Behaviour change techniques and a framework for increasing physical activity

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  - Prof Robert West, University College London
  - Prof Marie Johnston, University of Aberdeen
  - Health Psychology Research Group

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CANCER RESEARCH UK

This talk

- Understanding behaviour
- Complex interventions and behaviour change techniques
- What works?
- A framework for designing interventions

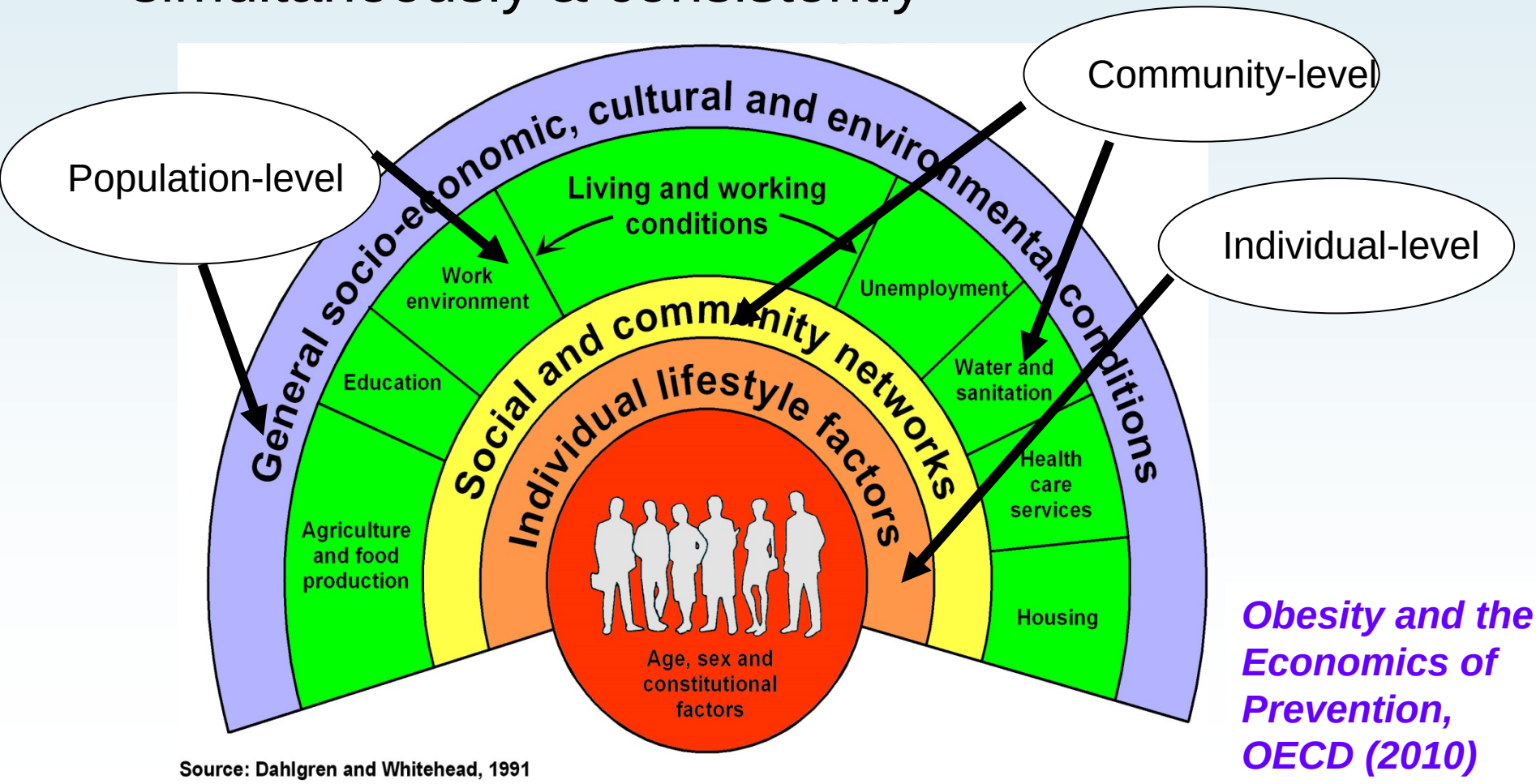
Understanding behaviour

- Behaviour is in the moment and influenced by its context
- Understanding behaviour is key to changing it
- Understand before you intervene!

Changing behaviour

- Intervene at many levels
- simultaneously & consistently

NICE Guidance for Behaviour change at population, community and individual levels (2007)



Obesity and the Economics of Prevention, OECD (2010)

Behaviours are different and contexts are different

- If we are to develop effective interventions to change behaviour
  - need to understand the particular behaviour in its particular context
- For example .... the two categories of behaviour that need to change to combat the obesity epidemic ....

Understanding behaviour in context is key to effective interventions

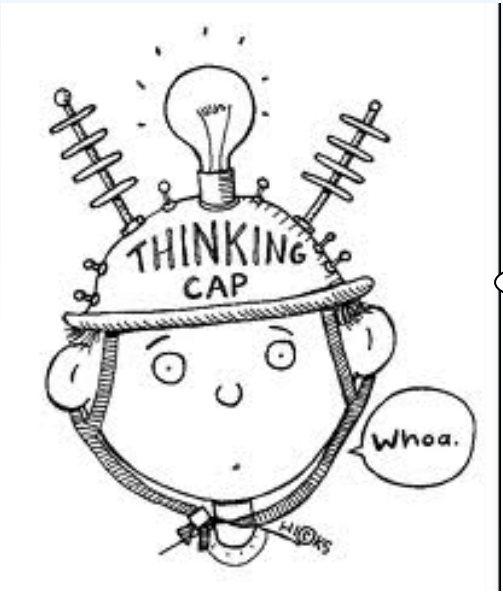
- Physical activity
  - requires energisation, “push”
  - begin doing things
  - create impulses
  - respond to cues
- Healthy eating
  - requires self-control, “pull”
  - avoid/stop doing things
  - resist impulses
  - ***not*** respond to cues

