

A Systematic Approach to Behaviour-Change Intervention Design and Evaluation

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Newcastle University



Overview

PAtH and public health research at UEMS

Population-level behaviour change – how are we doing?

Designing BC Interventions – Intervention Mapping

Evaluating BC Interventions

- process evaluation
- retrospective classification of intervention components

HeLP – an illustration

PenCLAHRC and “Translational Medicine”

The National Institute for Health Research (NIHR)

Collaboration for Leadership

in Applied Health Research and Care (CLAHRC)

South West Peninsula (PenCLAHRC)...

Partner in the NIHR School for Public Health Research

... within the “translational medicine” research theme structuring Exeter’s research – including behaviour change interventions.

PSYCHOLOGY APPLIED TO HEALTH (PAth), UNIVERSITY OF EXETER MEDICAL SCHOOL



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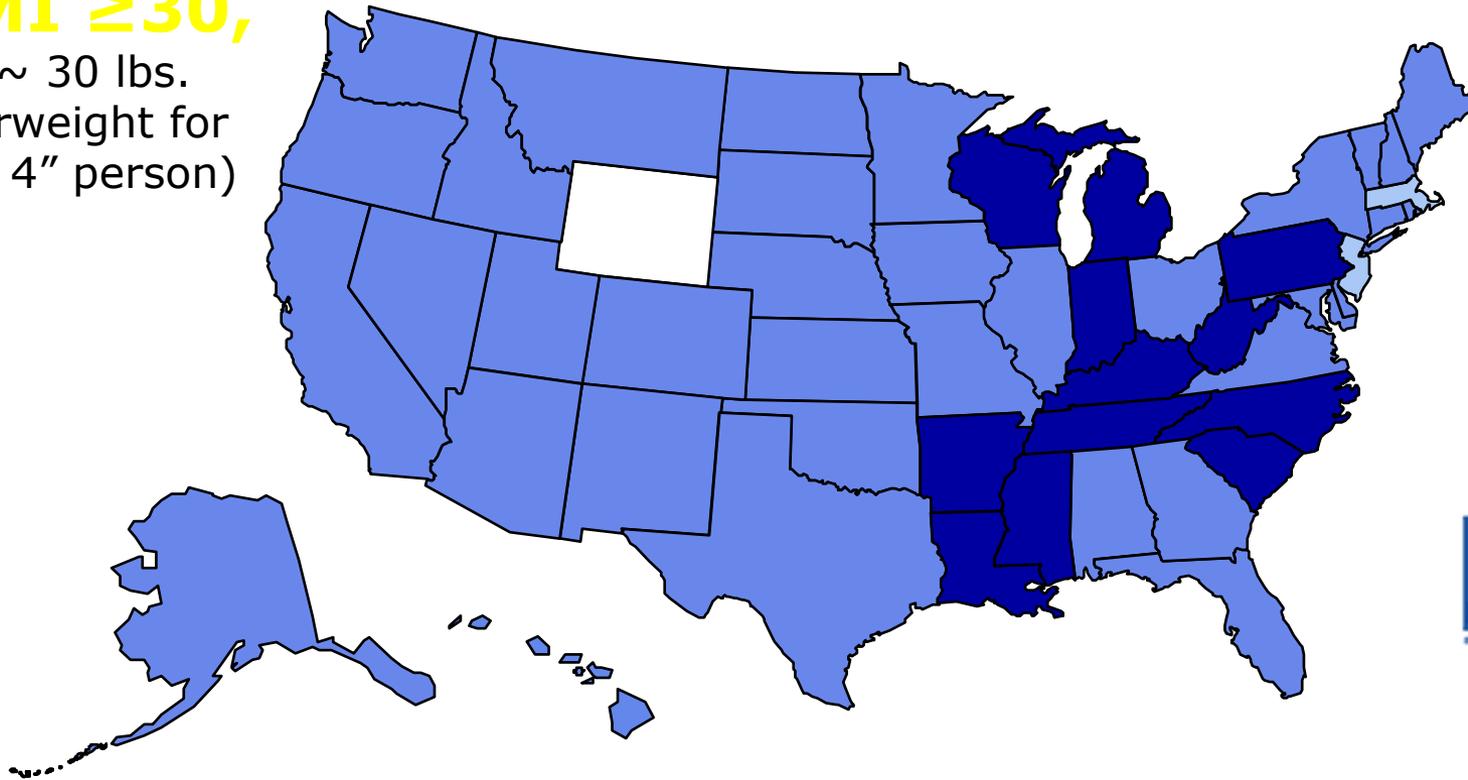


Matt White



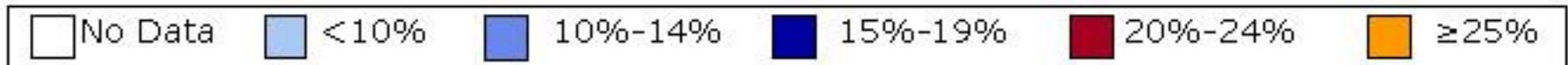
A Brief History of Obesity in the US: % Obese Adults in 1993

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/>



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...

Are We Creating Evidence-Based Interventions Relevant to Government Policy

- UK House of Lords Inquiry in Behaviour Change 2010 – 2011. Government response, October 2011.
- 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.

