REMIND

mHealth research group
School of Psychology, National University of Ireland, Galway

Designing Interventions for Health Behaviour Change An Introduction

Dr Jane Walsh

Connected Health Summer School, Florence

27 June 2017

NUI Galway
OÉ Gaillimh

@DrJaneWalsh

National University of Ireland, Galway

mHealth Research Group in NUI Galway

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THE M-HEALTH RESEARCH GROUP AT NUI GALWAY

What we do | People | Research | Publications

Research Focus

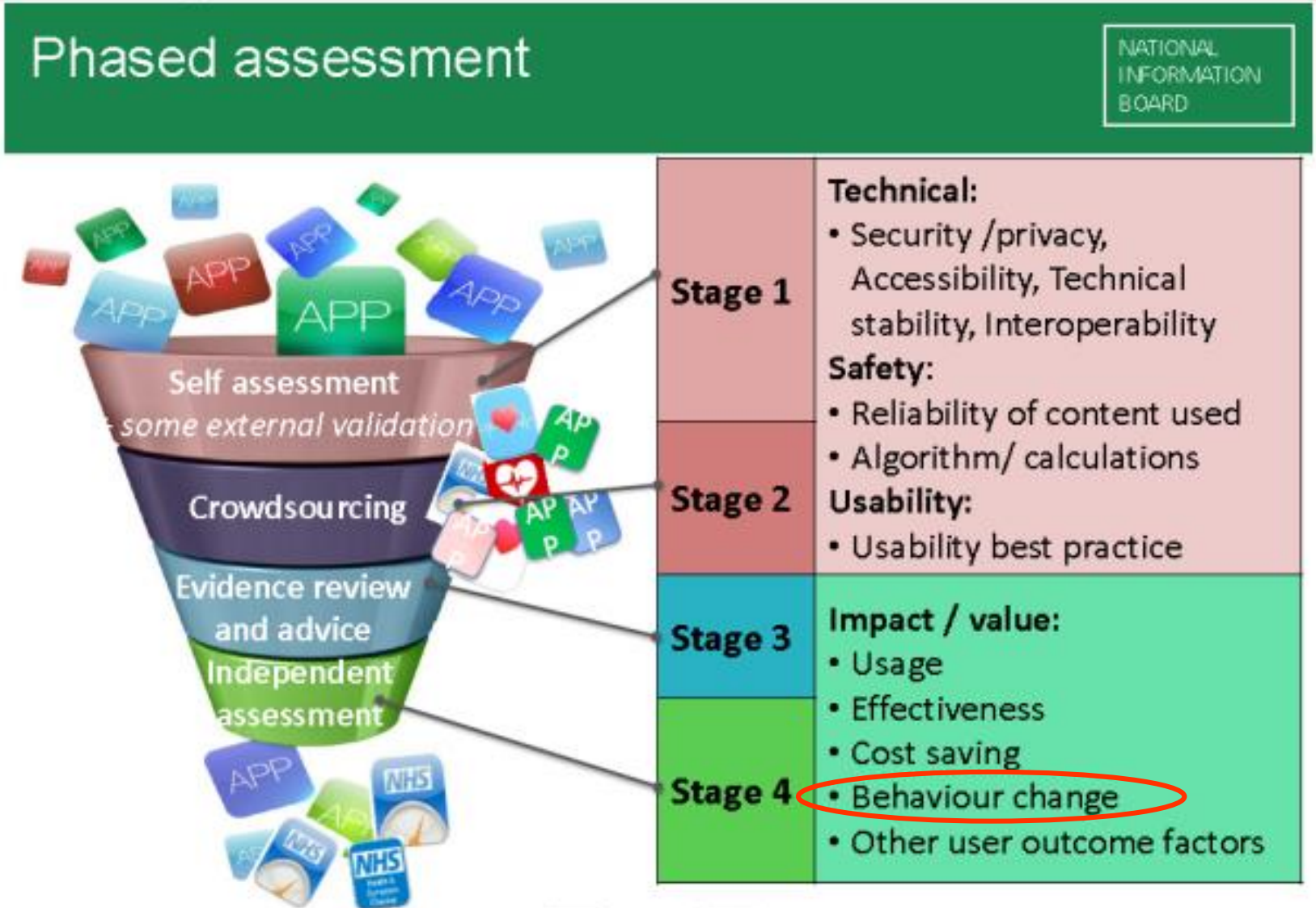
The M-Health Research Group was established in NUI Galway in 2014.

The particular focus of this area of research, M-Health, which is led by Dr. Jane Walsh, is an abbreviation for mobile health, a term used for the practice of medicine and public health supported by mobile devices (e.g. mobile phones, tablet computers and PDAs), for health services and information, but also to affect emotional states. M-health applications include the use of mobile devices in collecting community and clinical health data, delivery of healthcare information to practitioners, researchers, and patients, real-time monitoring of patient vital signs and direct provision of care (via mobile telemedicine).

M-health research encompasses a variety of possibilities, including increased access to healthcare and health-related information (particularly for hard-to-reach populations); improved ability to diagnose and track diseases; timelier, more actionable public health information; and expanded access to ongoing medical education and training for health workers.

European Commission

Draft Guidelines: Assessment of reliability of mobile technology (May 2016)



Reminding technologies - REMIND

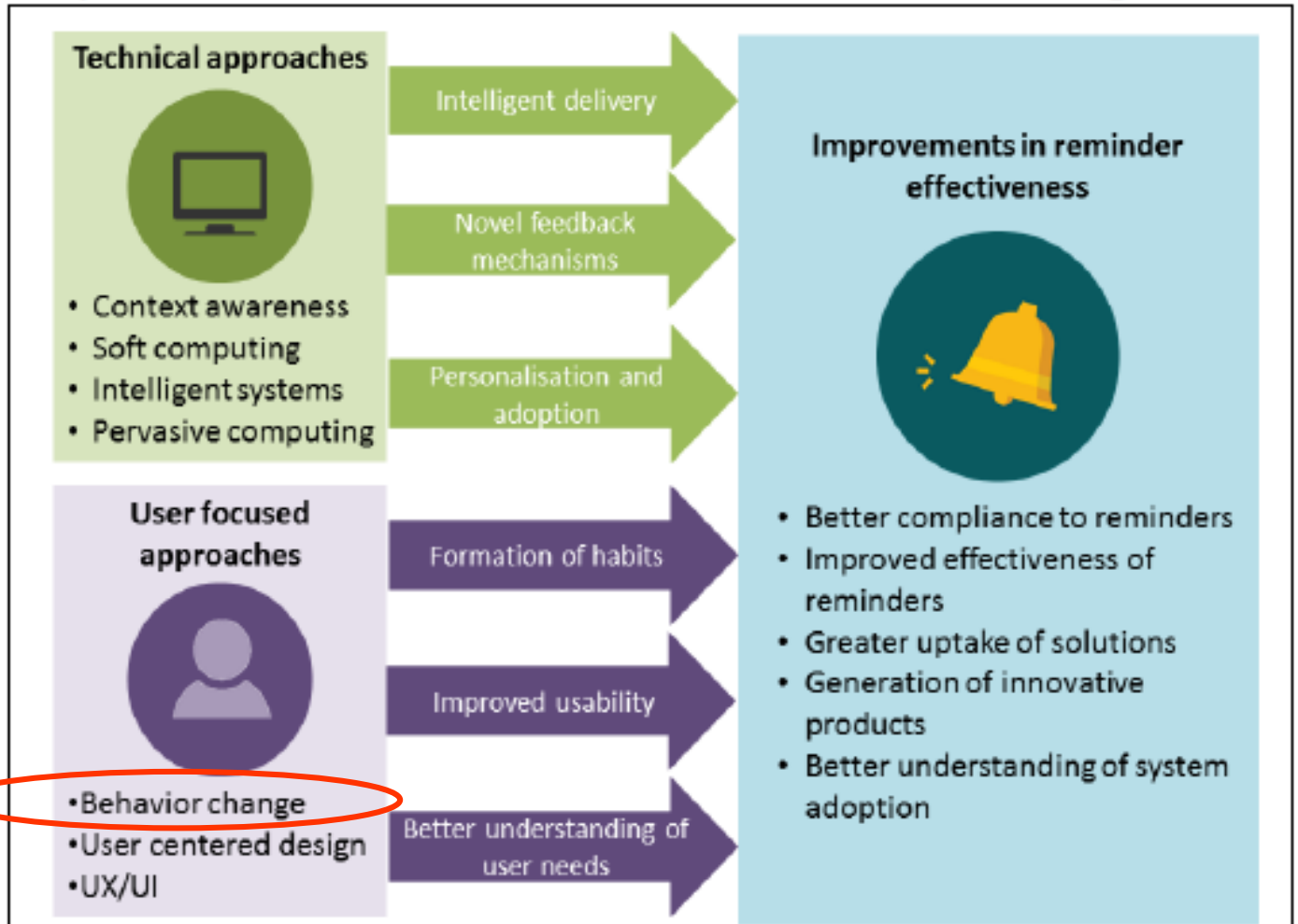


Figure 1. Illustrates the application of technical and user focused approaches to improve reminder effectiveness

So what's the problem?

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Behaviour change interventions can be effective

A gender-sensitised weight loss and healthy living programme for overweight and obese men delivered by Scottish Premier League football clubs (FFIT): [illegible] tic randomised controlled trial

Lancet 2014; 383: 1211–21

Kate Hunt, Sally Wyke, Cindy M Gray, Annie S Anderson, Adrian Brady, Christopher Bunn, Peter T Donnan, Elisabeth Fenwick, Eleanor Grieve, Jim Leishman, Euan Miller, Nanette Mutrie, Petra Rauchhaus, Alan White, Shaun Treweek

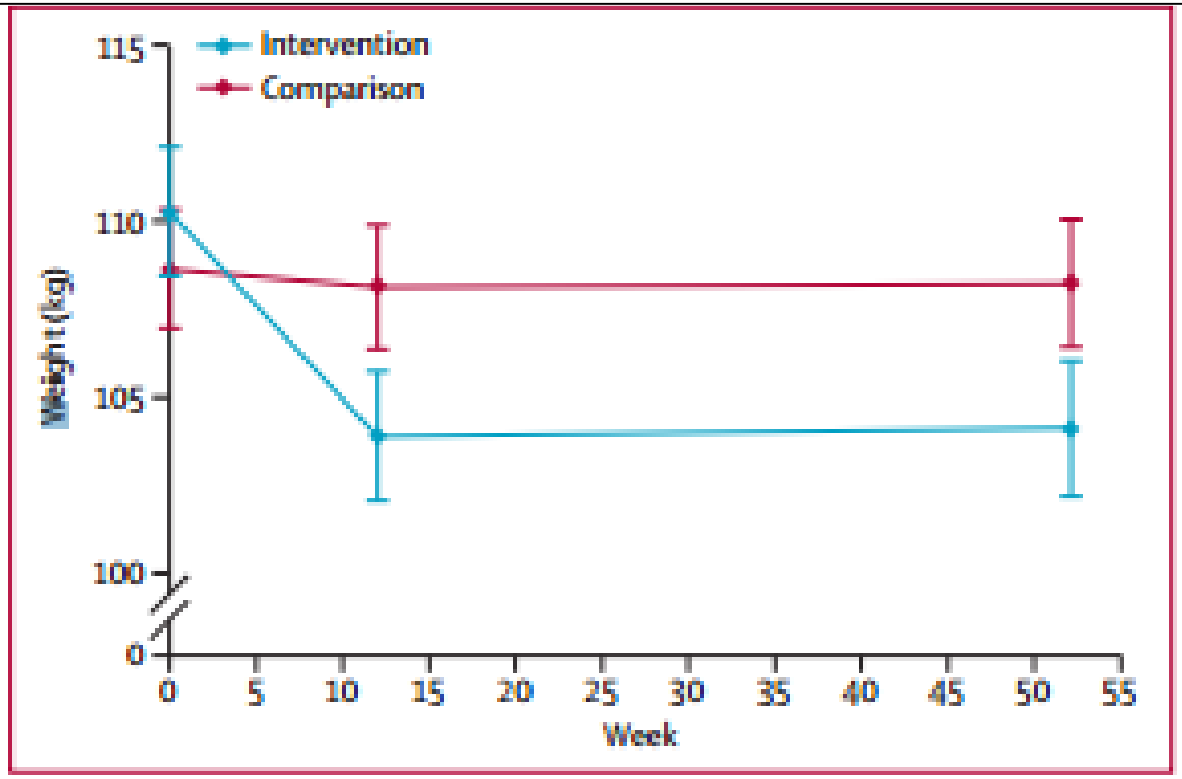
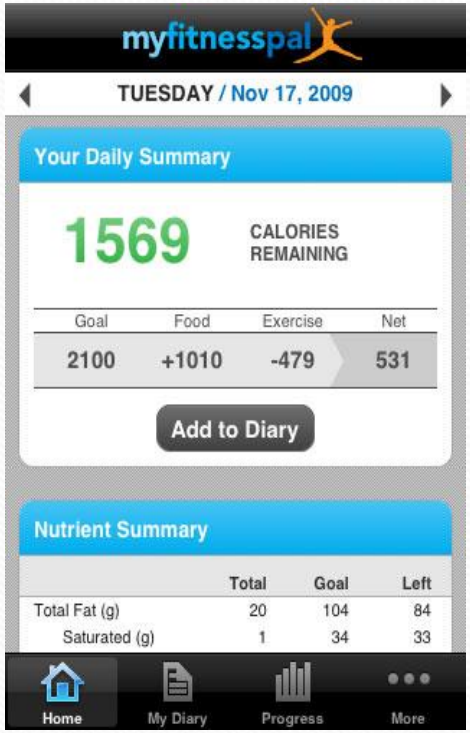
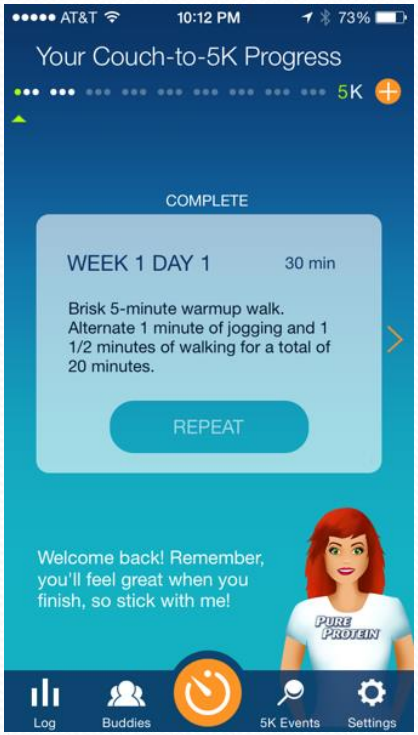