Understand the behaviour in context

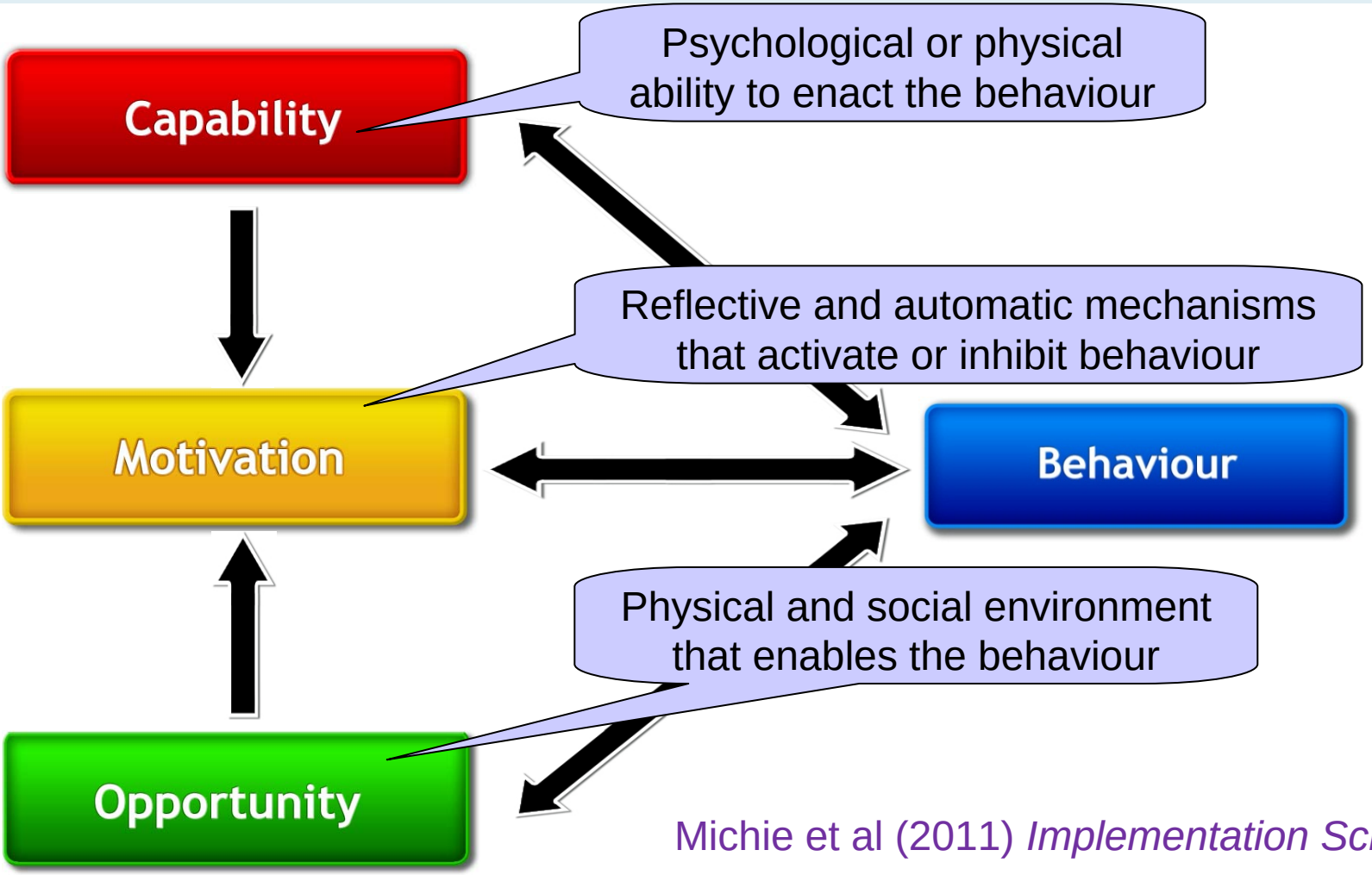
- Why are behaviours as they are?
- What needs to change for the desired behaviour/s to occur?

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*

This talk

- Understanding behaviour
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- What works?
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Interventions are complex

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

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

Effective principles of individual 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
- Maximise **Opportunity** to support self-regulation
  - Elicit social support
  - Avoid social and other cues for current behaviour
  - Change routines and environment
- 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

Abraham, Kelly, West & Michie, 2008, Psychology, Health and Medicine

Content of the intervention: behaviour change techniques

- “Active ingredients” within the intervention designed to change behaviour
- They are
  - observable,
  - replicable and
  - irreducible components of an intervention
- Can be used alone or in combination with other BCTs

Interventions are made up of specific behaviour change techniques (BCTs)

1. General information
2. Information on conseque
3. Information about appr
4. Prompt intention form
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 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.

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

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). A taxonomy of behavior change techniques used in interventions. *Health Psychology.*

Gives us an agreed, standard method of describing interventions to

- Report interventions as accurately as possible
  - Replicate interventions in research to build evidence
  - Implement effective interventions
- Synthesise published reports in systematic reviewing

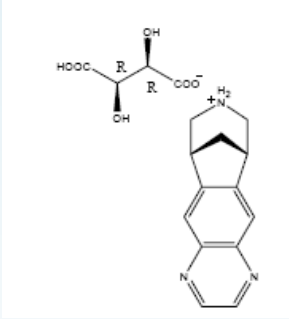
Example of the problem: Descriptions of "behavioural counselling" in two interventions

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*

“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 M
- Reducing excess
  Michie et al, Addict
  42 BCTs
- 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,
in press, Annals of Behavioral Medicine

This talk

- Understanding behaviour
- Complex interventions and behaviour change techniques
- What works?
- A framework for designing interventions

Applications of taxonomy approach

1. Identifying active ingredients in interventions
   - Meta-regression in evidence synthesis
     - Physical activity & healthy eating
2. Investigating mechanisms of action
   - The intervention “ProActive”
3. Designing interventions
   - The Behaviour Change Wheel

Identifying active ingredients in interventions

- Usual meta-analysis
  - overall effect of heterogeneous interventions

- Technique-based meta-regression
  - similar to traditional regression, except data at study rather than individual level
  - classify interventions into component BCTs
  - meta-regression to investigate effects of
    - individual techniques across interventions
    - theoretically based combination of techniques

What BCTs are effective in interventions to increase physical activity and healthy eating?

- Inclusion criteria
  - Interventions using behavioural &/or cognitive techniques
  - in adults
  - designs experimental or quasi-experimental
  - outcome measures objective or validated self-report
- 6 electronic databases, 1990-2007
- Intervention content analysed using
  - a reliable taxonomy of 26 techniques
  - a theoretically derived combination of techniques
- Random effects meta-analysis and meta-regression
  - isolates unique contribution of specific techniques to heterogeneity

Michie, Abraham, et al (2009) Effective techniques in healthy eating and physical activity interventions: A meta-regression. *Health Psychology,* 28, 690-701

The interventions

- 84 interventions (n=28,838)
- Target behaviour
  - Physical activity &/or Healthy eating
- Interventions ave. 6 techniques (range 1-14)
  - Many different combinations