Importance of Evaluation

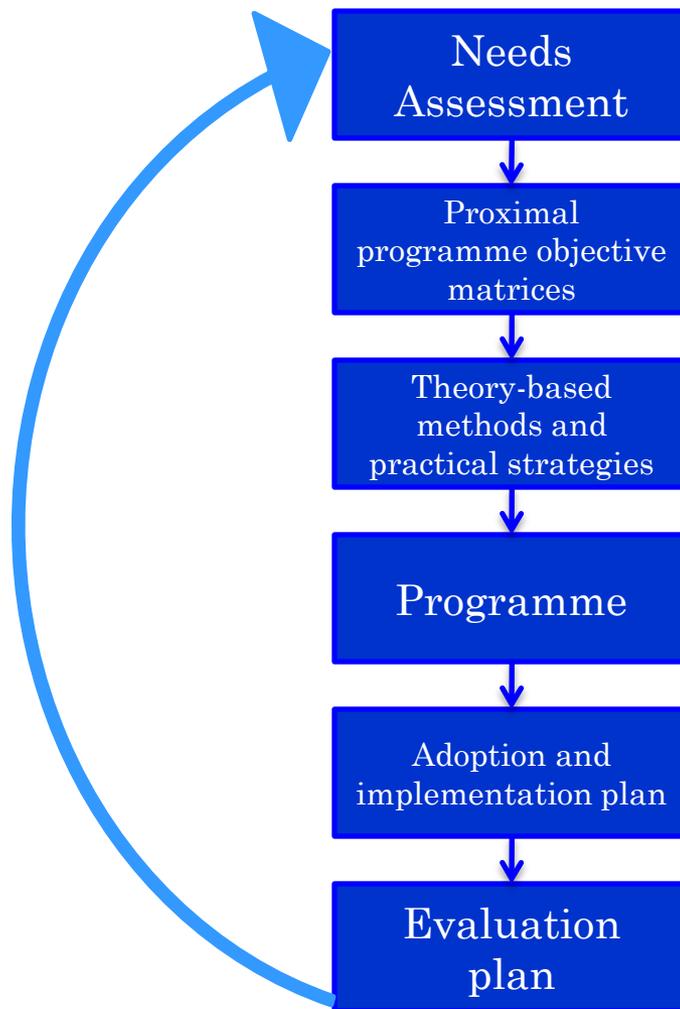
8.21. Effective evaluation requires that: evaluation should be considered at the beginning of the policy design process. External evaluation expertise should be sought, where necessary, from the policy's inception...

Behaviour Change Interventions *Can Work*

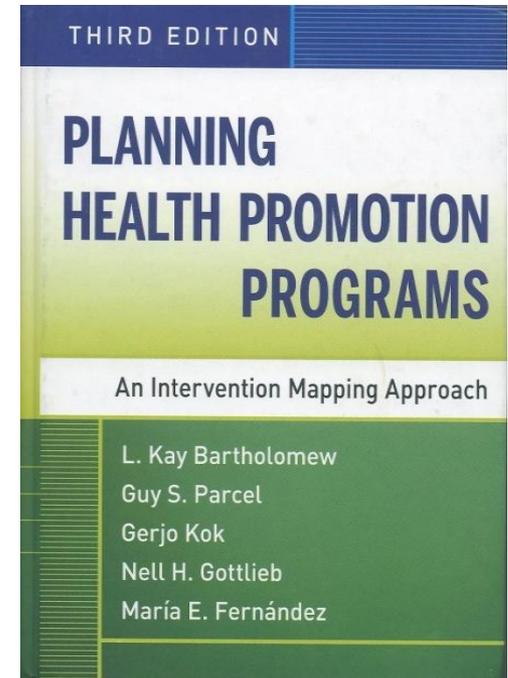
Johnson et al. (2010, *Am J Pub Hlth*)

- 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.
- Varying small/ medium effect sizes

Intervention Mapping: A BCI Design and Evaluation framework



Bartholomew, L.K., Parcel, G.S., Kok, G. & Gottlieb, N.H., & Fernández (2011). *Planning Health Promotion Programmes An Intervention mapping Approach*. Jossey-Bass, San Francisco.



Lloyd et al., 2011 Evidence Theory and Context – Using intervention mapping to develop a school-based intervention to prevent obesity in children. *Int J of Bev Nut and Phys Act* 8: 73 .

Intervention Mapping

Needs assessment and elicitation research

Define measurable change objectives

Identification of relevant regulatory mechanisms

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

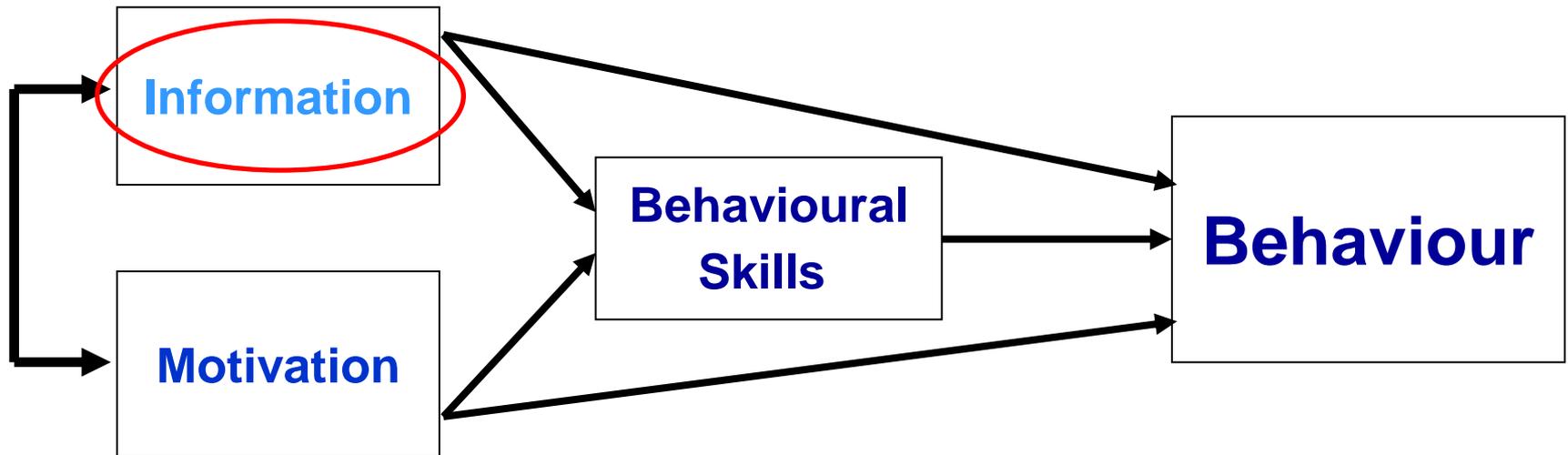
Planning marketing, adoption and implementation

Planning evaluation – before materials are created!