Figure 2: Mean weight (kg, 95% CI) in participants allocated to the Football Fans in Training weight loss programme or waiting list comparison group

Behaviour change is complicated!

100,000 Apps on market
Do they work?





(Hint: NO)

HOW ARE TECHNOLOGY INTERVENTIONS DEVELOPED?

Many interventions designed according to the ISLAGIATT principle

It Seemed Like A Good Idea At The Time

Patient has changed their behaviour!
Intervention worked!

But how did it work?
Can we do it again?
Can we train others to do the same?

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IRISH RESEARCH COUNCIL
An Chomhairle um Thaighde in Éirinn

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ELSEVIER

American Journal of Preventive Medicine

Available online 17 November 2015

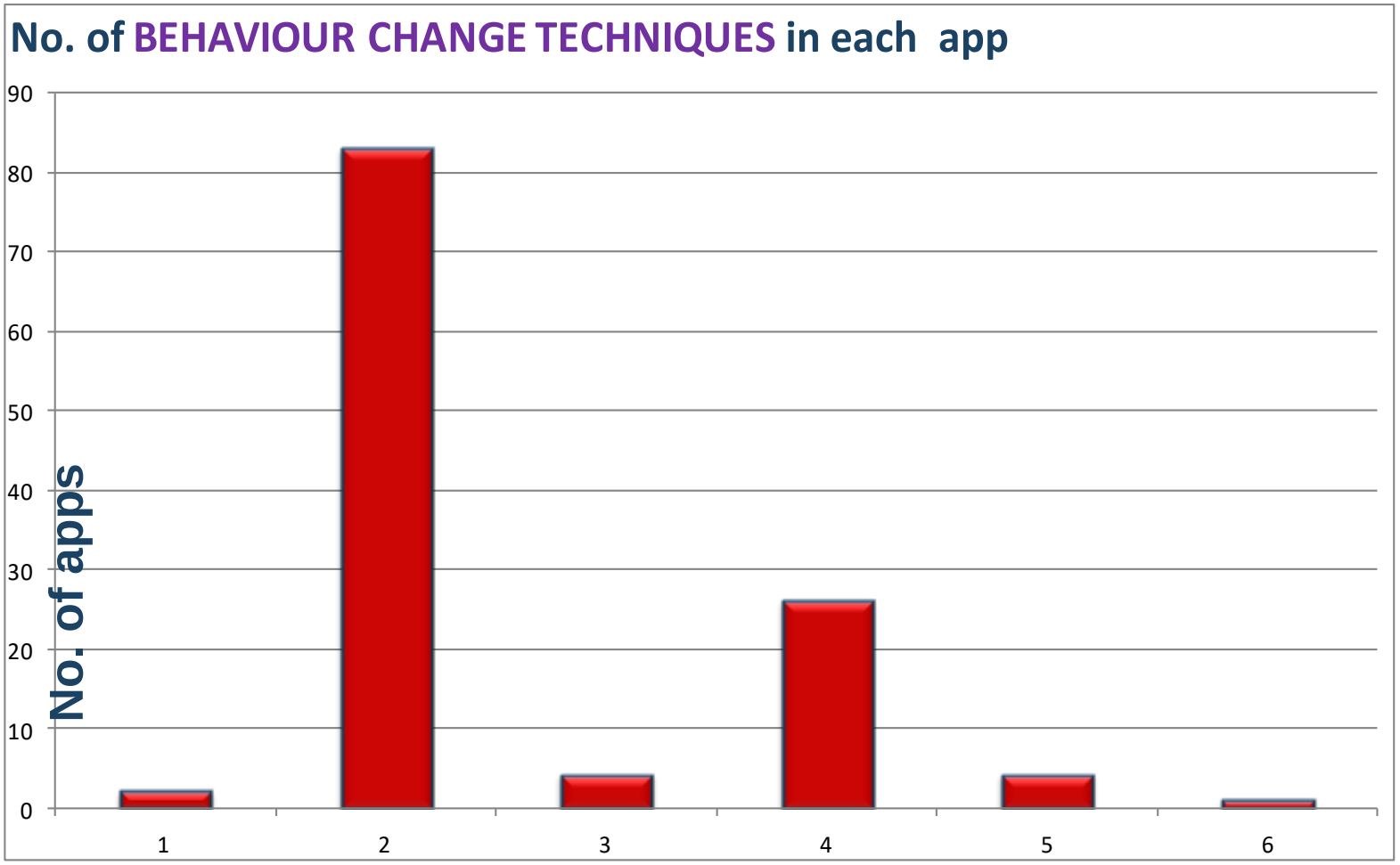
In Press, Corrected Proof — Note to users

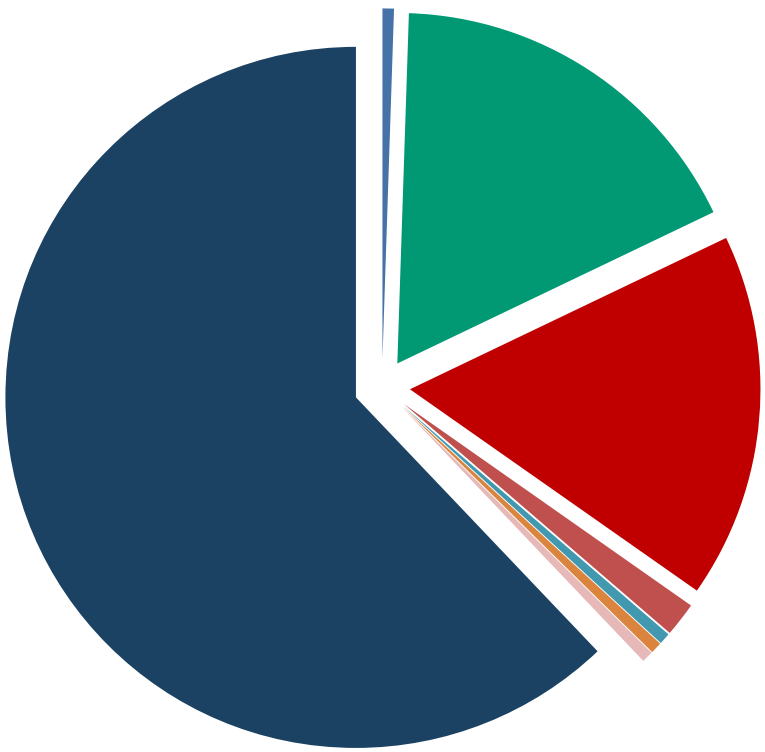
Brief Report

Behavior Change Techniques in Apps for Medication Adherence: A Content Analysis

Eimear C. Morrissey, MSc, Teresa K. Corbett, MSc, Jane C. Walsh, PhD, Gerard J. Molloy, PhD

Show more


No. of BEHAVIOUR CHANGE TECHNIQUES in each app
No. of apps
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6



- 1.1 Goal setting (0.53%)
- 2.2 Feedback on behaviour (17.37%)
- 2.3 Self-monitoring (16.84%)
- 3.1 Social support (unspecified) (1.58%)
- 4.2 Information about the antecedents (0.53%)

INTERVENTIONS MUST BE EVIDENCE-BASED TO WORK

Lack of evidence base in many apps on the market

DESCRIBING INTERVENTION
Need for specificity

BMJ

BMJ 2013;347:f3755 doi: 10.1136/bmj.f3755 (Published 10 September 2013)

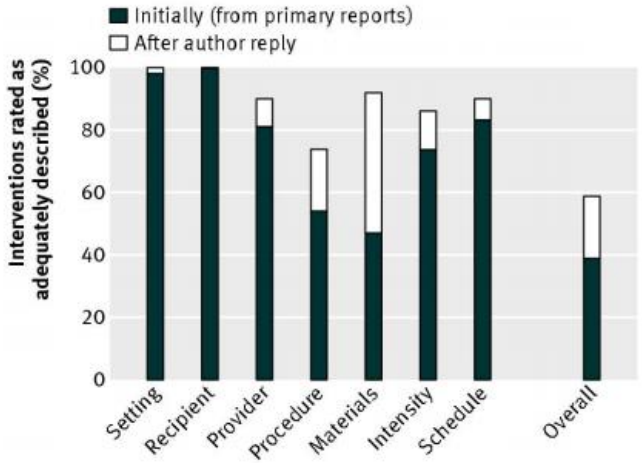
RESEARCH

Poor description of non-pharmacological interventions: analysis of consecutive sample of randomised trials

OPEN ACCESS

Tammy C Hoffmann *associate professor of clinical epidemiology*, Chrissy Erueti *assistant professor*, Paul P Glasziou *professor of evidence-based medicine*

Figures



Of 137 interventions, only 53 (39%) were adequately described

Need for a common language
Biomedicine vs Behavioural Science

Varenicline (JAMA 2006)

Intervention content

- Varenicline titrated to 1 mg twice daily (n = 344) or bupropion SR titrated to 150 mg twice daily (n = 342) or placebo (n = 341) for 12 weeks

Mechanism of action

Behaviour 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

Which of these would you find easier to replicate?

Which of these could you explain to someone else?

Summary: So what's the problem?

- Poor **definition of interventions**
  - Limited ability to develop science/theory
  - Limited ability to generalise findings

- No understanding of **mechanisms of change**
- If effective, unclear why it worked, can't replicate...
- If ineffective, not sure why...