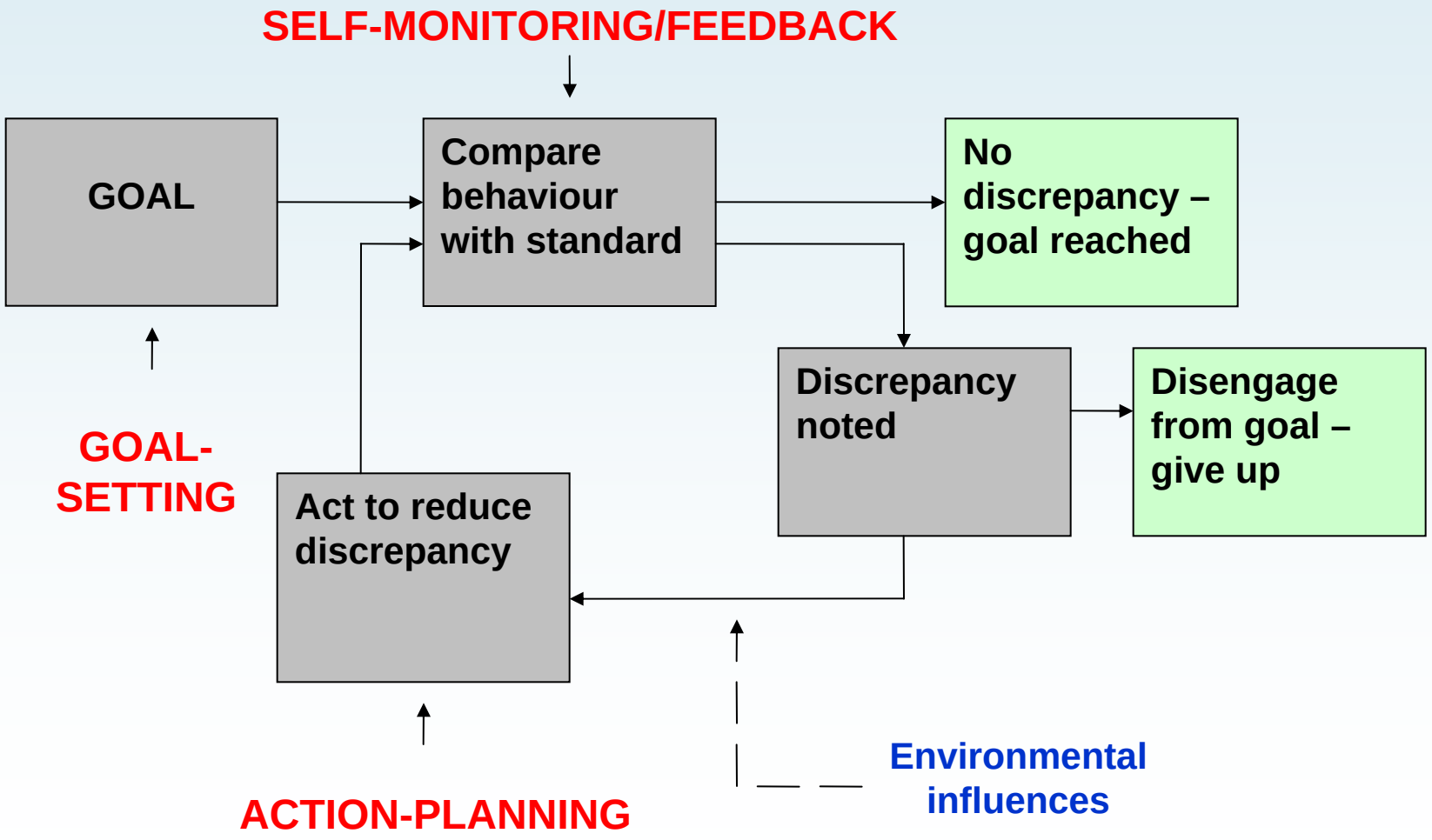
- Effect d=0.37, 95% CI 0.29-0.54
- Very heterogeneous effects (I^2=79%)
  - not explained by 10 moderators examined e.g.
    - Setting, population, intervention characteristics, target behaviour

Results

- Only one technique, self-monitoring, had a significant effect for both behaviours across interventions
  - d=0.57, 14.6% variance

- Next step
  - Use psychological theory to predict combinations of techniques that might be more effective
  - Control Theory suggests how feedback may interact with other techniques to change behaviour
    Carver & Scheier, 1982

A Self-regulation (control) Theory: *Carver & Scheier, 82*



Theoretical combination of techniques

- self-monitoring of behaviour
- Other core self regulatory processes:
  - setting goals
  - reviewing goals
  - specifying action plans
  - feedback on performance

Findings

- Interventions comprising self-monitoring with at least one other “self-regulatory” techniques (n=28)

compared with the other interventions (n=56)

- were twice as effective
- d=0.60 *vs* d=0.26

Used BCT taxonomy approach to

- Assess fidelity of delivery
- Evaluate mechanism of action
  - By linking intervention content to theory

Collaboration with Wendy Hardeman, Ann Louise Kinmonth and Steve Sutton, University of Cambridge

Example: intervention to increase physical activity of those at risk of Type 2 diabetes

- "*ProActive*": 14 behaviour change techniques
- Delivered by trained professionals in 5 sessions over 12 months
- Specified in detailed protocols/manuals
- An RCT of 365 people, family history & sedentary
  - Increased activity by equivalent of 20 minutes per day
  - No difference between intervention and "control" groups

Kinmonth et al, *Lancet*, 2008

- What worked?
  - Assess implementation/ fidelity

Hardeman, Michie et al (2008) Fidelity of delivery of a physical activity intervention: Predictors and consequences. *Psychology and Health*, 23, 11-24.

- How did it work?
  - Link component techniques to theory

Michie, Hardeman et al (2008) Investigating Theoretical Explanations for Behaviour Change: The Case Study of ProActive. *Psychology and Health*, 23, 25-39.

Intervention techniques

1. Give information
2. Elicit questions
3. Summarise message
4. Set goals
5. Self-monitor
6. Build motivation
7. Action plans
8. Use prompts
9. Use rewards
10. Build support
11. Review goals
12. Build habits
13. Relapse prevention
14. Generalise skills