Identifying Mechanisms of Change

Information, Motivation, Behaviour Skills Model: An Initial Grouping of Behavioural Determinants

IMB: Fisher & Fisher (1992, *Psych Bull*)



Information I

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



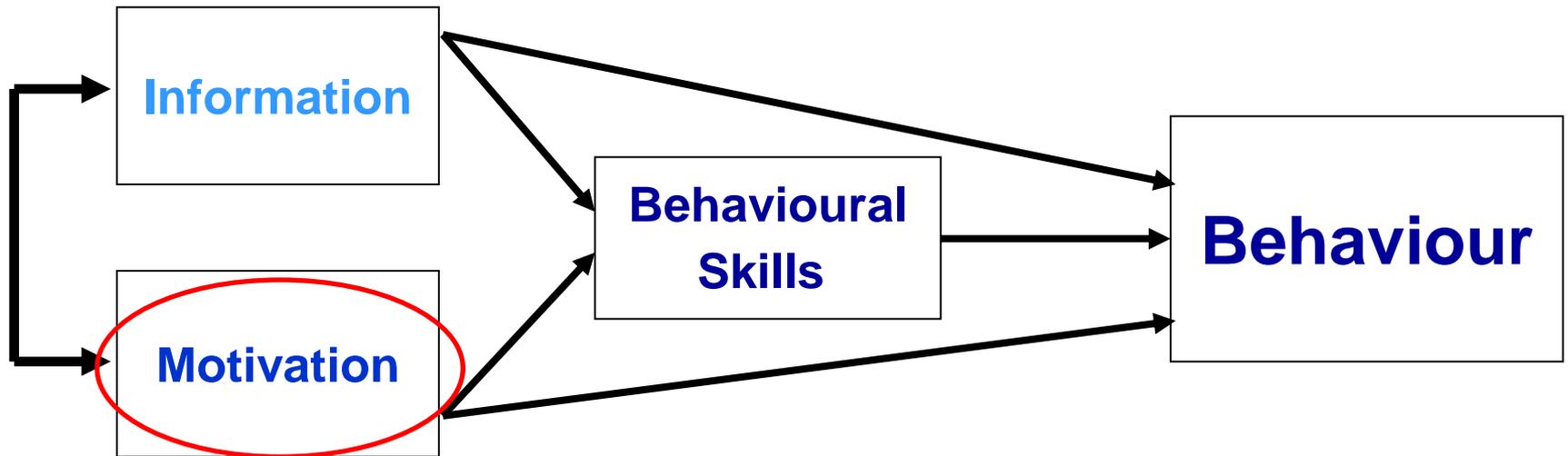
To influence action, information must be...

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

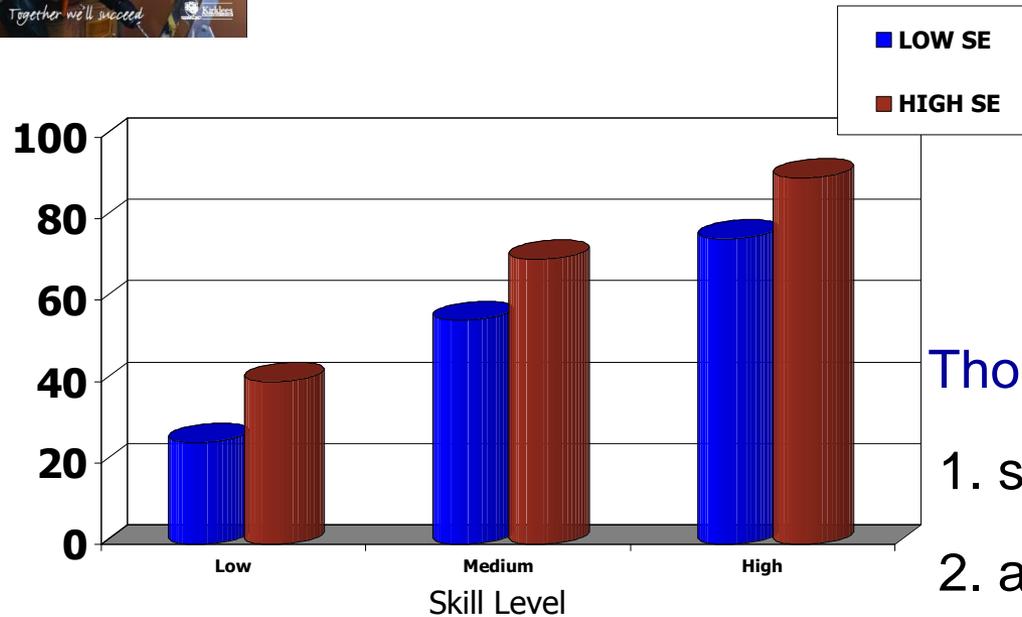
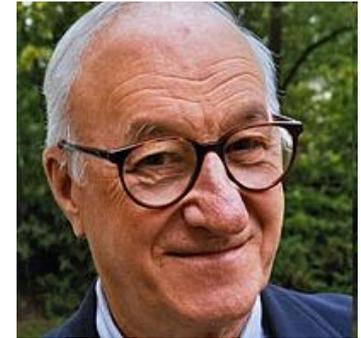
Fishbein et al (2001 in Baum et al. *Handbook of Health Psychology*)

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**.



Self Efficacy



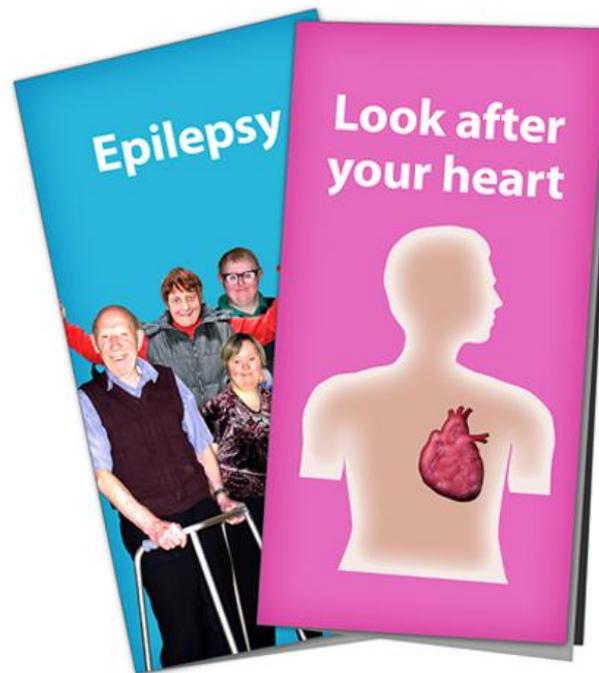
Those with higher self efficacy...