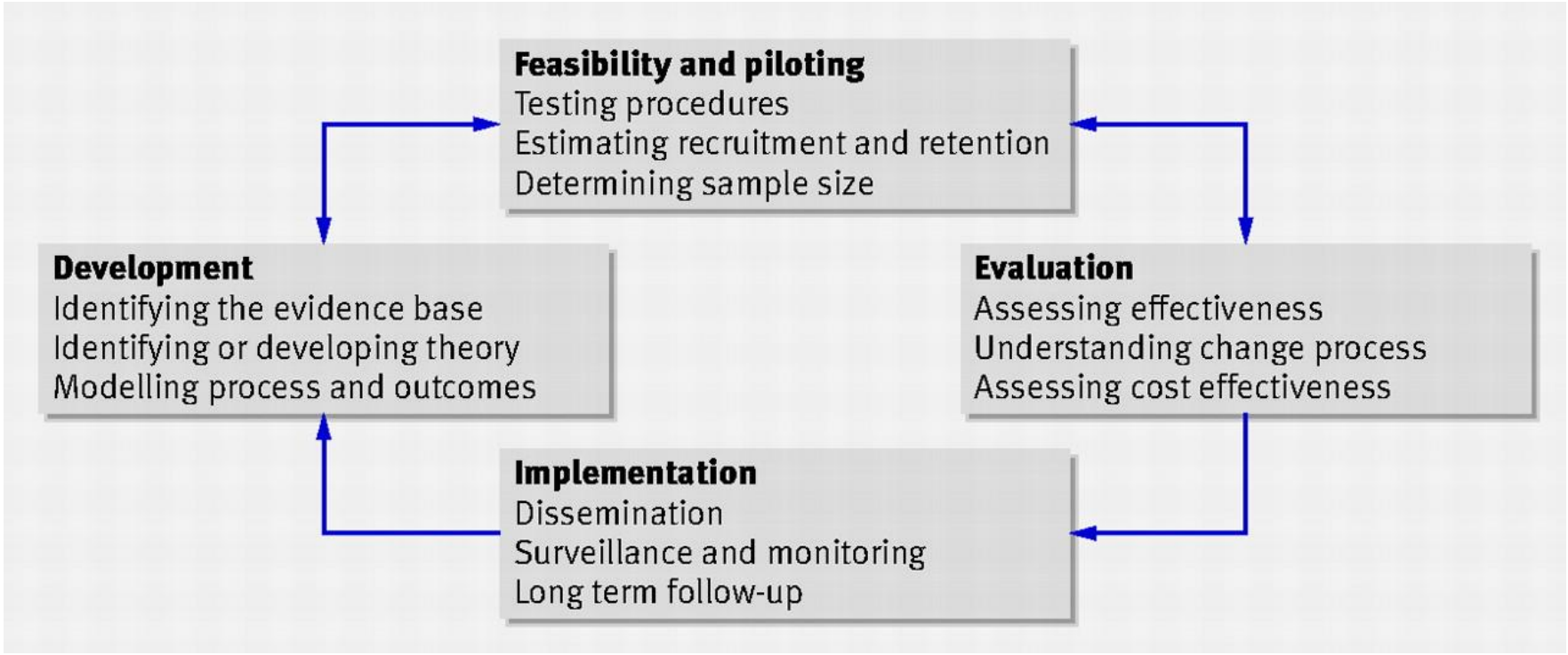
IMPORTANCE OF SCIENTIFIC METHODS

BMJ. 2008; 337: a1655. PMCID: PMC2769032
Published online 2008 Sep 29. doi: 10.1136/bmj.a1655

Developing and evaluating complex interventions: the new Medical Research Council guidance

Peter Craig, programme manager,[1] Paul Dieppe, professor,[2] Sally Macintyre, director,[3] Susan Michie, professor,[4] Irwin Nazareth, director,[5] and Mark Petticrew, professor[6]

Author information ► Article notes ► Copyright and License information ►



How to improve behaviour change interventions

1. **Specify** target behaviour precisely
2. Use behavioural **theory** to develop interventions **systematically**
3. Describe **mechanisms** through which these work
4. Specify **behaviour change techniques**, linking these to theory
5. Improve **reporting**, using standardised, shared terminology
6. Facilitate **combining evidence** in systematic reviews to **inform practice**

Behaviour Change Process

Stage 1: Understand the behaviour

1. Define the problem in behavioural terms
2. Select target behaviour
3. Specify the target behaviour
4. Identify what needs to change

Stage 2: Identify intervention options

Identify:

5. Intervention functions
6. Policy categories

Stage 3: Identify content and implementation options

Identify:

7. Behaviour change techniques
8. Mode of delivery

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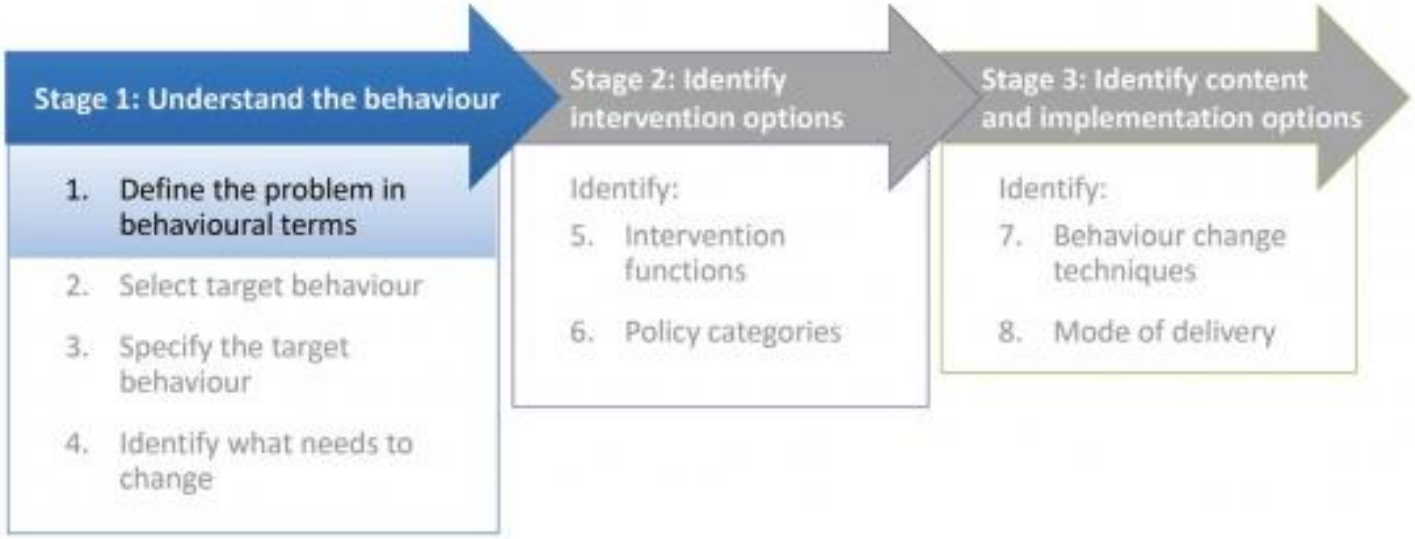
DEFINING BEHAVIOUR

Step 1: Define the problem in behavioural terms



What is Behaviour?

- Anything a person does in response to internal or external events.

- Behaviours are physical events that occur in the body and are controlled by the brain

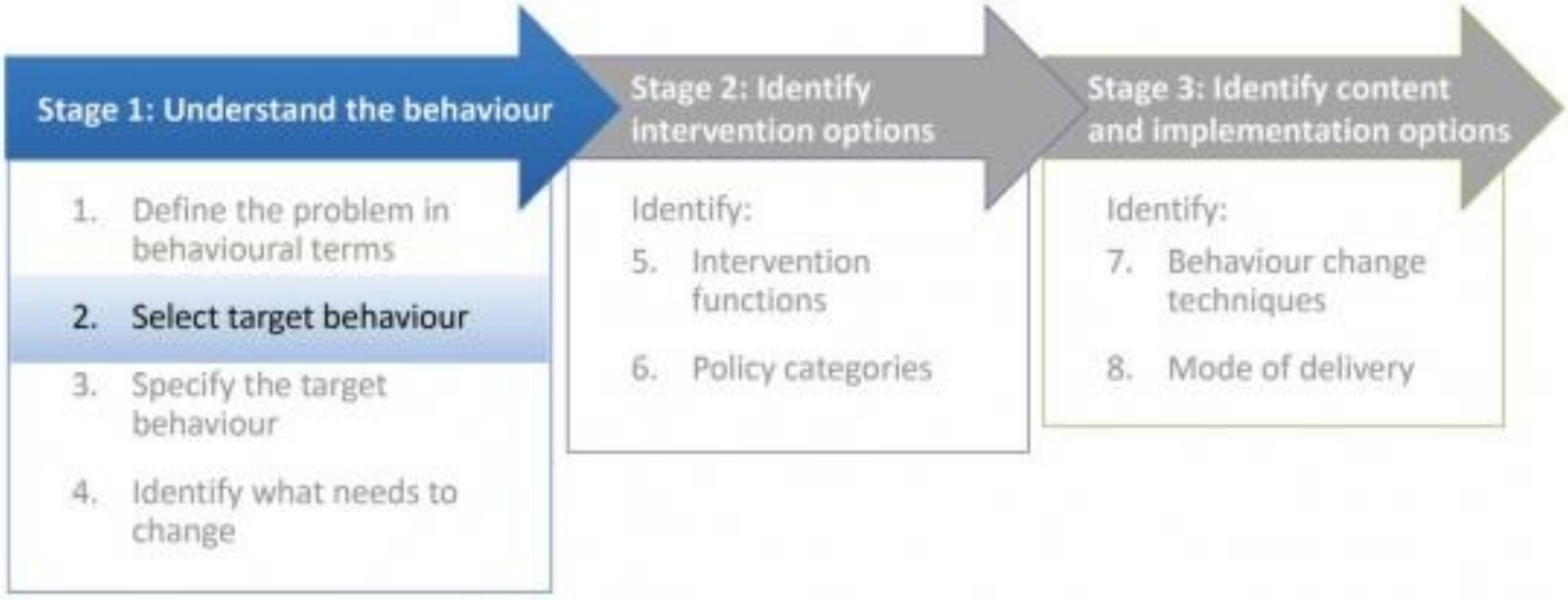
What is a health behaviour?

"…any activity undertaken for the purpose of preventing or detecting disease or for improving health and well-being."
(Conner and Norman, 1996)

What is Behaviour?

1) Walking in the park ☑
2) Having the confidence to ride a bike ☒
3) Taking a statin tablet ☑
4) Losing weight ☒
5) Intending to eat 3 pieces of fruit a day ☒
6) Washing your hands ☑
7) Reducing cholesterol ☒

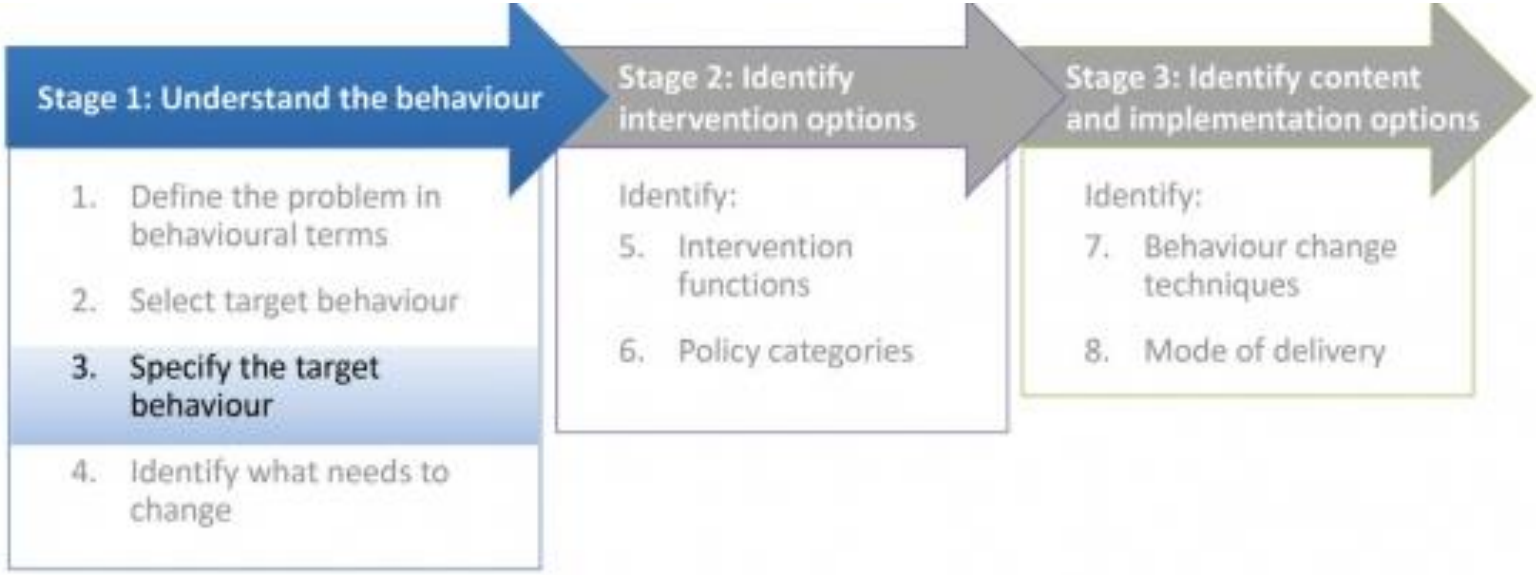
Step 2: Select the target behaviour



- Multiple potentially relevant behaviours
- Consider:

  Impact, Likelihood, Spillover, Ease of measurement

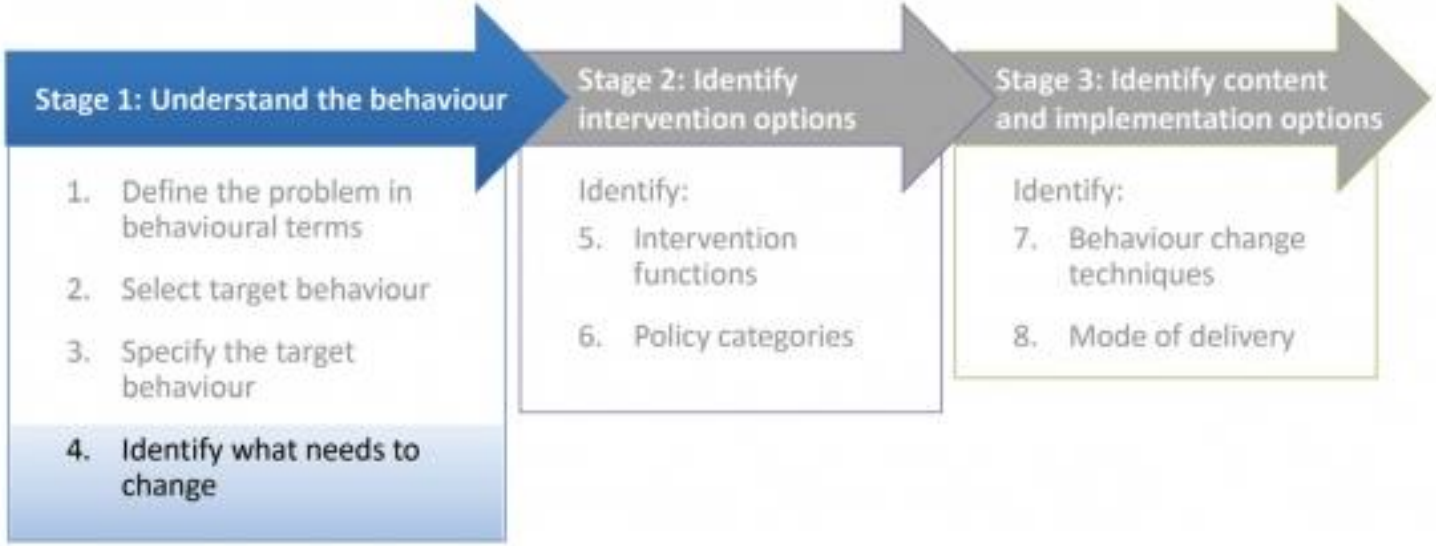
Step 3: Specify the target behaviour



- More precise the better
- Will help in developing and evaluating intervention

The COM-B Model

Step 4: Identify what needs to change



Step 4: Identify what needs to change

- **Target behaviour** identified and specified
- But why not currently being carried out?
- Need to understand behaviour change in context
  - Population
  - Environment
- Need to understand **predictors** of the behaviour

Theories of Behaviour Change

Research

Highly accessed | Open Access

The behaviour change wheel: A new method for characterising and designing behaviour change interventions

Susan Michie[1*], **Maartje M van Stralen**[2] and **Robert West**[3]

* Corresponding author: Susan Michie s.michie@ucl.ac.uk

For all author emails, please log on.

▸ Author Affiliations

Implementation Science 2011, **6**:42 doi:10.1186/1748-5908-6-42

Published: 23 April 2011

Abstract

Background

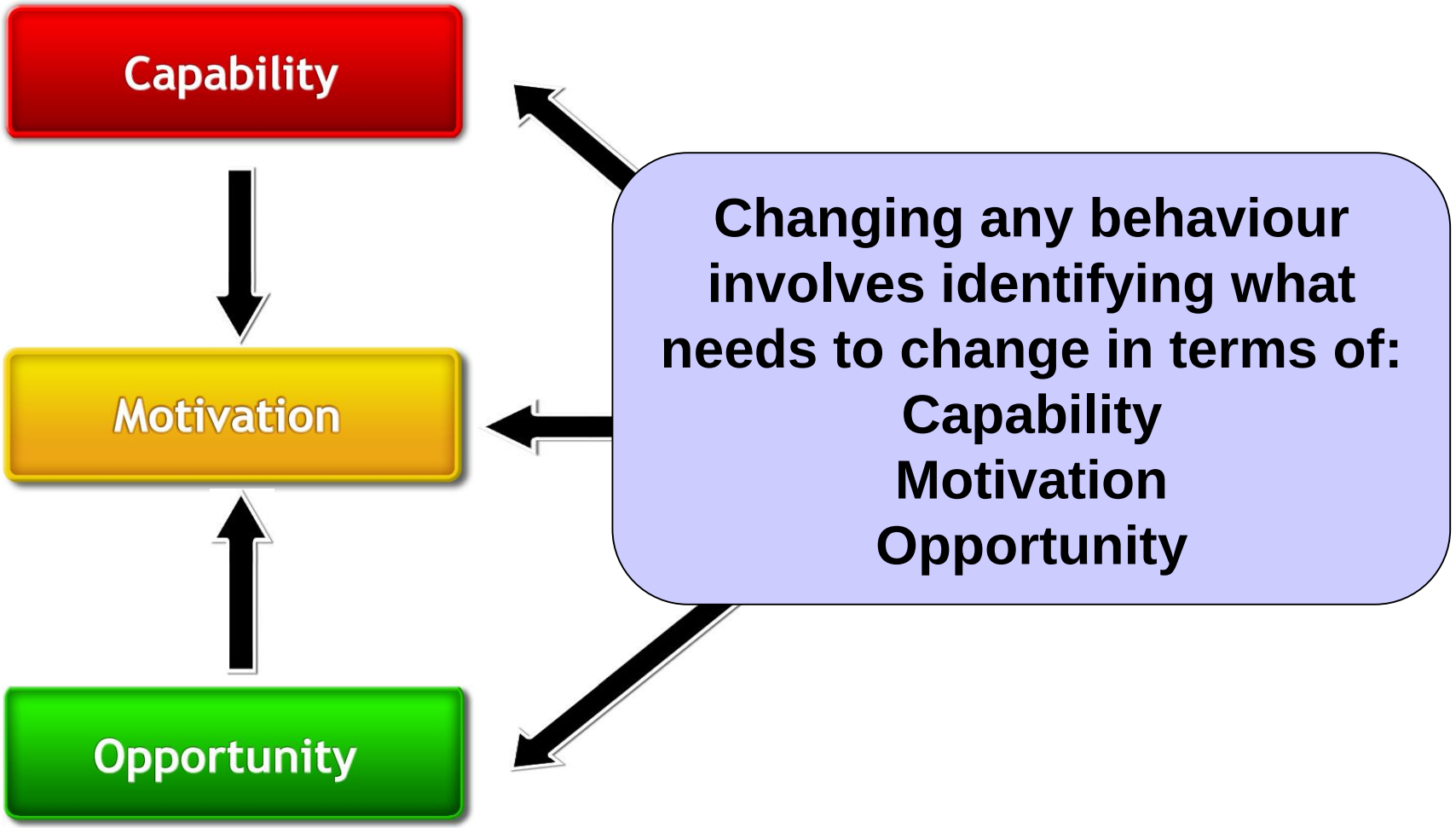
Improving the design and implementation of evidence-based practice depends on successful behaviour change interventions. This requires an appropriate method for characterising interventions and linking them to an analysis of the targeted behaviour. There exists a plethora of frameworks of behaviour change interventions, but it is not clear how well they serve this purpose. This paper evaluates these frameworks, and develops and evaluates a new framework aimed at overcoming their limitations.