Theories

1. Theory of Planned Behaviour
2. Relapse Prevention Theory
3. Self-regulation Theory
4. Operant Learning Theory

The implementation process

Theories of behaviour change

↘

Techniques in manual

↘

Delivery of techniques by professional

↘

Participant response to intervention

↘

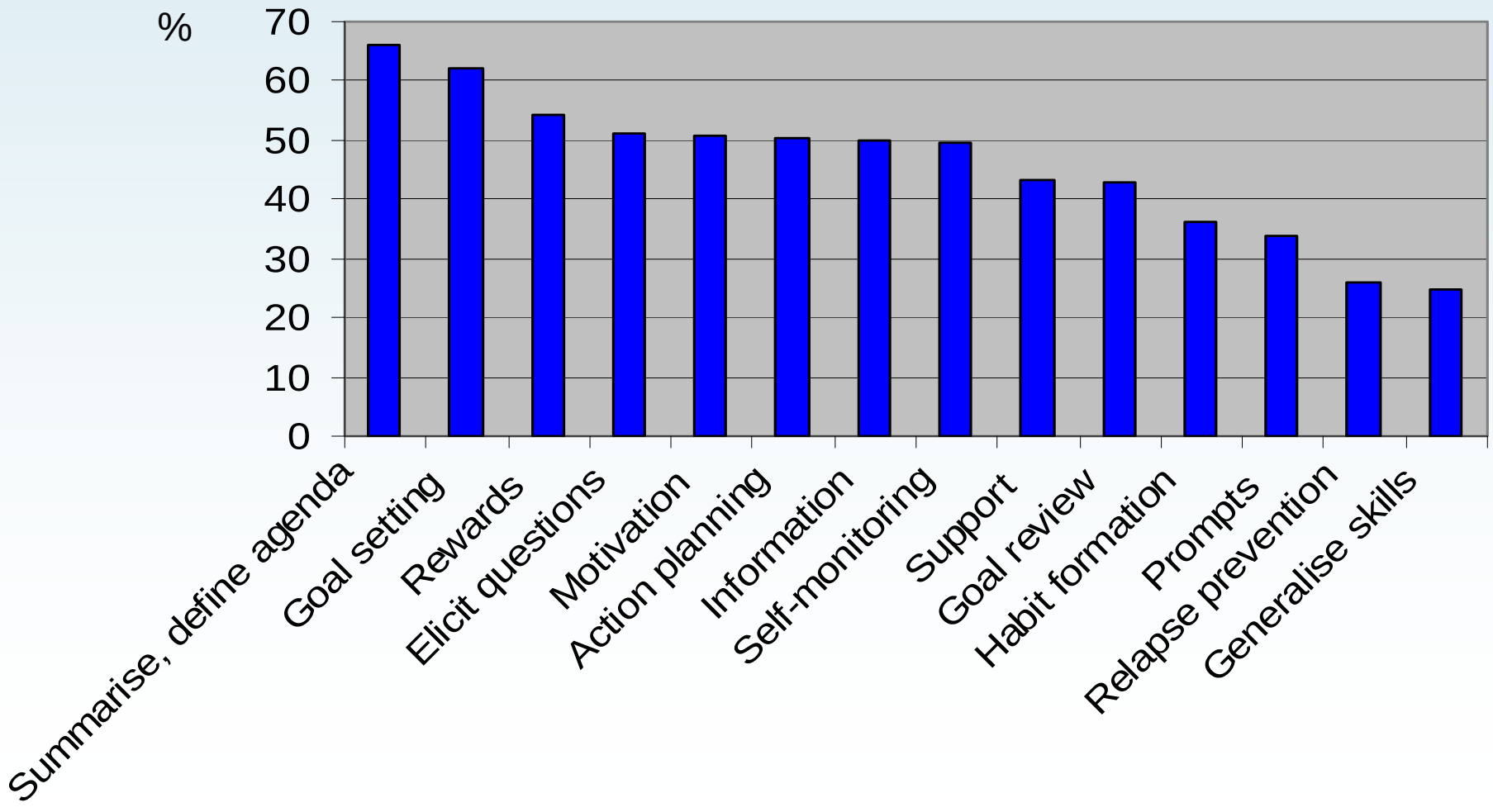
Physical activity

Question: How did the intervention work?

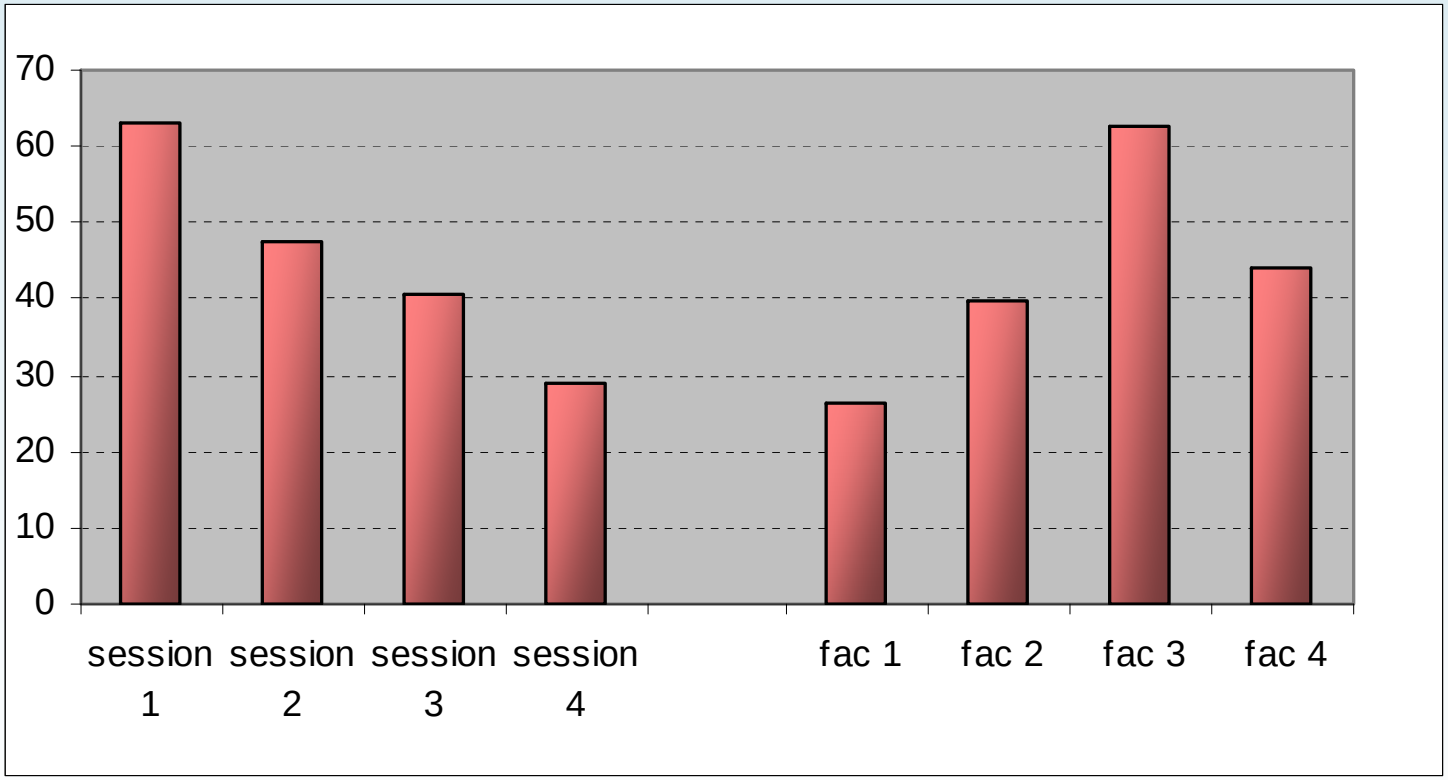
- 27 participants selected to study in depth
- Tape recorded and transcribed sessions
- All discussion in sessions relevant to behaviour change was reliably coded into techniques and theories
  - Both of professionals and of participants