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

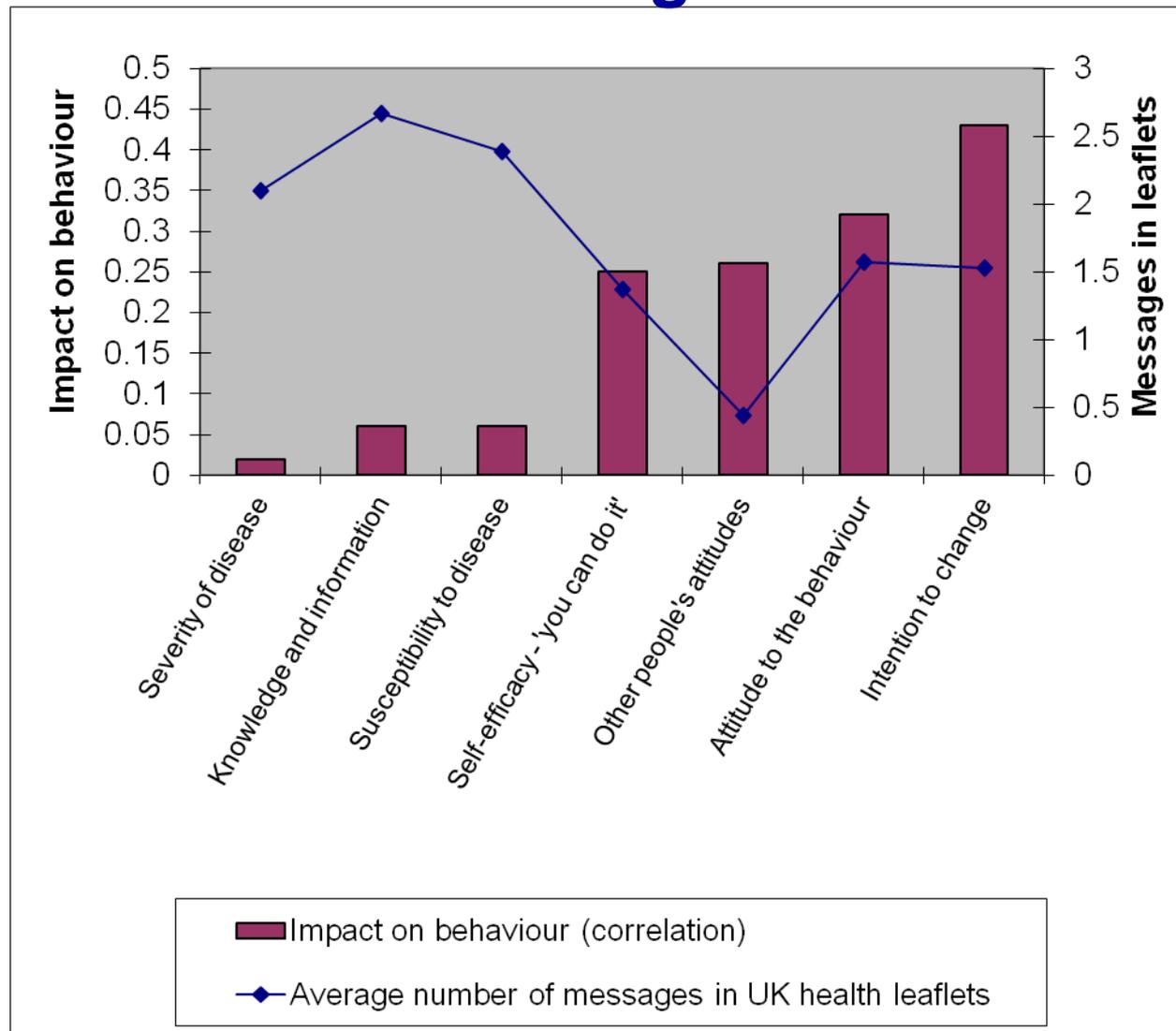
i.e., formulating messages that relate directly to mechanisms regulating behaviour patterns in the target audience....



Mismatch Between Motivational Targets and Leaflet Content

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

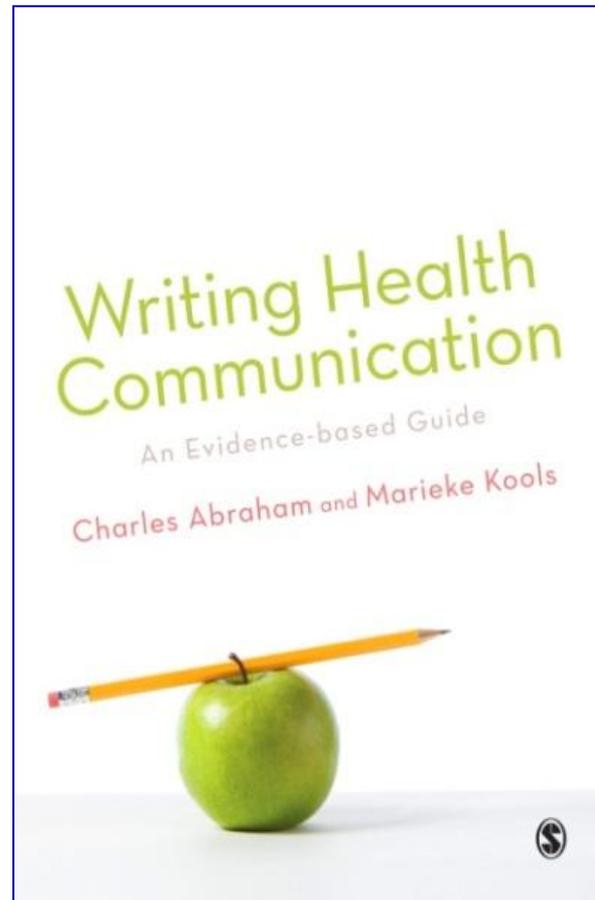
*Personal Responsibility and
Changing Behaviour: the
state of knowledge and its
implications for public
policy.* HMSO, London.



Writing Health Communication: An Evidence-Based Guide

Abraham C & Kools M (Eds. 2012)

London, SAGE Publications Ltd.