Comprehensive

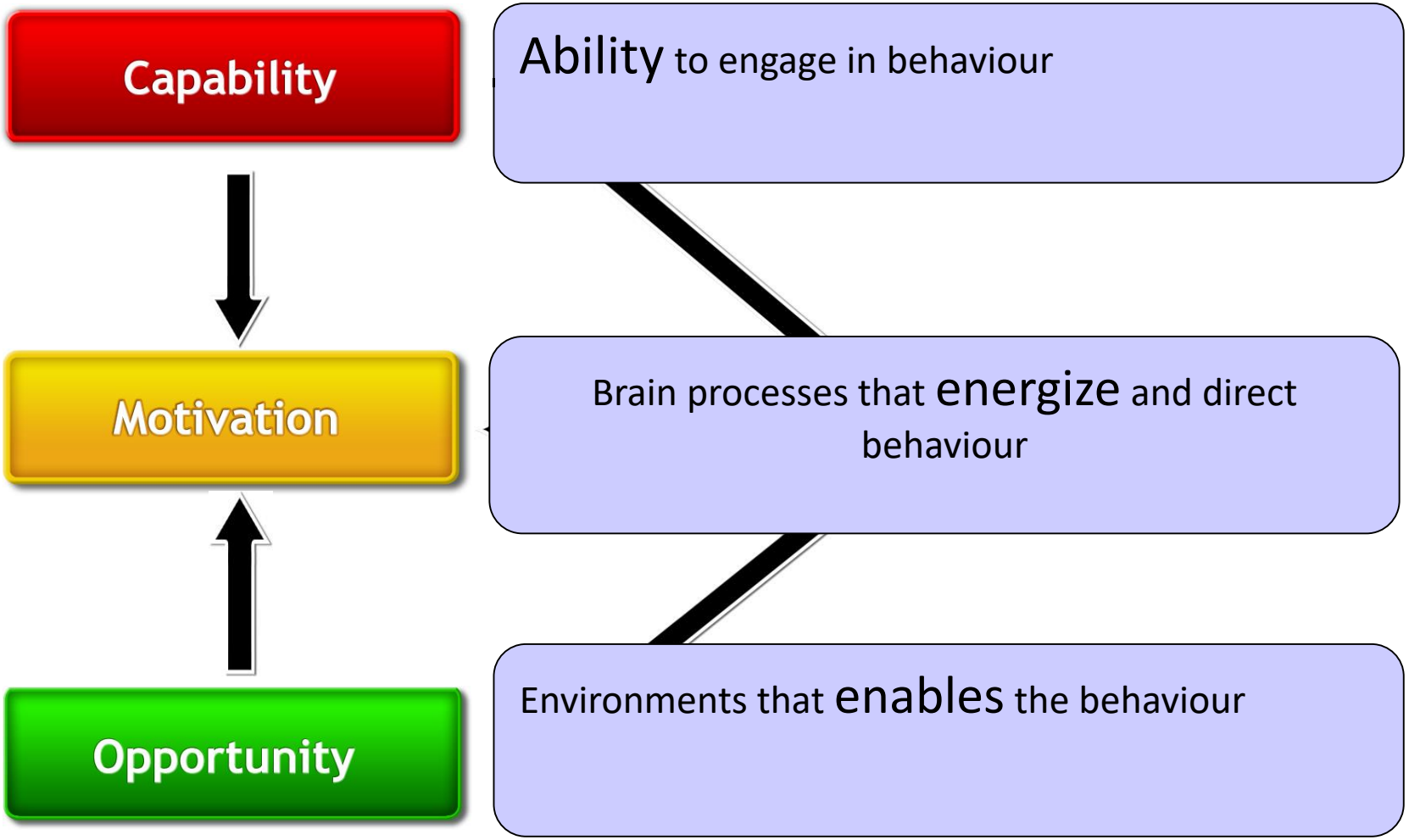
Coherent

Minimum number of factors

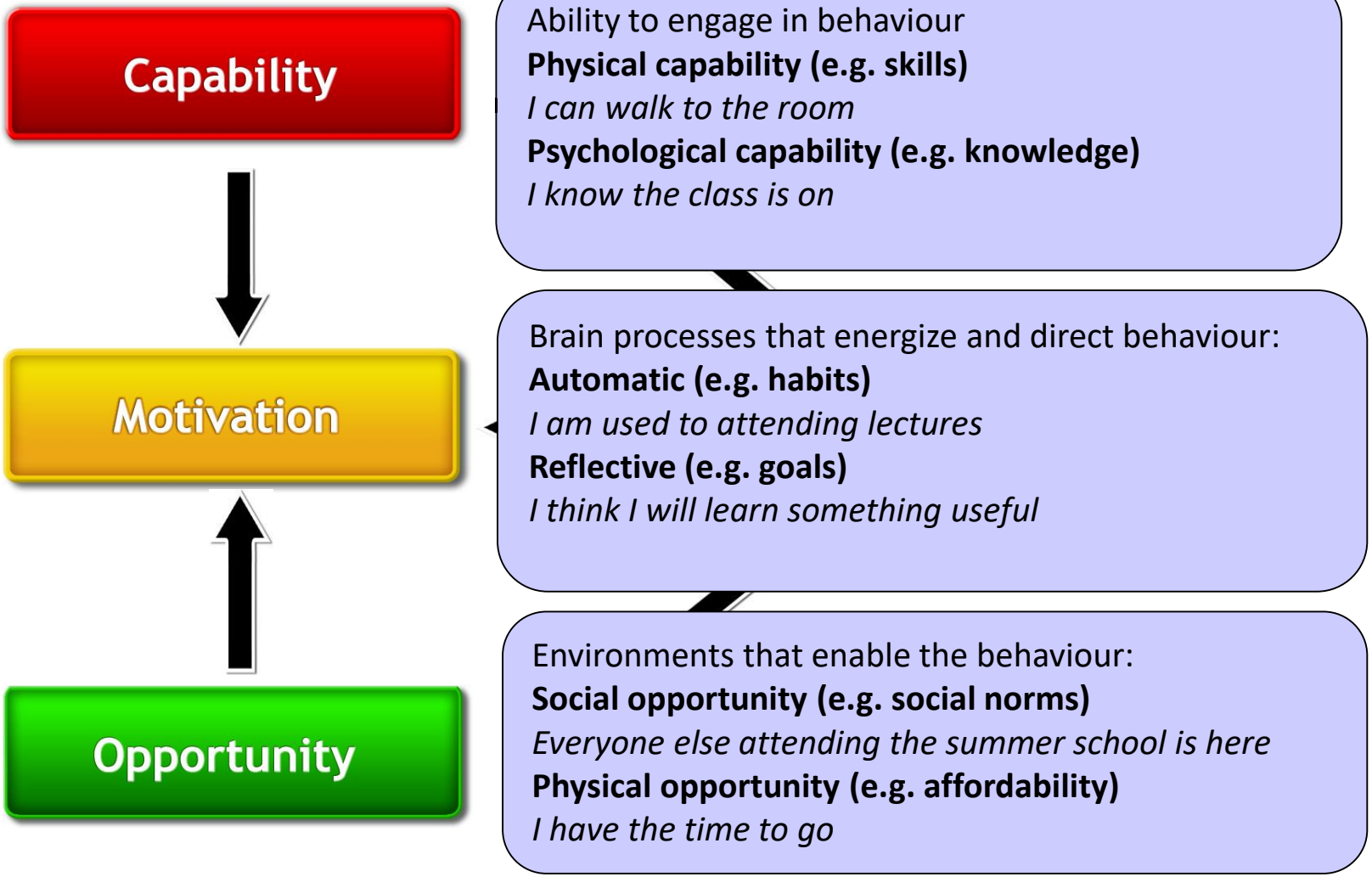
The Capability Opportunity Motivation – Behaviour (COM-B) Model



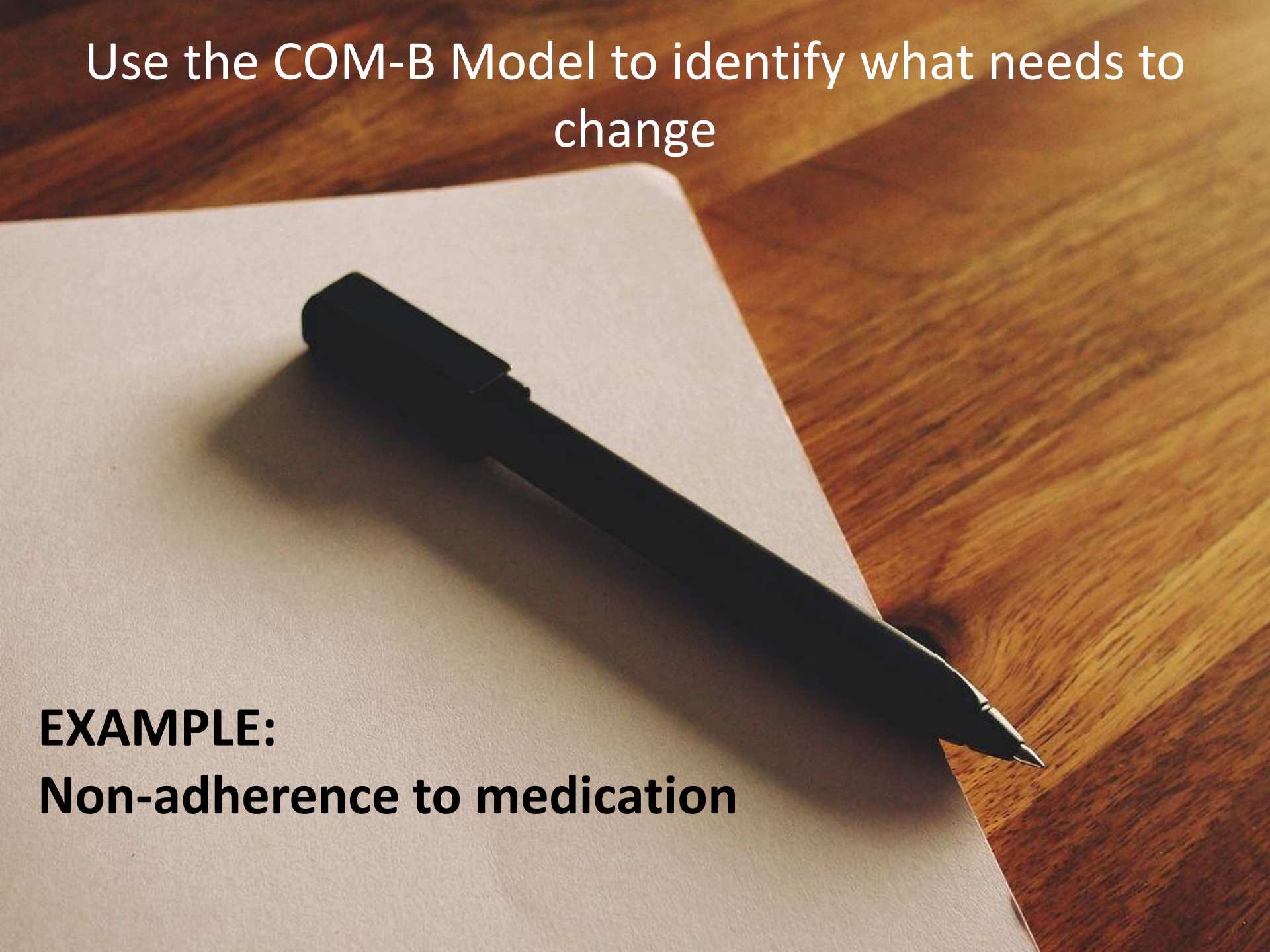
The COM-B Model



The COM-B Model:
Behaviour: Attending this talk



Use the COM-B Model to identify what needs to change



EXAMPLE:
Non-adherence to medication

original article

Applying COM-B to medication adherence

A suggested framework for research and interventions

Table 1. *Applying COM-B to factors associated with adherence*

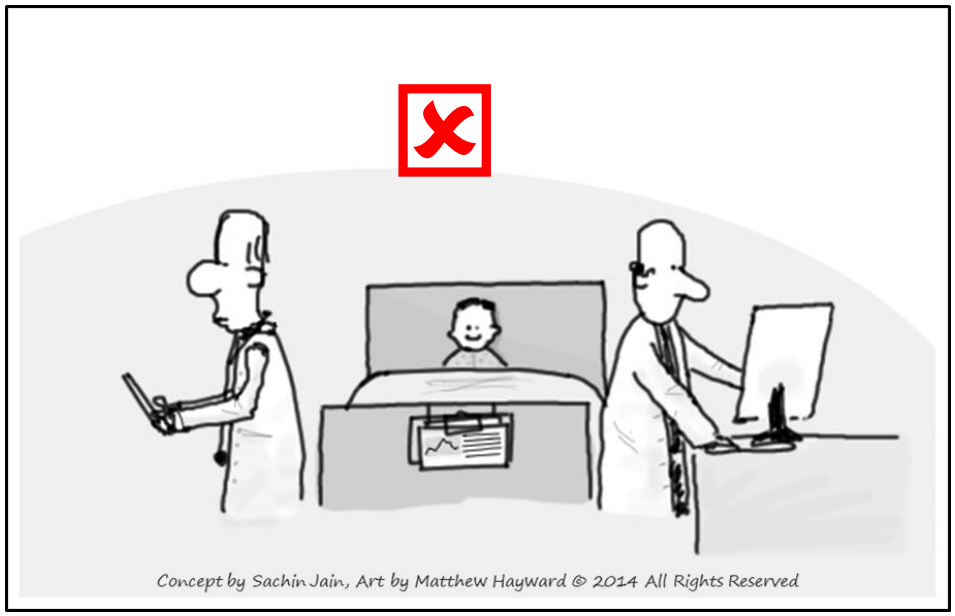
CAPABILITY	MOTIVATION	OPPORTUNITY
The individual's physical and psychological capacity to engage in the behaviour*	***All brain processes that energise and direct behaviour***	***All factors lying outside the individual that make performance of the behaviour possible or prompt it***
Psychological *Capacity to engage in necessary thought processes*	**Reflective** *Evaluations and plans*	**Physical** *Physical opportunity provided by the environment*
•Comprehension of disease and treatment •Cognitive functioning (e.g. memory, capacity for judgement, thinking) •Executive function (e.g. capacity to plan)	•Perception of illness (e.g. cause, chronic vs. acute etc.) •Beliefs about treatment (e.g. necessity, efficacy, concerns about current or future adverse events, general aversion to taking medicines) •Outcome expectancies •Self-efficacy	•Cost •Access (e.g. availability of medication) •Packaging •Physical characteristics of medicine (e.g. taste, smell, size, shape, route of administration) •Regimen complexity •Social support •HCP-patient relationship / communication
Physical *Capacity to engage in necessary physical processes*	**Automatic** *Emotions and impulses arising from associative learning and/or innate dispositions*	**Social** *Cultural milieu that dictates the way we think about things*
•Physical capability to adapt to lifestyle changes (e.g. diet or social behaviours) •Dexterity	•Stimuli or cues for action •Mood state/disorder (e.g. depression and anxiety)	•Stigma of disease, fear of disclosure •Religious/cultural beliefs

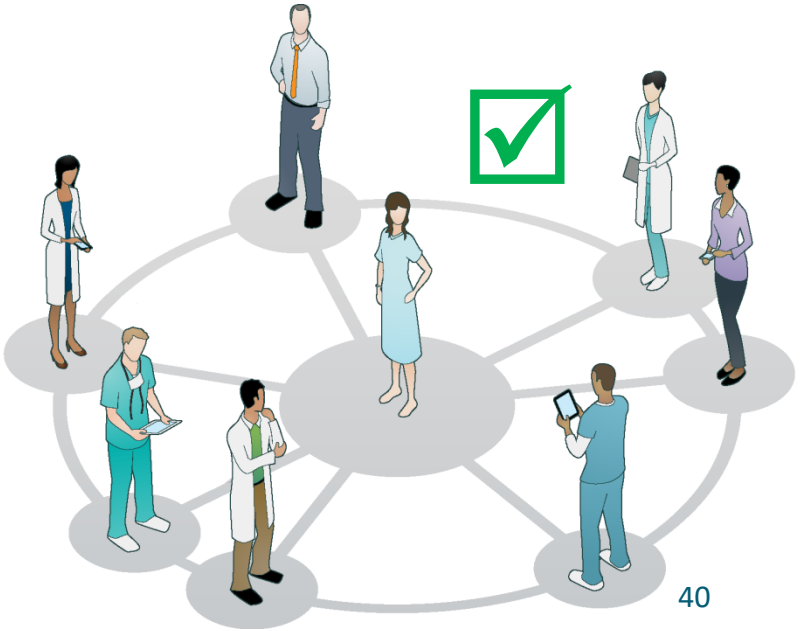
*statements in italics represent definitions given by Michie et al. (2011)

Target behaviour: Taking medication as prescribed by doctor	
COM-B Component	**Possible examples for target behaviour**
Capability: Physical	Inability to open pill box
Capability: Psychological	Not sure of pill purpose and dosage
Opportunity: Physical	Cost of medications
Opportunity: Social	Religious beliefs, taking medication during Ramadan
Motivation: Reflective	”I’m on so many medications I rattle”
Motivation: Automatic	Changed routines

It's important to develop apps using a ***'person-centred approach'*** '(Yardley et al., 2015)

In-depth qualitative research is conducted with the users before the digital intervention is developed. This data is used to develop **"guiding principles"** that state the key intervention design objectives





BMC Medicine 2015

Glynn et al. BMC Family Practice (2015) 16:119
DOI 10.1186/s12875-015-0333-7

BMC Family Practice

RESEARCH ARTICLE Open Access

Patients' views and experiences of technology based self-management tools for the treatment of hypertension in the community: A qualitative study