Percentage of techniques delivered by professionals

45%



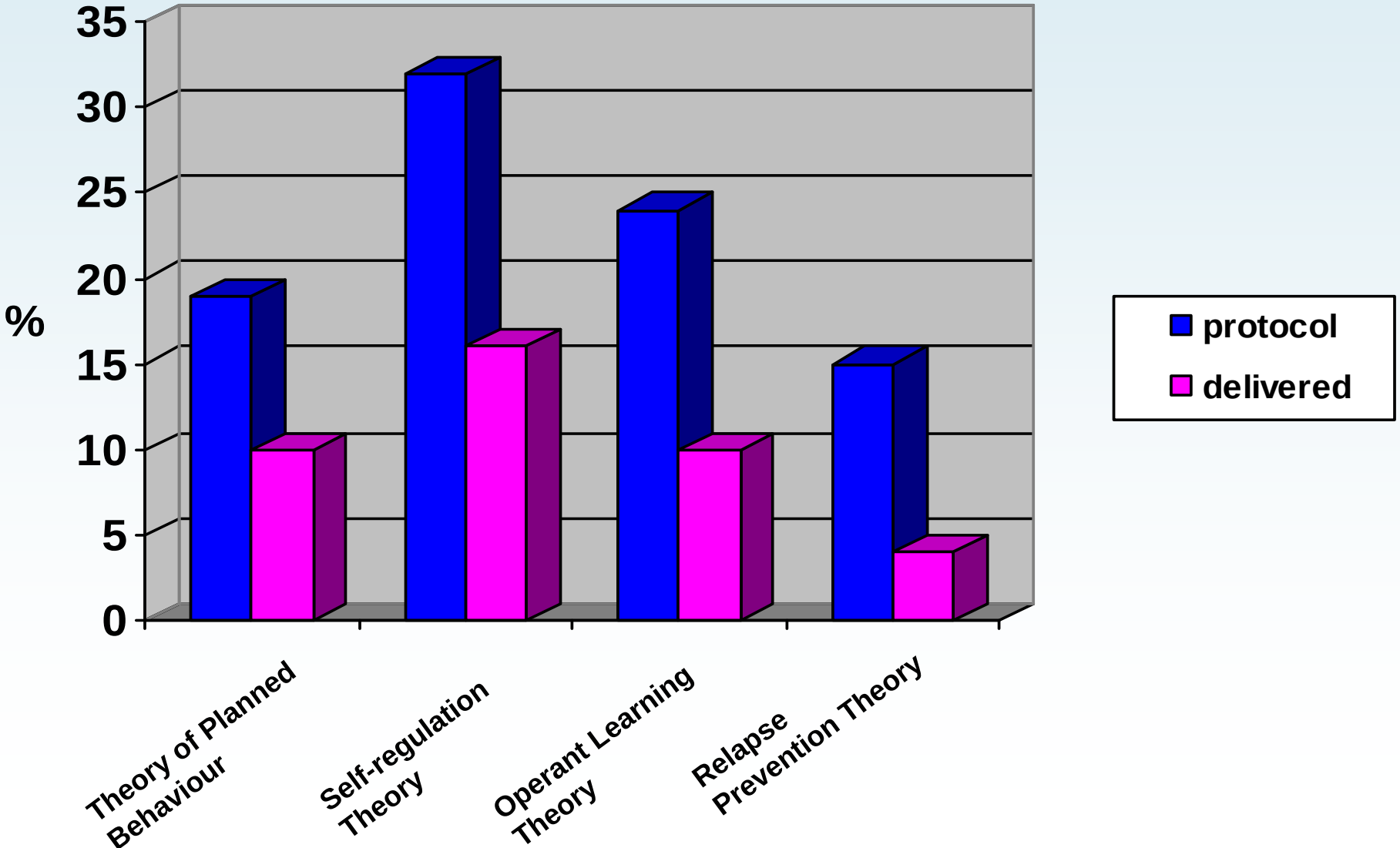
Variation in implementation



Sessions: $p<0.001$ (Page test)

Facilitators: $p<0.001$ (Kruskal-Wallis test)

How were techniques distributed over the theories? (a) in protocol (b) delivered



Process linking theory and behaviour change

Theories of behaviour change

↘

Techniques in manual

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Delivery of techniques by professional

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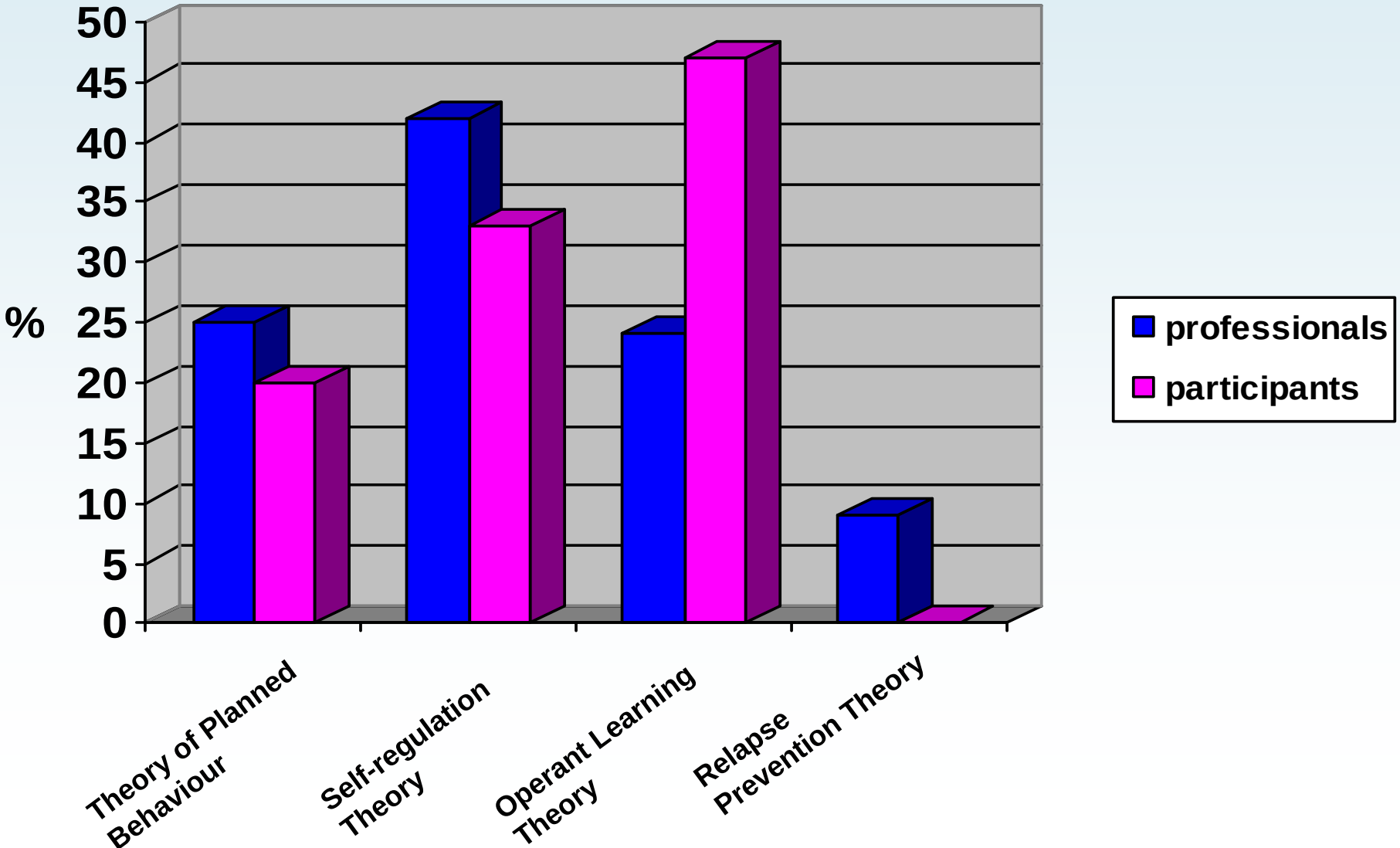
Participant response to intervention

↘

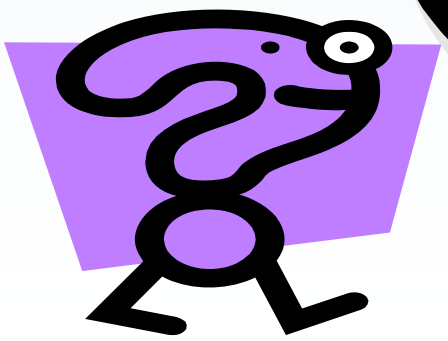
Physical activity

How was (a) professional (b) participant talk about behaviour distributed over the theories?