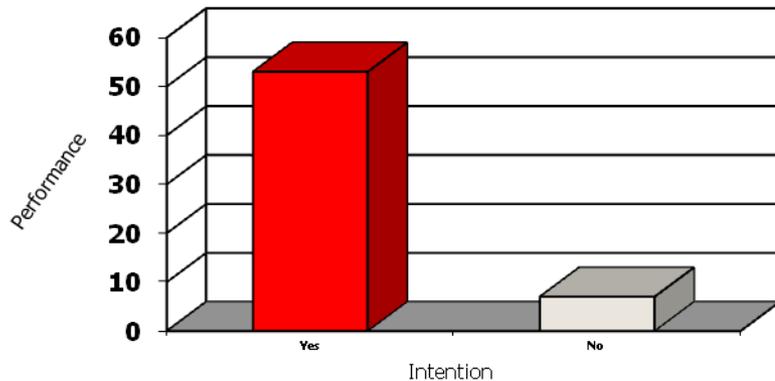


Motivation: Key Conclusions

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

From Motivation to Behaviour

- Sheeran (2002) across 6 studies..
of cancer screening, exercise and condom use

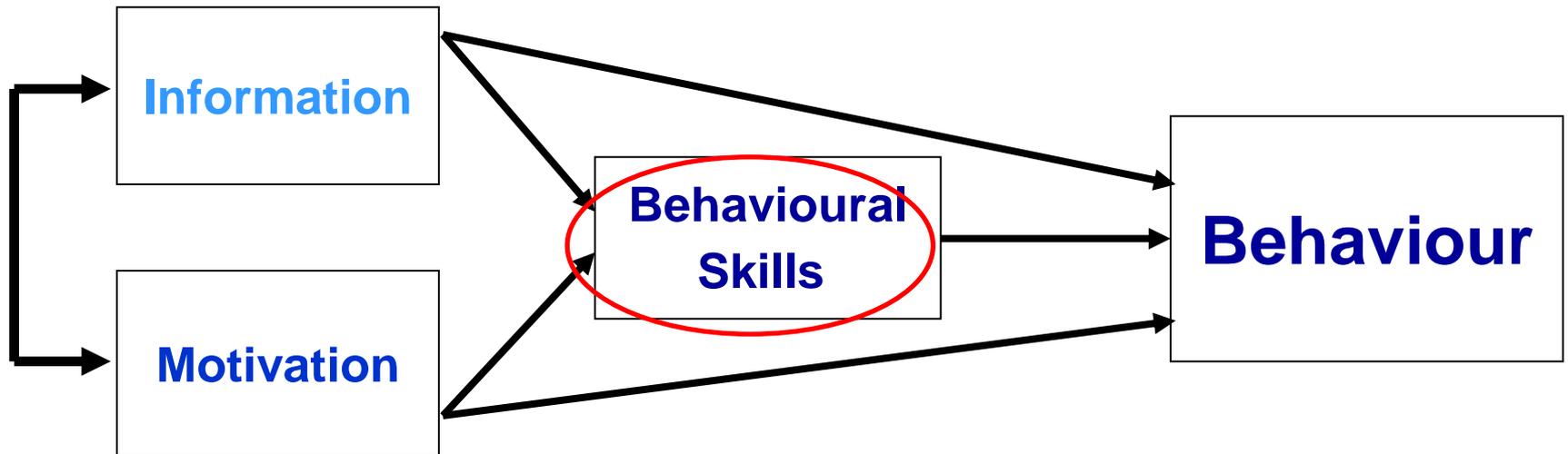


Median %
intenders who acted = 53%
non-intenders who acted = 7%

Intention is a good predictor of behaviour..

... but this “gap” highlights the need for
a psychology of enactment.

Information, Motivation, Behaviour Skills Model



Behavioural Skills

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.

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, A., Sobczyk, A, & Abraham, C. (2007) Planning to lose weight: RCT of an implementation intention prompt to enhance weight reduction among overweight and obese women. *Health Psychology, 26*, 507-512.

Luszczynska, Sobczyk & Abraham, 2007

Results – 2 Months Later

Health Psychology
2007, Vol. 26, No. 4, 507–512

Copyright 2007 by the American Psychological Association
0278-6133/07/\$12.00 DOI: 10.1037/0278-6133.26.4.507

BRIEF REPORTS

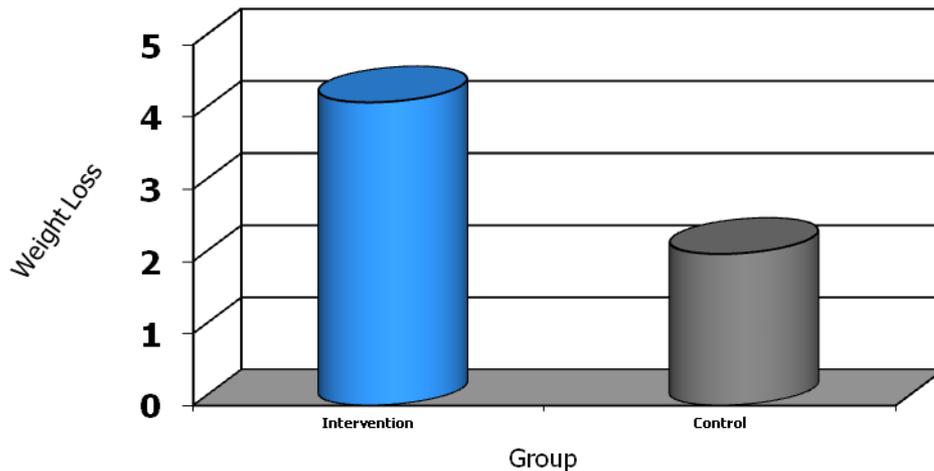
Planning to Lose Weight: Randomized Controlled Trial of an Implementation Intention Prompt to Enhance Weight Reduction Among Overweight and Obese Women

Aleksandra Luszczynska
University of Sussex

Anna Sobczyk
Warsaw University

Charles Abraham
University of Sussex

Objective: The trial investigates the effects of augmenting an established weight-reduction intervention with implementation intention prompts. *Design:* Fifty-five overweight or obese women (ages 18 to 76 years; body mass index from 25.28 to 48.33) enrolled in a commercial weight reduction program were randomly assigned to either an implementation intention prompt or a control condition. Data were collected twice, with a time gap of 2 months. *Main Outcome Measures:* The primary outcome was participants' change in weight and body mass index from preintervention to follow-up. *Results:* Repeated measures analysis of variance revealed a significant Time × Condition interaction: On average, implementation intention prompt participants lost 4.2 kg (95% confidence interval = 3.19, 5.07), whereas control participants lost 2.1 kg (95% confidence interval = 1.11, 3.09). The change in frequency of planning mediated the effects of the intervention on weight and body mass index change. *Conclusion:* Among obese or overweight women participating in a



Control	2.1kg Lost
Intervention	4.2 Kg Lost

Clinically significant reduction of weight (5%):

54.2% of Intervention participants
8.3% of Control participants

Two Systems Regulate Behaviour: Dual Process Models

Strack & Deutsch (2004, *Personality & Social Psych Review*)

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 external cues without reflective initiation. Thought to be largely associative with growing neural activation resulting in priority of action through initiation of well-learned (potentially complex) motor routines.

Addiction as a Failure of Regulation Due to Associative Programming 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.

