can clarify…

How outcomes were generated
  - especially negative or unexpected findings.

What is going on in complex interventions
  - with multiple, interacting components

Which components undermine effectiveness
  - or cause harm

How intervention might operate in other contexts
Evaluation Guidance is Available!

Systematic review identified over 402 guidance documents.

Screened for (1) direct relevance to public health, (2) Being freely available, (3) published after 1999 (4) by a national or international organization

98 guides produced by 43 organisations/bodies of which 48 were reviewed in detail.

1. Adopt a problem-solving, intervention mapping approach.

2. Identify underlying regulatory mechanisms
   information,
   motivation
   self regulatory skills
   habits/ automaticity of action.

3. Match change techniques to specific underlying mechanisms.

4. Develop materials and practices that can readily be used in everyday work/ leisure environments and are sustainable over time within available resources,

5. … with the active creative participation of those who will use, deliver and adopt the intervention.
Key Points 2: Intervention Evaluation

6. Evaluation design is critical to the IM process

7. Outcome, economic and process evaluation are all important

8. Quality process evaluation depends on measurement of implementation, mechanisms and context.

9. Assess the evaluability of an intervention before investing in evaluation.

10. Evaluation guidance and training is available.
Thank You!

Questions?