Which theories best accounted for change**?**

Although *Self-regulation theory* is the basis of the most commonly delivered intervention techniques, *Operant learning theory* may be a better explanation for behaviour change among participants



This talk

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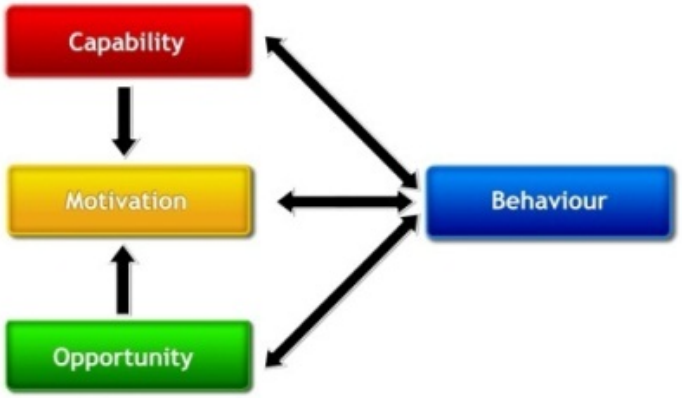
Designing effective behaviour change interventions

1. Identify the target behaviour/s
2. Understand the target behaviour/s in context
3. Consider full range of possible intervention functions
4. Identify specific behaviour change techniques

Understand the behaviour



Do we have a framework that has ….

1. Comprehensive coverage
2. Coherence
3. Clear link to a model of behaviour

Useable by, and useful to, policy makers, service planners and intervention designers

Systematic literature review

- Identified 19 frameworks to classify behaviour change interventions
- Addressed behaviours relating to health, environment, culture change, social marketing etc.
- Results for 3 criteria:

Model of behaviour	Based on a model of behaviour or behaviour change	7/19
Coherence	Is structured logically and coherently	3/19
Comprehensiveness	Covers all types of interventions	0/19

Synthesis into an integrated framework

- Model of behaviour at the hub of a wheel
- Synthesis of existing frameworks
  - 9 intervention functions
    - each include one or more behaviour change techniques
  - 7 policy categories
    - that could enable or support these interventions to occur

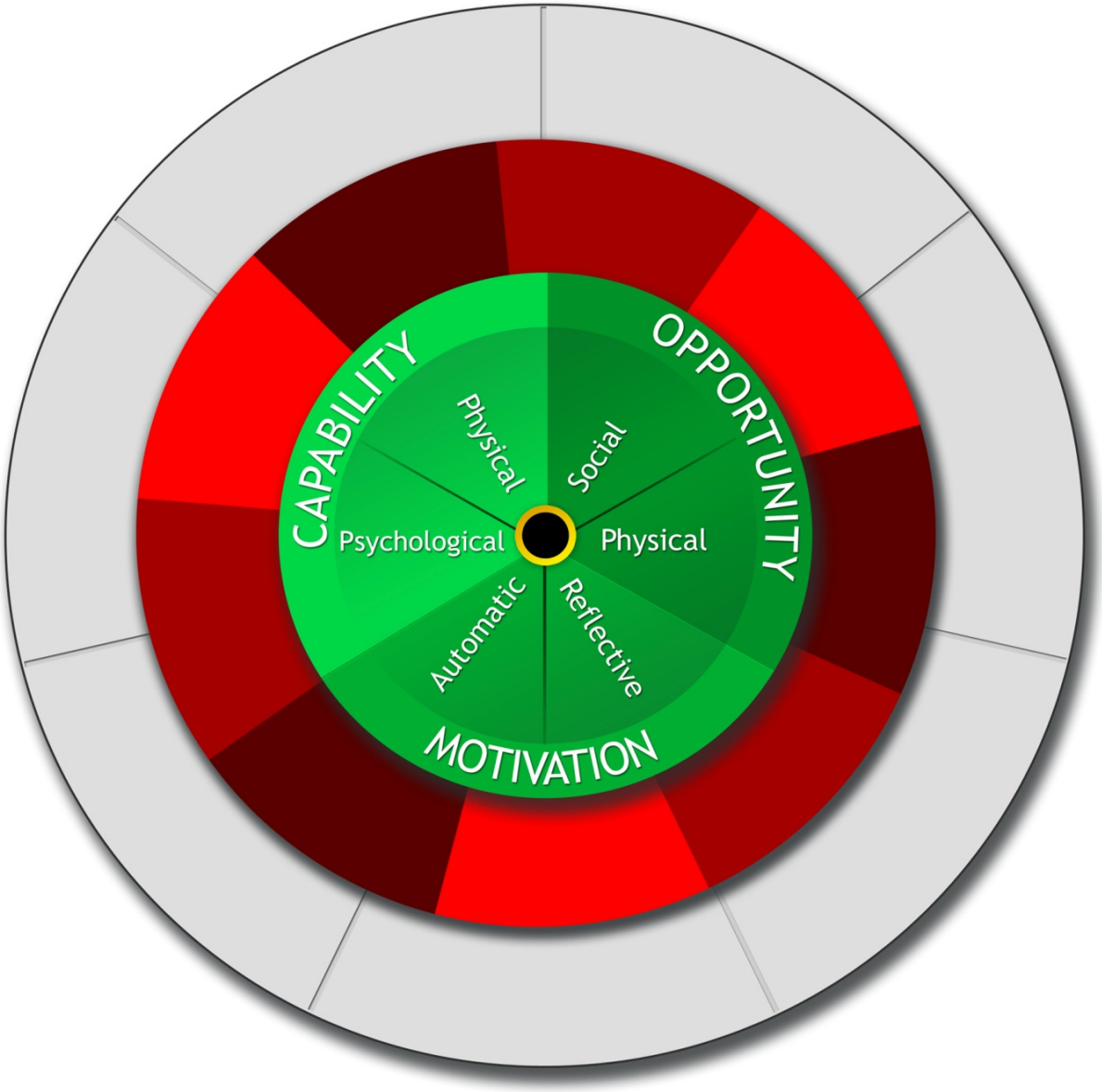
Michie et al (2011) The Behaviour Change Wheel: a new method for characterising and designing behaviour change interventions, *Implementation Science.*