Changing Many Behaviour Patterns may Involve “Treatment” for “Addiction”: “Rehab”

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).



The end of overeating.



TAKING CONTROL OF THE
INSATIABLE AMERICAN APPETITE
DAVID A. KESSLER, MD

Managing “Food Rehab”: Kessler’s Recommendations: The “Treatment” I

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 itfor what it is... fat of fat on sugar on fat that will never provide lasting satisfaction and only keeps me coming back for more...”



Automaticity: Key Conclusions

Identify and avoid cues.

Nurture premonitory 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.

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 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.

Process Evaluation (*MRC*)

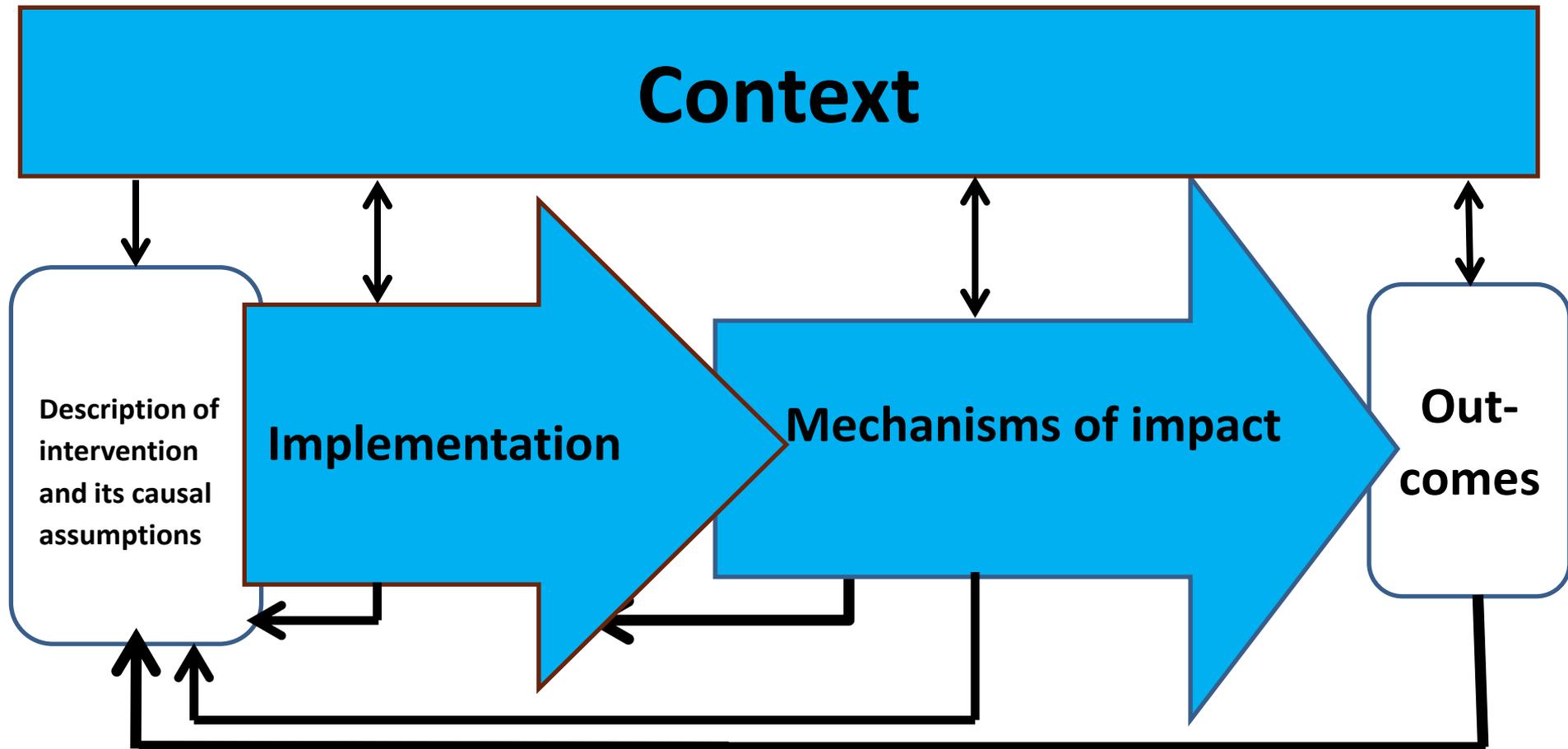
Investigates delivery fidelity of **implementation**

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

Process Evaluation (*MRC Guidance*)



Moore G, Audrey S, Barker M, Bond L, Bonell C, Hardeman W, Moore L, O’Cathain A, Tinati T, Wight D, Baird J. *Process evaluation of complex interventions: Medical Research Council guidance*. MRC Population Health Science Research Network, London, 2014

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

Retrospective Process Evaluation Using Meta Analysis e.g., Albarracín et al. 2005, *Psych Bull.*

Identified measures of...