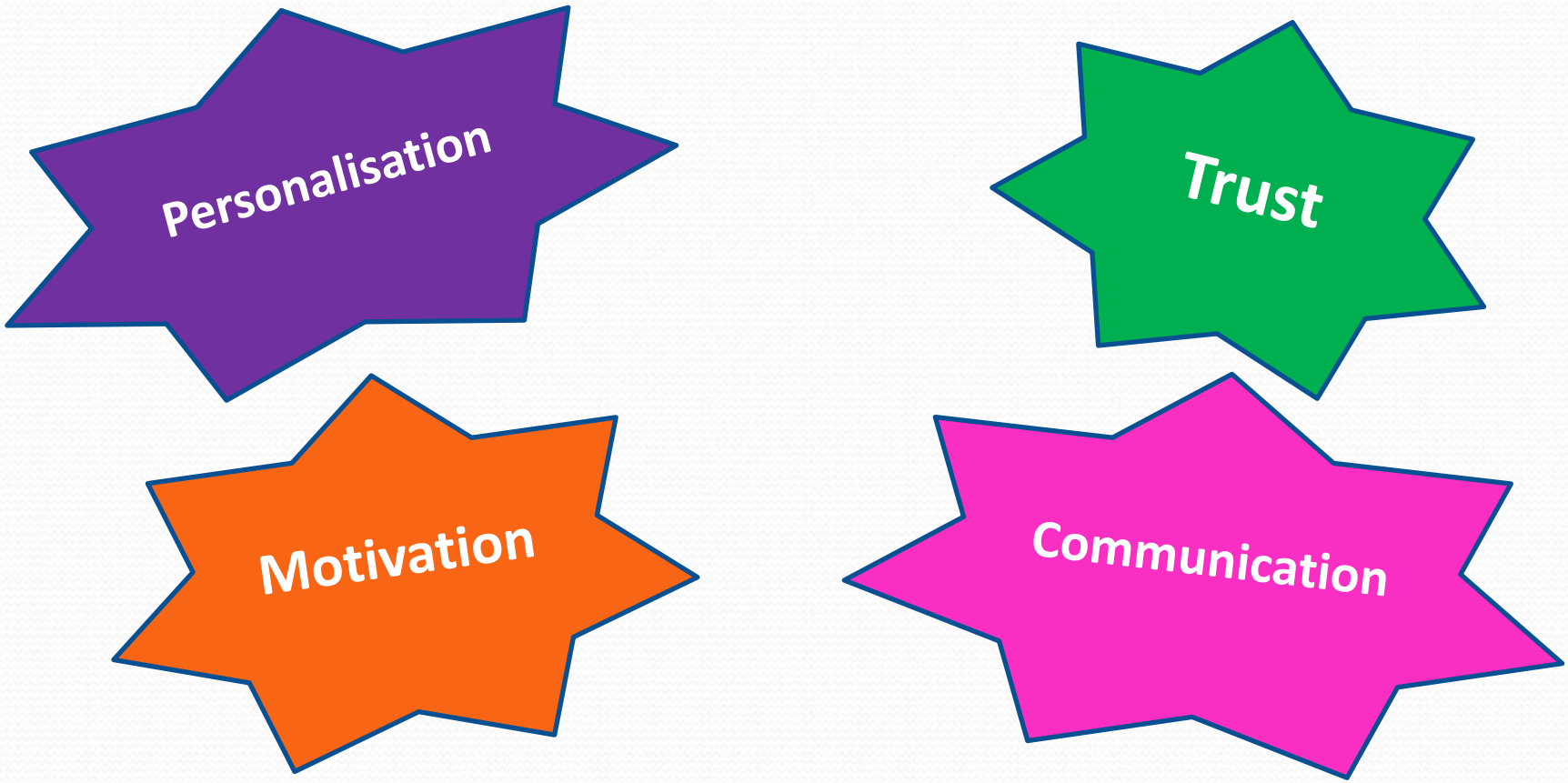
Liam Glynn[1*], Monica Casey[1], Jane Walsh[2], Patrick S. Hayes[3], Richard P. Harte[4] and David Heaney[5]

Abstract

Background: Patients with hypertension in the community frequently fail to meet treatment goals. The optimal way to organize and deliver care to hypertensive patients has not been clearly identified. The powerful on-board computing capacity of mobile devices, along with the unique relationship individuals have with newer technologies, suggests that they have the potential to influence behaviour. However, little is known regarding the views and experiences of patients using such technology to self-manage their hypertension and associated lifestyle behaviours. The aim of this study was to explore patients' views and experiences of using technology based self-management tools for the treatment of hypertension in the community

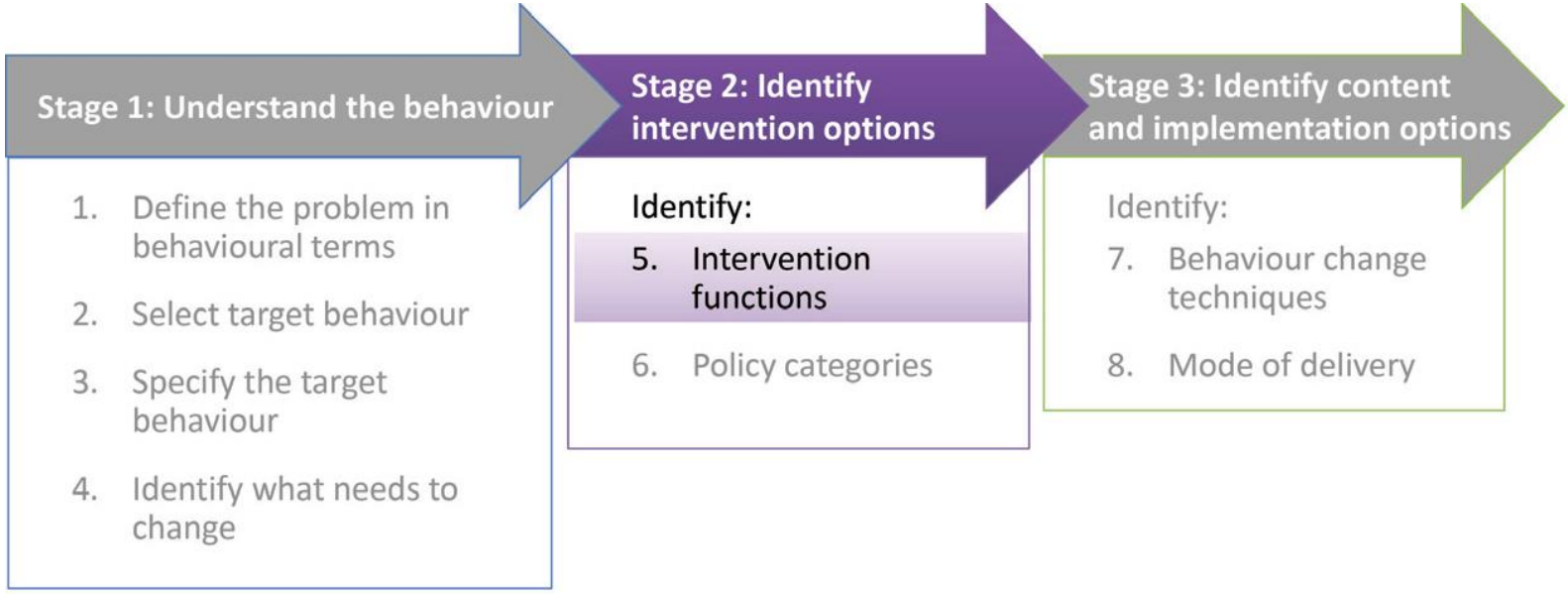
Results

Four key inter-related themes emerged from the analysis :



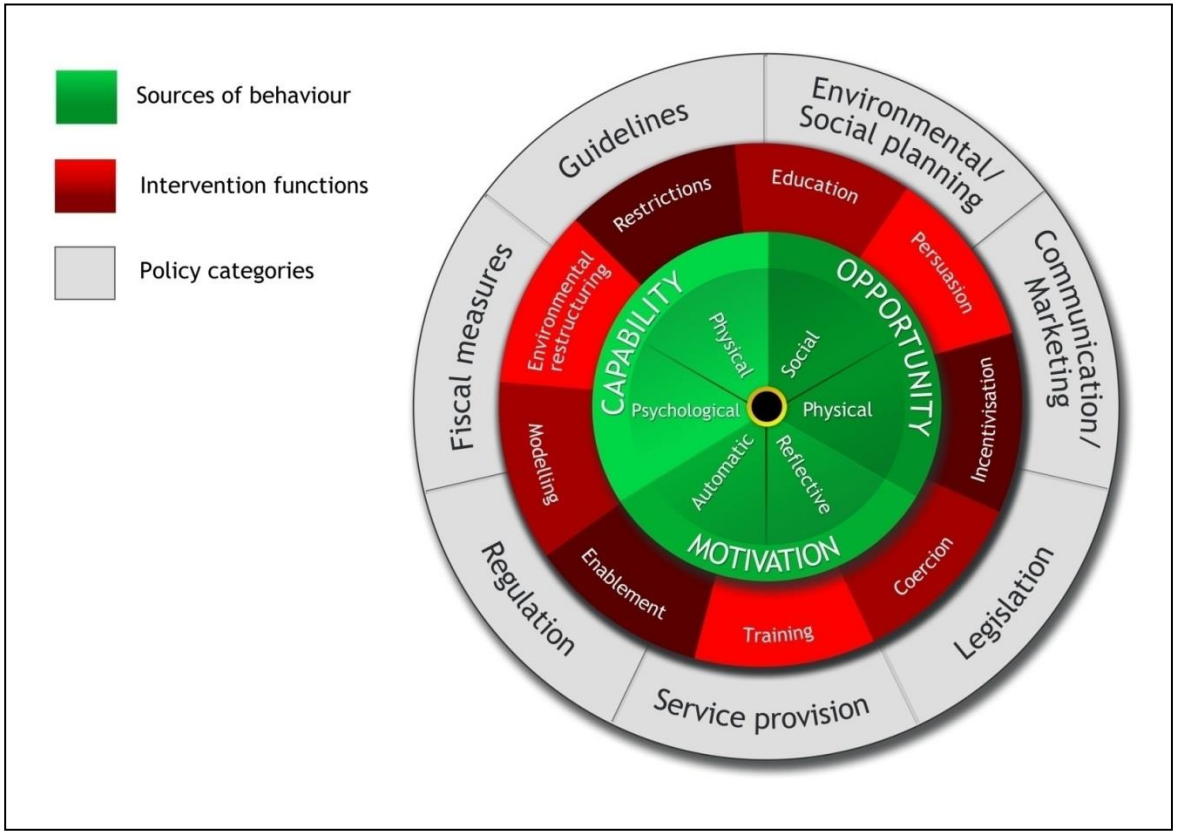
The Behaviour Change Wheel

Step 5: Identify intervention Functions



- The Behaviour Change Wheel: a procedure for intervention development
- Allows the selection of selecting intervention functions and policy options

The Behaviour Change Wheel



Research

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The behaviour change wheel: A new method for characterising and designing behaviour change interventions

Susan Michie[1*], Maartje M van Stralen[1] and Robert West[1]

* Corresponding author: Susan Michie s.michie@ucl.ac.uk

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Systematic Review:
19 frameworks
Combined into the BCW