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

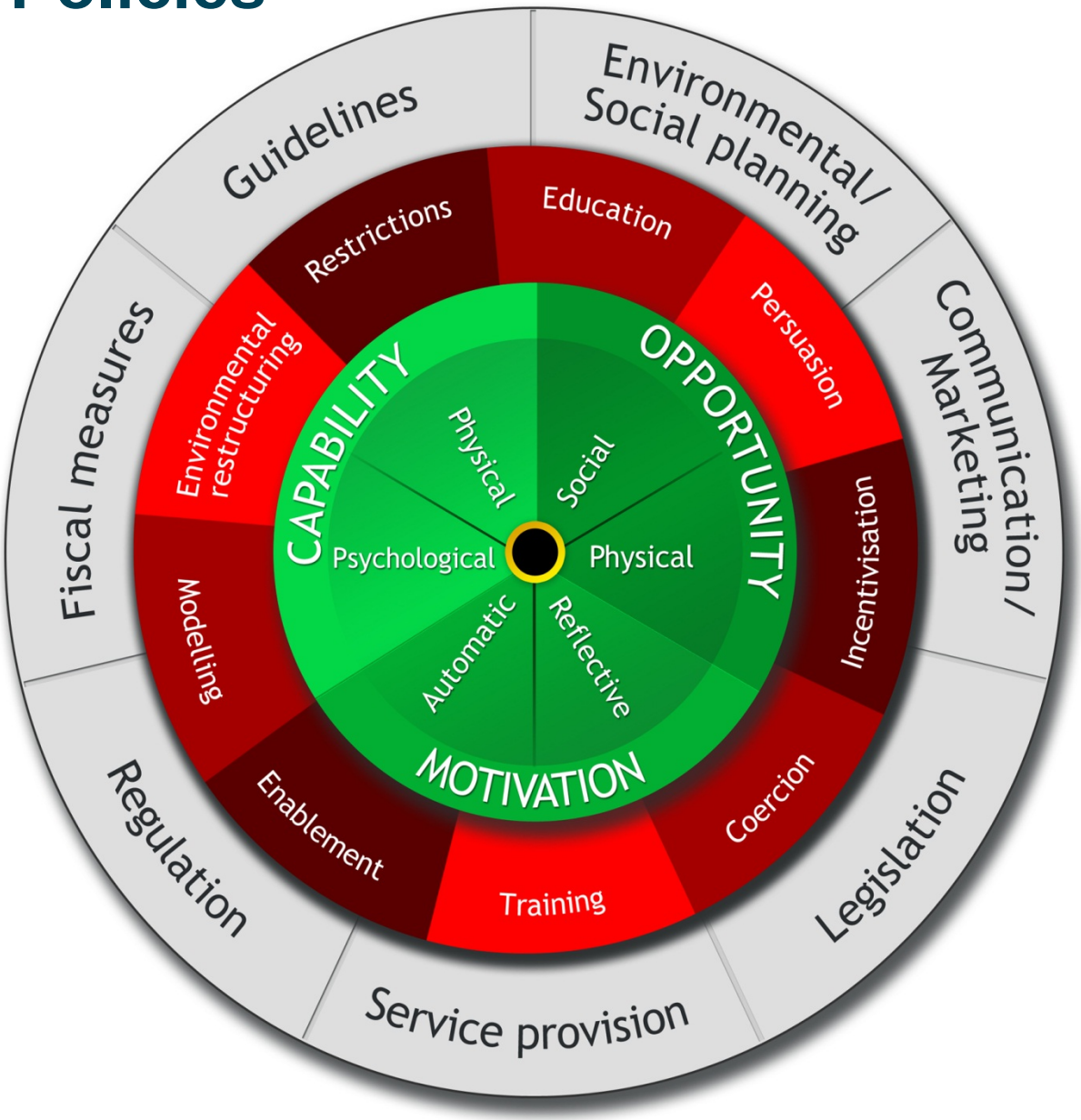
Policies

Sources of behaviour

Intervention functions

Policy categories

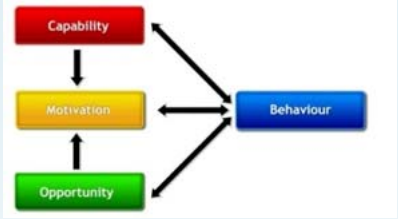
Policies: decisions made by authorities concerning interventions



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

Behaviour change techniques and a framework for increasing physical activity

- Start by understanding the problem
  - Specific behaviours in specific contexts
    - COM-B
    - ***Then*** identify the intervention strategy
- Consider the full range of effective interventions
  - and supporting policies
- Identify behaviour change techniques
  - and modes of delivery



For more information

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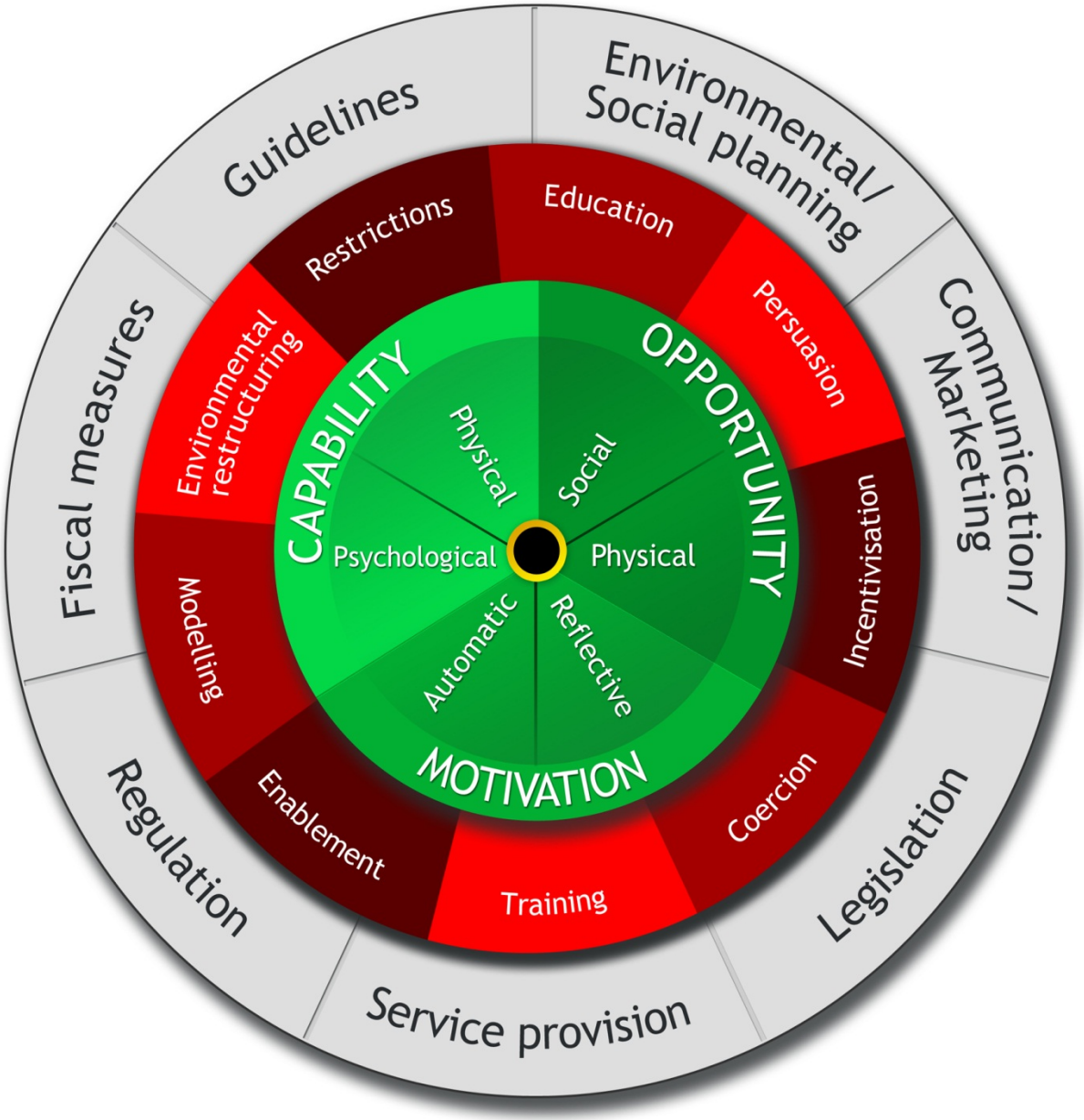
Health Psychology Research Group, 2011