Implementation characteristics e.g.,

active versus passive delivery
target group
person delivering intervention

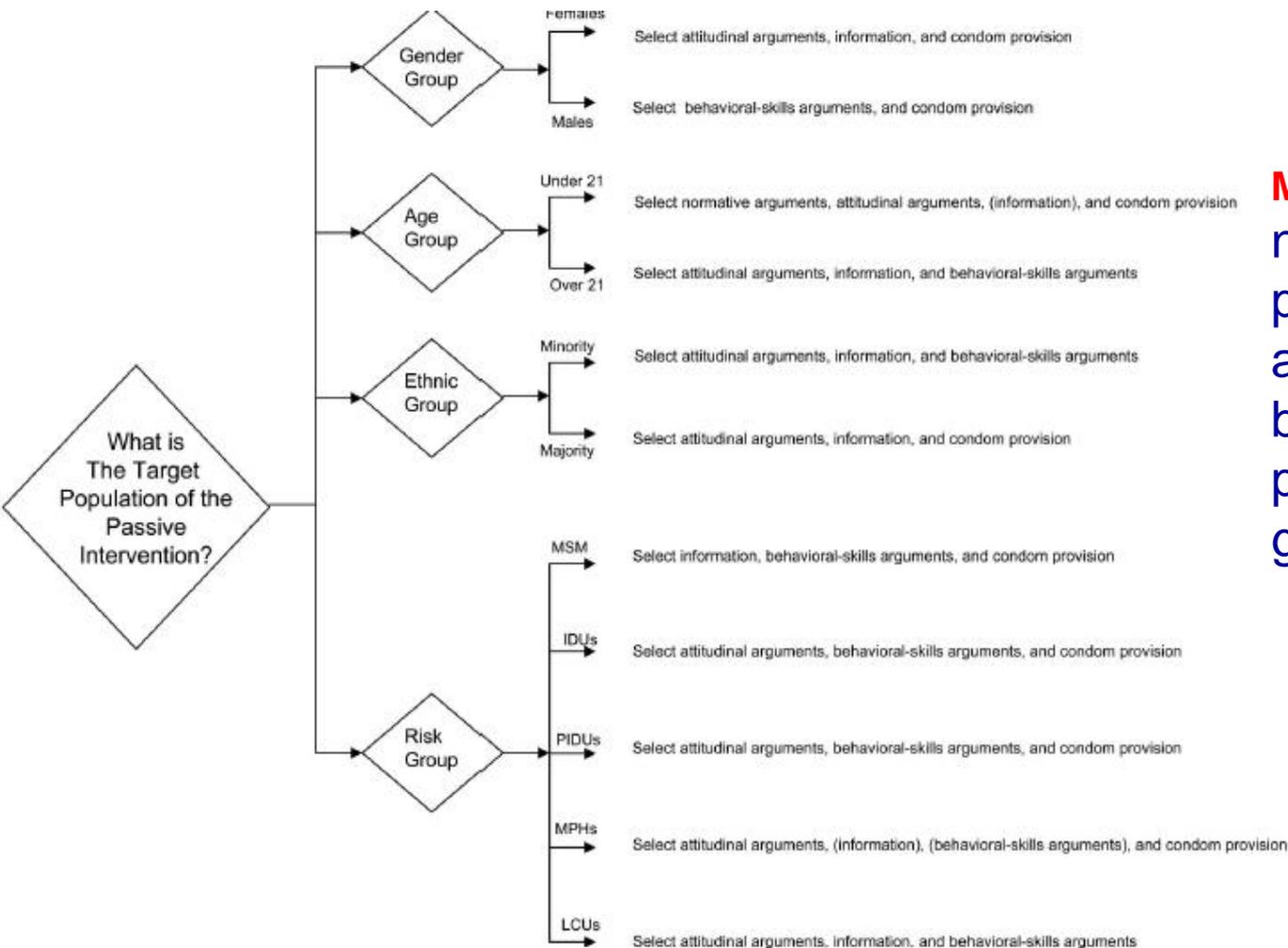
Change mechanisms e.g.,

1. Attitudinal argument, 2. Normative argument
3. Factual information, 4. Behavioural skills arguments
5. Threat-inducing arguments
6. Condom use skills training, 7. Interpersonal skills training
8. Self-management skills training,
9. HIV counselling and testing and 10. Condom provision

Mediation and moderation analyses of 354 intervention descriptions and 99 control group descriptions in published papers supported mechanisms specified by IMB, TPB, social-cognitive theory – but not for fear arousal....

Components Associated with Effectiveness – and Moderation by Target Audience

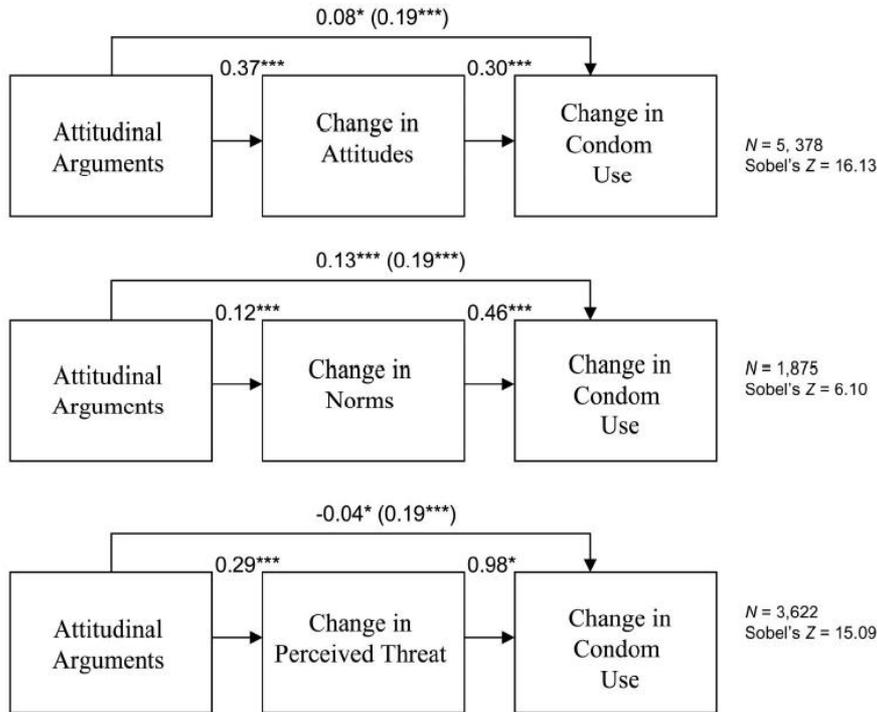
Albarracín et al. 2005 Content recommendations for *non* face-to-face interventions promoting condom use among specific audiences.



Moderation by age
normative arguments
promote condom use
among under- 21s
but may be counter-
productive for older
groups..

Multiple Related Change Mechanisms: Mediation Analyses

Albarracín et al. 2005

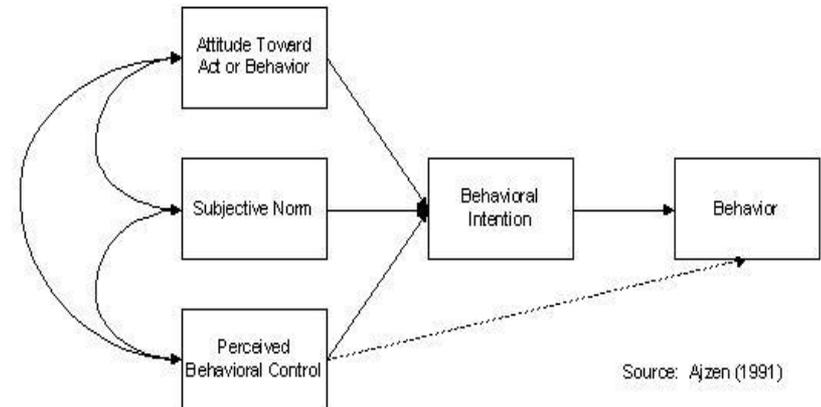


" *attitudinal arguments* [seeking to change evaluations] *convey not only that - using condoms is good - but also that - the communicator thinks that using condoms is good.*

Consequently, the impact of attitudinal arguments on condom use could be mediated by changes in norms instead of [or as well as] changes in attitudes.