Sources of behaviour

Intervention functions

9 Intervention functions: Broad categories through which an intervention can change behaviour

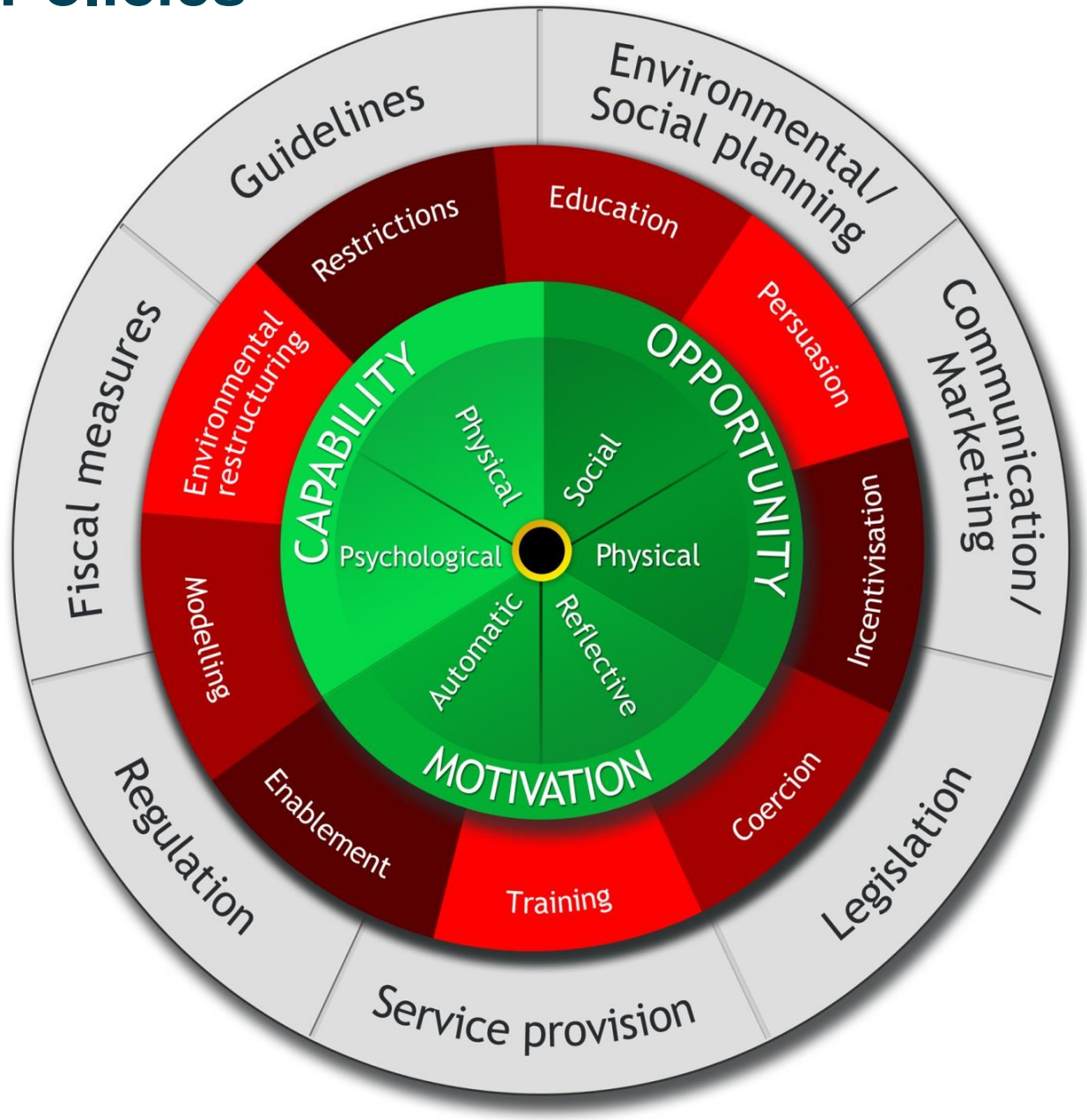
Intervention function	Definition
Education	Increasing knowledge or understanding
Persuasion	Using communication to induce a positive or negative feelings or stimulate action
Incentivisation	Create expectation of reward
Coercion	Create expectation of punishment or cost
Training	Imparting skills
Restriction	Using rules that limit engagement in the target behaviour or competing or supporting behaviour
Environmental restructuring	Changing the physical or social context
Modelling	Provide an example for people to aspire to or imitate
Enablement	Increasing means/reducing barriers

Policies

Sources of behaviour

Intervention functions

Policy categories



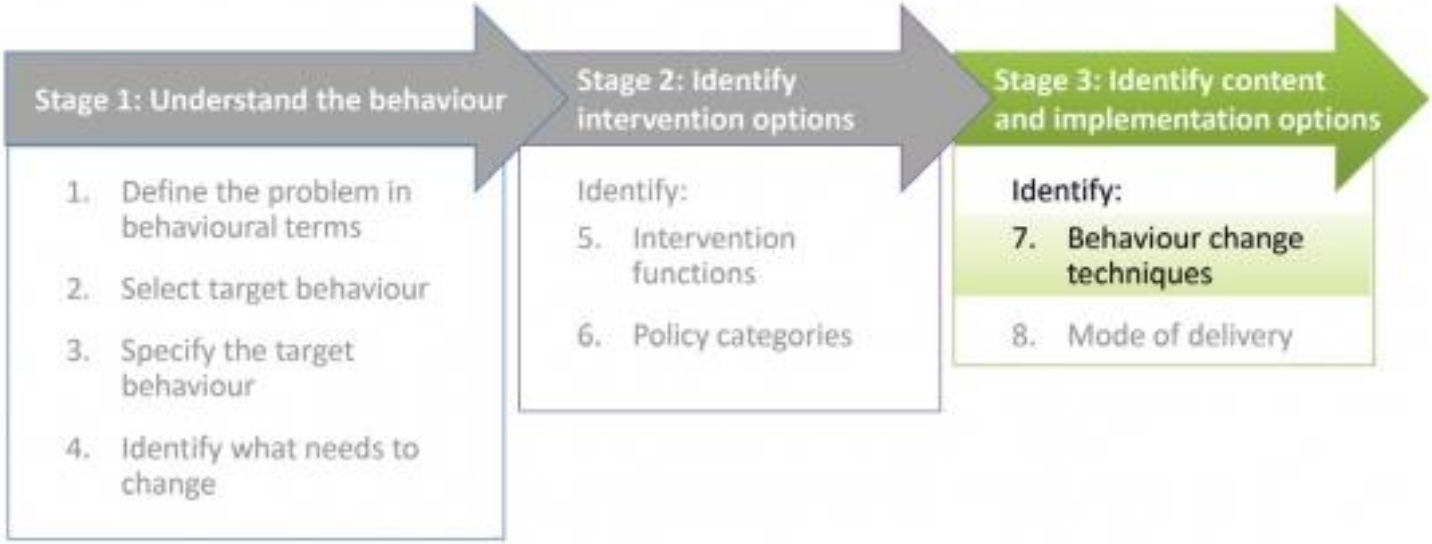
7 policy categories: Support the delivery of intervention functions

Step 6: Identify Policy Categories

Policy category	Definition
Communication/ Marketing	Using print, electronic, telephonic or broadcast media
Guidelines	Creating documents that recommend or mandate practice. This includes all changes to service provision
Fiscal	Using the tax system to reduce or increase the cost
Regulation	Establishing rules or principles of behaviour or practice
Legislation	Making or changing laws
Environmental/ social planning	Designing and/or controlling the physical or social environment
Service provision	Delivering a service

The BCT Taxonomy

Step 7: Identify Behaviour Change Techniques



BCT Taxonomy (2013)

ann. behav. med. (2013) 46:81–95
DOI 10.1007/s12160-013-9486-6

ORIGINAL ARTICLE

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

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

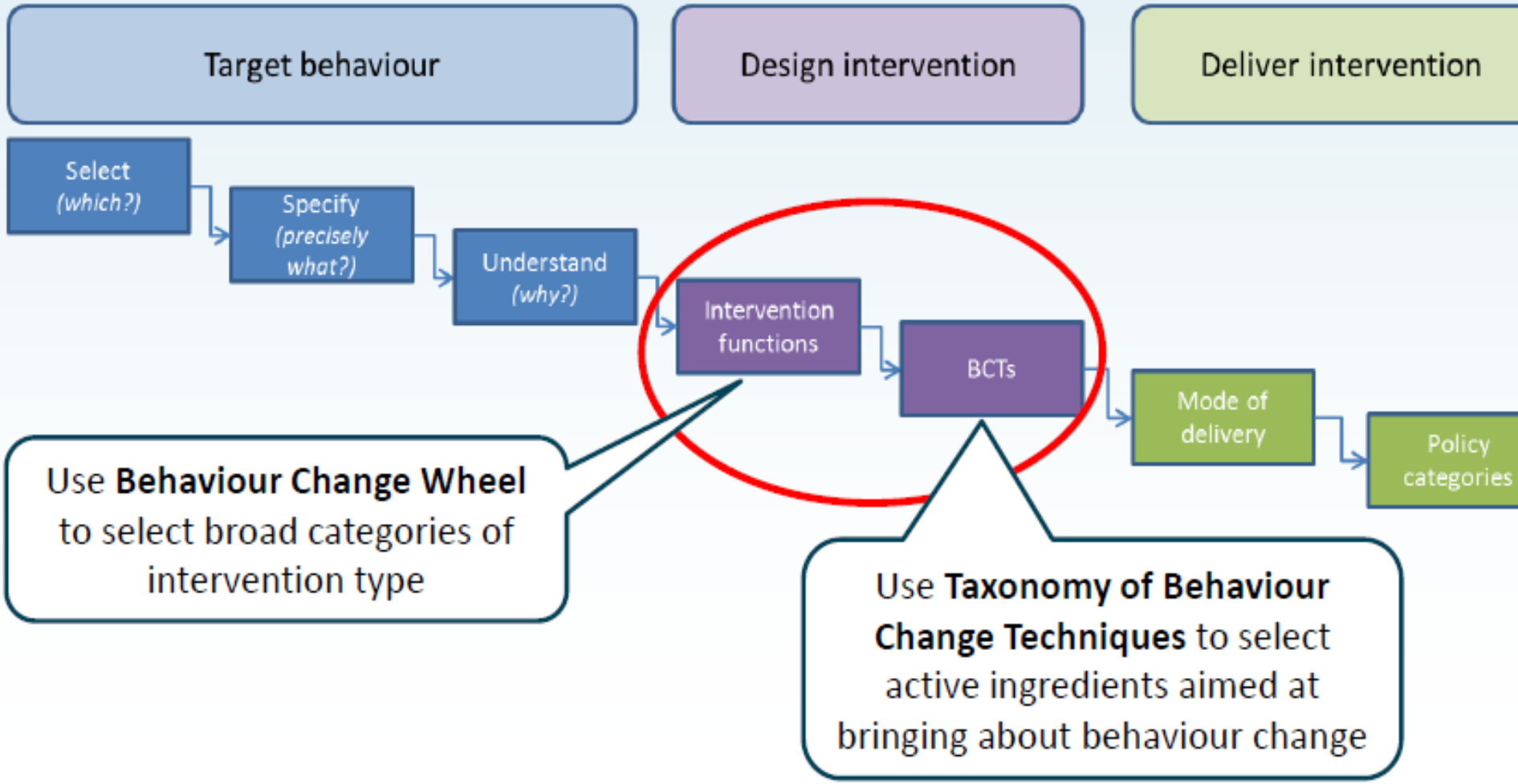
Published online: 20 March 2013

Consensus study with experts

Descriptions of "behavioural counselling" in two interventions

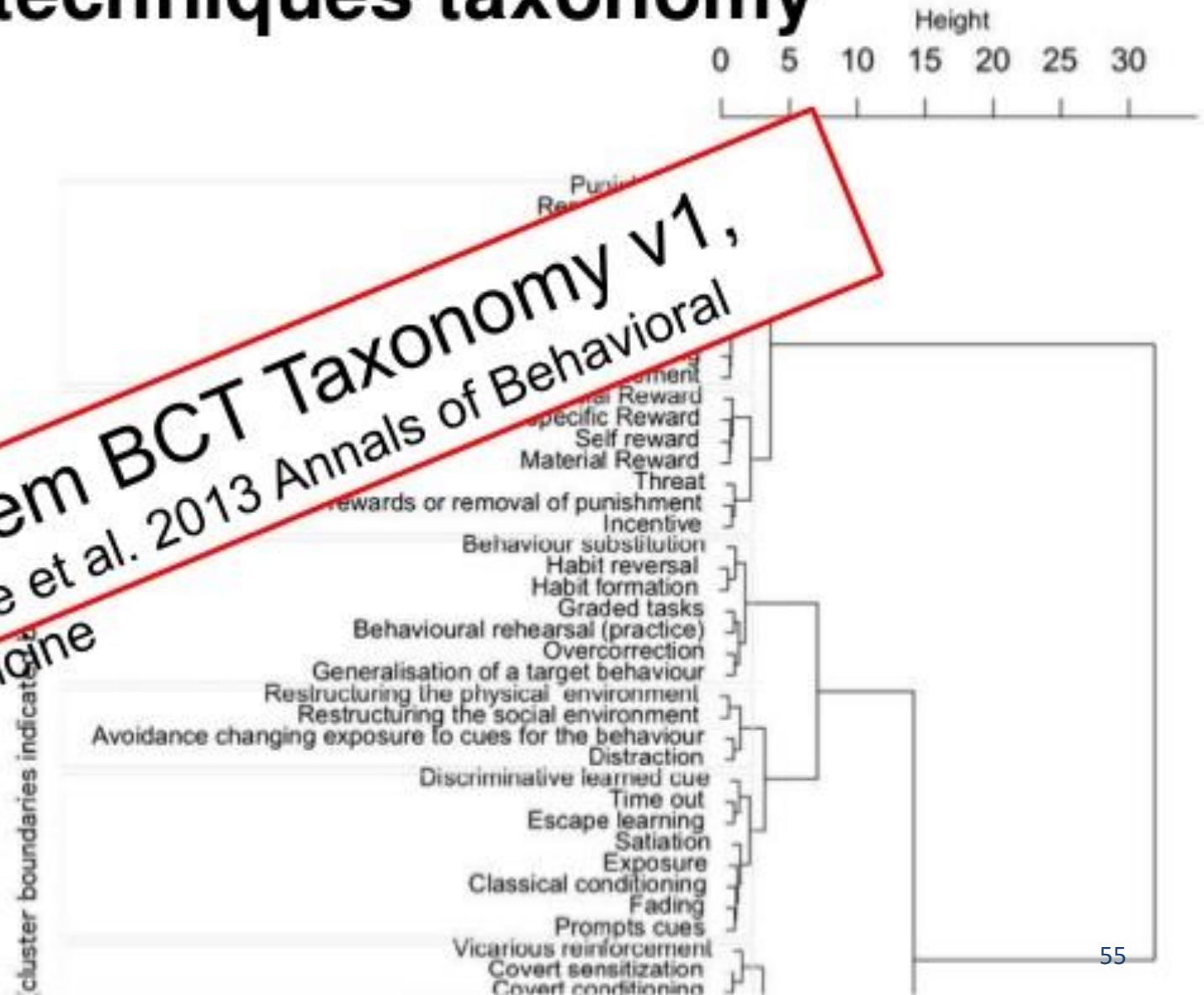
Title of journal article	Description of "behavioural counseling"
The impact of ***behavioral counseling*** on stage of change fat intake, physical activity, and cigarette smoking in adults at increased risk of coronary heart disease	"***educating*** patients about the benefits of lifestyle change, encouraging them, 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)