Sources of behaviour

Intervention functions

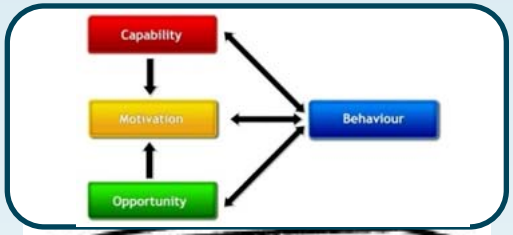
Policy categories



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

ADDITIONAL SLIDES

Intervention design



Intervention functions

Behaviour change techniques

Frameworks included in systematic review

- **1. Epicure taxonomy** West (2006) Taxonomy of approaches designed to influence behaviour patterns
- **2. Culture capital framework** Knott *et al.* (2008) Framework of knowledge about culture change, offering practical tools for policymaking
- **3. EPOC taxonomy of interventions** Cochrane Effective Practice and Organisation of Care Review Group (EPOC) (2010) Checklist to guide systematic literature reviewers about the types of information to extract from primary studies
- **4. RURU: Intervention implementation taxonomy** Walter *et al.* (2003) Taxonomy covering a wide range of policy, practice and organisational targets aimed at increasing impact of research
- **5. MINDSPACE** Institute for Government and Cabinet Office (2010) Checklist for policy-makers aimed at changing or shaping behaviour
- **6. Taxonomy of behaviour change techniques** Abraham *et al.* (2010) Taxonomy of behaviour change techniques grouped by change targets
- **7. Intervention Mapping** Bartholomew *et al.* (2011) Protocol for a systematic development of theory- and evidence-based interventions
- **8. People and places framework** Maibach *et al.* (2007) Framework that explains how communication and marketing can be used to advance public health
- **9. Public health: ethical issues** Nuffield Council on Bioethics (2007) Ladder of interventions by government, industry, organisations and individuals to promote public health.

- **10. Injury control framework** Geller *et al.* (1990) Heuristic framework for categorising and evaluating behaviour change strategies aimed at controlling injuries
- **11. Implementation taxonomy** Leeman *et al.* (2007) Theory-based taxonomy of methods for implementing change in practice
- **12. Legal framework** Perdue *et al.* (2005) Conceptual framework for identifying possible legal strategies used for preventing cardiovascular diseases
- **13. PETeR** White (in prep.) Comprehensive and universally applicable model or taxonomy of health
- **14. DEFRA's 4E model** DEFRA (2008) Process model for policy makers aimed at promoting pro-environmental behaviours in accordance with social marketing principles
- **15. STD/ HIV framework** Cohen and Scribner (2000) Taxonomy to expand the scope of interventions that can be used to prevent STD and HIV transmission
- **16. Framework on public policy in physical activity** Dunton *et al.* (2010) Taxonomy aimed at understanding how and why policies successfully impact on behaviour change
- **17. Intervention framework for retail pharmacies** Goel *et al.* (1996) Framework that presents factors that may affect retail pharmacy describing and strategies for behaviour change to improve appropriateness of prescribing
- **18. Environmental policy framework** Vlek (2000) A taxonomy of major environmental problems, their different levels and global spheres of impact, and conceptual modelling of environmental problem- solving
- **19. Population Services International (PSI) framework** PSI (2004) A conceptual framework to guide and help conduct research on social marketing interventions

Intervention functions

Intervention function	Definition	*Health examples*
Education	Increasing knowledge or understanding	*Providing information to promote healthy eating*
Persuasion	Using communication to induce positive or negative feelings or stimulate action	*Using imagery to motivate increases in physical activity*
Incentivisation	Creating expectation of reward	*Using prize draws to induce attempts to stop smoking*
Coercion	Creating expectation of punishment or cost	*Raising the financial cost to reduce excessive alcohol consumption*
Training	Imparting skills	*Advanced driver training to increase safe driving*
Restriction	Using rules that limit engagement in the target behaviour or competing or supporting behaviour	*Prohibiting sales of solvents to people under 18 to reduce use for intoxication*
Environmental restructuring	Changing the physical or social context	*Providing on-screen prompts for GPs to ask about smoking behaviour*
Modelling	Providing an example for people to aspire to or imitate	*Using TV drama scenes involving safe-sex practices to increase condom use*
Enablement	Increasing means/reducing barriers to increase capability or opportunity	*Behavioural support for smoking cessation, medication for cognitive deficits, surgery to reduce obesity, prostheses to promote physical activity*

Policy categories

Policy category	Example	*Examples*
Communication / marketing	Using print, electronic, telephonic or broadcast media	*Conducting mass media campaigns*
Guidelines	Creating documents that recommend or mandate practice. This includes all changes to service provision	*Producing and disseminating treatment protocols*
Fiscal	Using the tax system to reduce or increase the financial cost	*Increasing duty or increasing anti-smuggling activities*
Regulation	Establishing rules or principles of behaviour or practice	*Establishing voluntary agreements on advertising*
Legislation	Making or changing laws	*Prohibiting sale or use*
Environmental/ social planning	Designing and/or controlling the physical or social environment	*Using town planning*
Service provision	Delivering a service	*Establishing support services in workplaces, communities etc.*

Selecting interventions and policies

	INTERVENTION FUNCTIONS								
	Restric-tion	Environ-mental restructuring	Modelling	Persuasion	Incentivi-sation	Coercion	Education	Training	Enable-ment

Consensus of at least 3 of 4 raters for:

Techniques	Theory
Build motivation **Give information**	Theory of Planned Behaviour
Set goals **Develop action plans** **Self-monitoring** **Review goals**	Self-regulation Theory
Use rewards **Use prompts** **Build support** **Generalise skills** **Build habits**	Operant Learning Theory
Prepare for setbacks	Relapse Prevention Theory

How was the intervention *received* by participants?

Participants talk about behaviour change or maintenance was reliably coded into 17 components of four theories e.g.

Example from transcript	*Theoretical component*	*Theory*
Thinking about benefits of activity e.g. losing weight	**Attitude**	**Theory of Planned Behaviour**
Parking car further away so has to walk further	**Action plan**	**Self-regulation Theory**
Asking partner to remind him	**Cue to action**	**Operant Learning Theory**