Implications

1. Code for change mechanisms.
2. Intervention evaluations should include multiple mechanism measures in process evaluations.



Source: Ajzen (1991)

Reliably-Identifiable, Commonly-Used, Generic 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.

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

Borek A. Abraham et al. (under review). A Checklist to Improve Reporting of Group-Based Behaviour-Change Interventions.

Which Descriptions Should We Classify?

Abraham & Michie (2008) Change Techniques Taxonomy

13 article- manual pairs (describing the same intervention)

Correspondence of included change techniques = 74%.

73% of mismatches - technique in manual only.

Techniques in manuals M=9.07

Techniques in articles M=6.07 $t(25) = 2.4$ $p < 0.033$ (2 tailed)

SHARP Taxonomy

27 article- manual pairs (describing the same intervention)

Correspondence of included change techniques = 78%.

84% of mismatches - technique in manual only.

Techniques in manuals M=44.63

Techniques in articles M=18.56 $t(26) = 7.15$ $p < 0.000$ (1 tailed)

Under-reporting of change techniques in articles (compared to manuals) may provide a partial picture of intervention content.

Process Evaluation: Key Points



Process evaluation depends on mechanism-based intervention design – see IM

Process evaluation is only possible if well specified measures of mechanism change are built into experimental outcome evaluations (i.e., trials)

Retrospective process evaluation is difficult because of many confounding components that may explain effectiveness/ ineffectiveness – risks misattribution of mechanism...

Retrospective process evaluation requires large data sets and clear conceptual analyses of implementation, mechanism and context.

An Illustration

The Healthy Lifestyles Programme (HeLP)

Led by Prof Katrina Wyatt and Dr Jenny Lloyd

Context-Sensitive Co-Creation
of an Evidence-Based
Organisational
Behaviour Change Intervention

Designed Using Intervention Mapping with PAtH

HeLP - Key Behaviour Change Targets

Prevention of weight gain in 11 year olds through..

Decreasing consumption of sweetened fizzy drinks

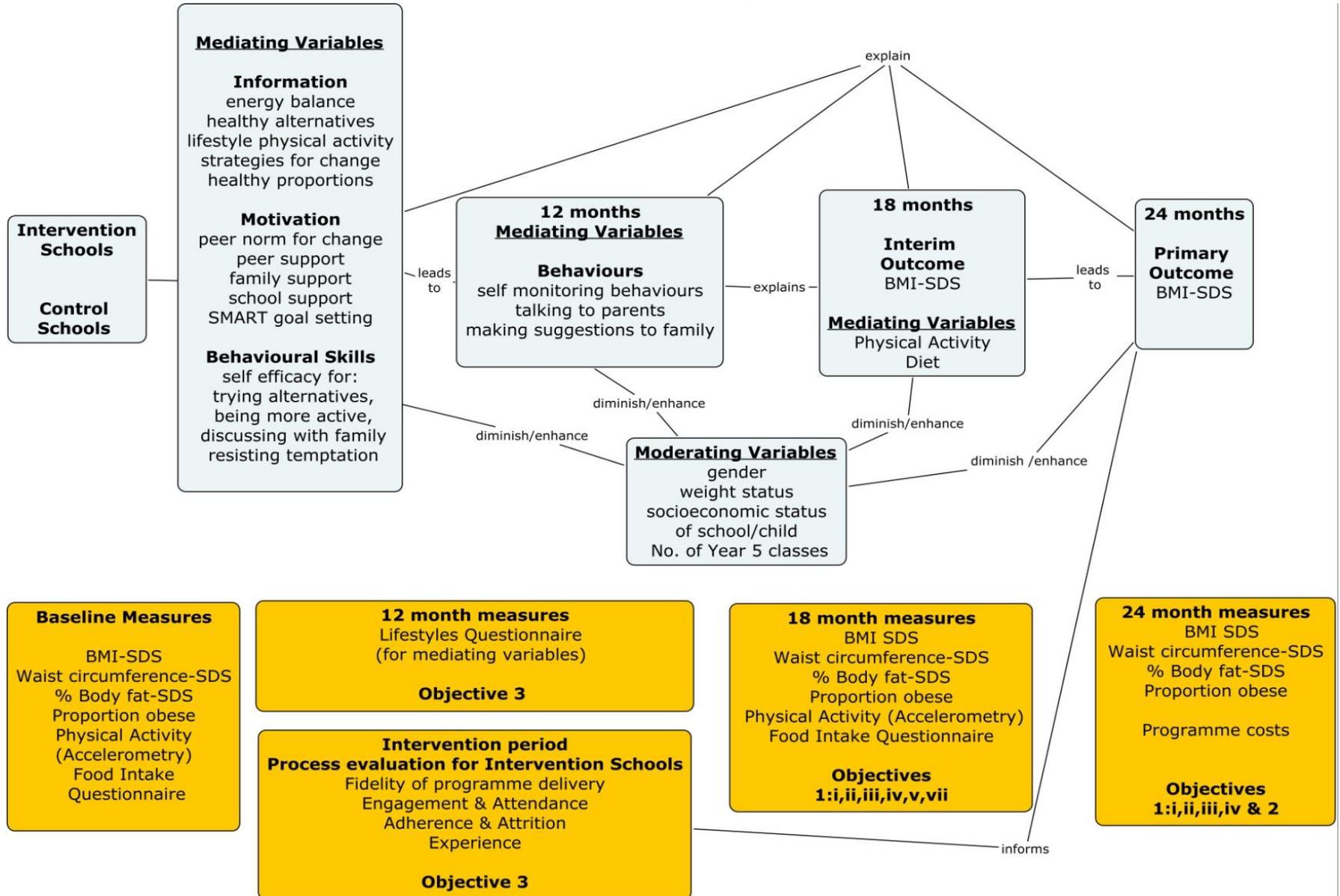
Increasing the ratio of healthy to unhealthy snacks

Decreasing screen-based activity



<http://medicine.exeter.ac.uk/research/healthserv/childhealth/researchprojects>

HeLP: Mapping of Proposed Change Processes and Corresponding Measures



Key Points 1: Intervention Design

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. Large sample retrospective process evaluation of intervention sets can provide useful guidelines – BUT – requires large data sets, sensitive sophisticated and conceptually coherence coding systems.



Thank You!

Questions?