An approach to developing behaviour change interventions



Behaviour-change techniques taxonomy

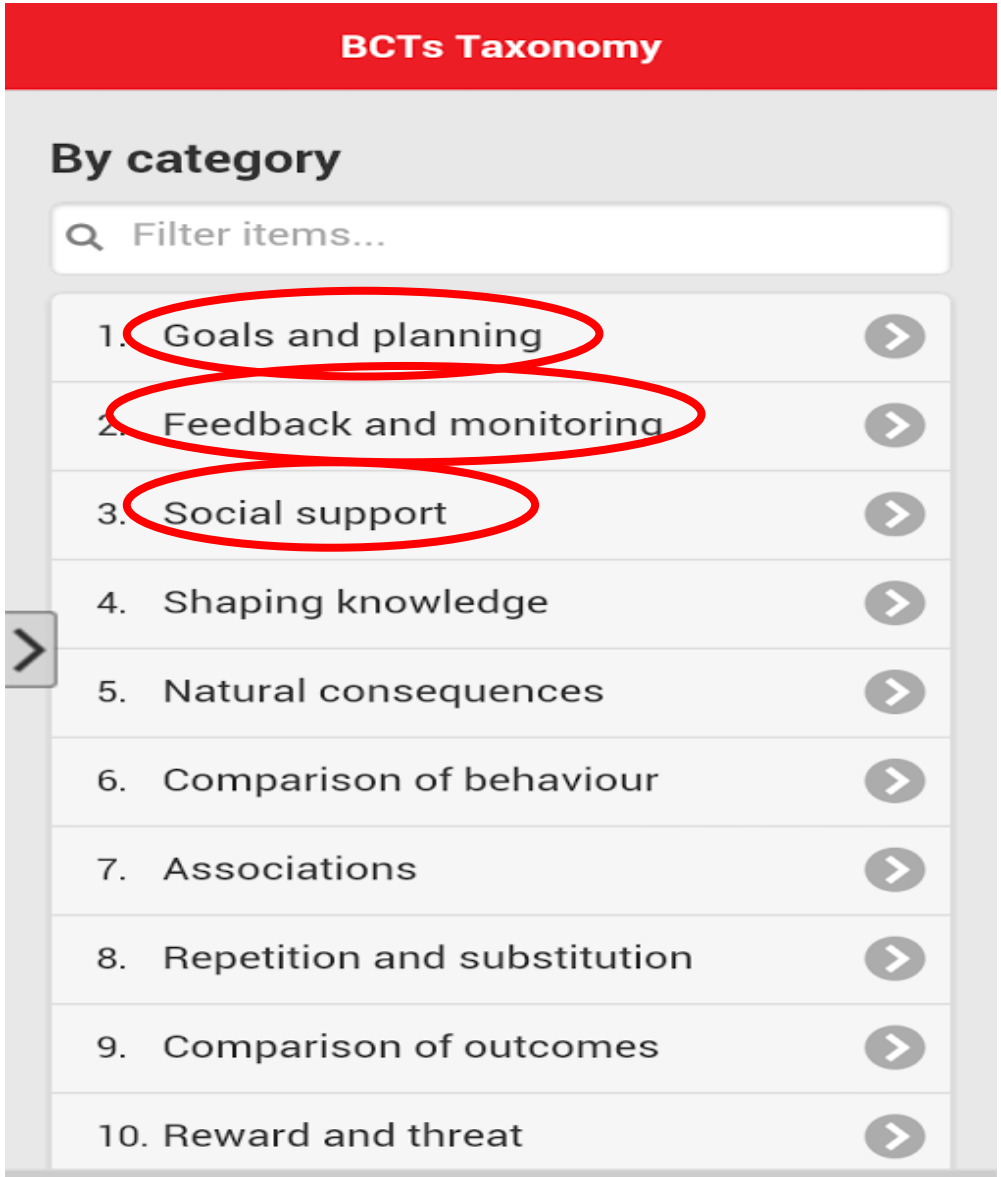
Fig. 1 Results of hierarchical cluster analysis (step 6): dendrogram for 85 behavior change techniques (BCTs) partitioned across 16 clusters



93 item BCT Taxonomy v1, Michie et al. 2013 Annals of Behavioral Medicine

No.	Label	Definition	Examples
1. Goals and planning			
1.1	**Goal setting (behaviour)**	Set or agree a goal defined in terms of the behaviour to be achieved *Note: only code[d] goal-setting if there is sufficient evidence that goal set as part of intervention; if goal unspecified or a behavioural outcome, code **1.3, Goal setting (outcome)**; if the goal defines a specific context, frequency, duration or intensity for the behaviour, also code **1.4, Action planning*** 	Agree 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

Behaviour change techniques - App – (Michie et al, 2013)



mHealth research group
School of Psychology, National University of Ireland, Galway

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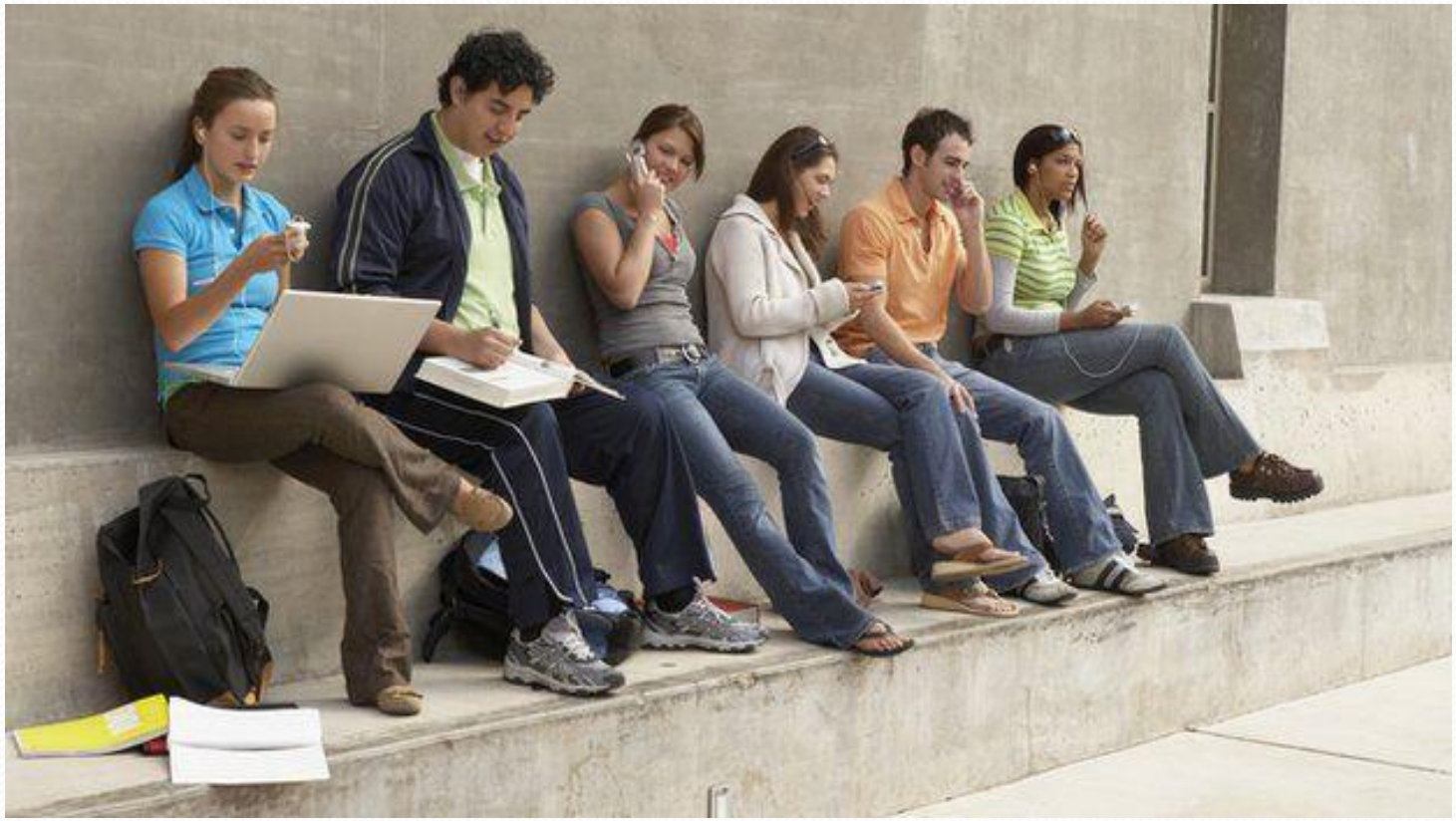
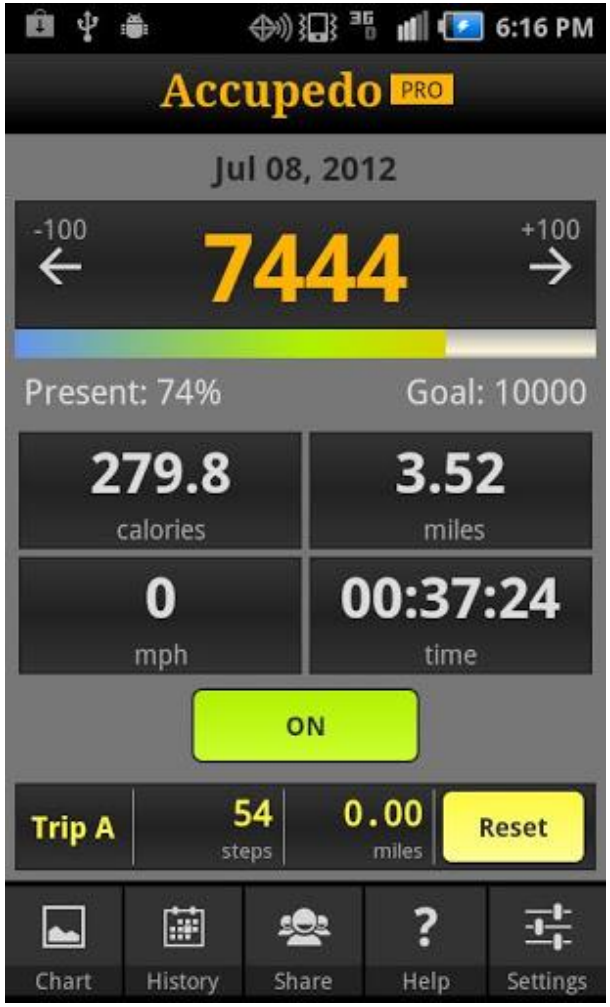
EXAMPLE OF BEHAVIOUR CHANGE INTERVENTION USING BCT

Using a smartphone app to increase walking behaviour in students

Only ***13–32%*** of university students meet guidelines



Accupedo app



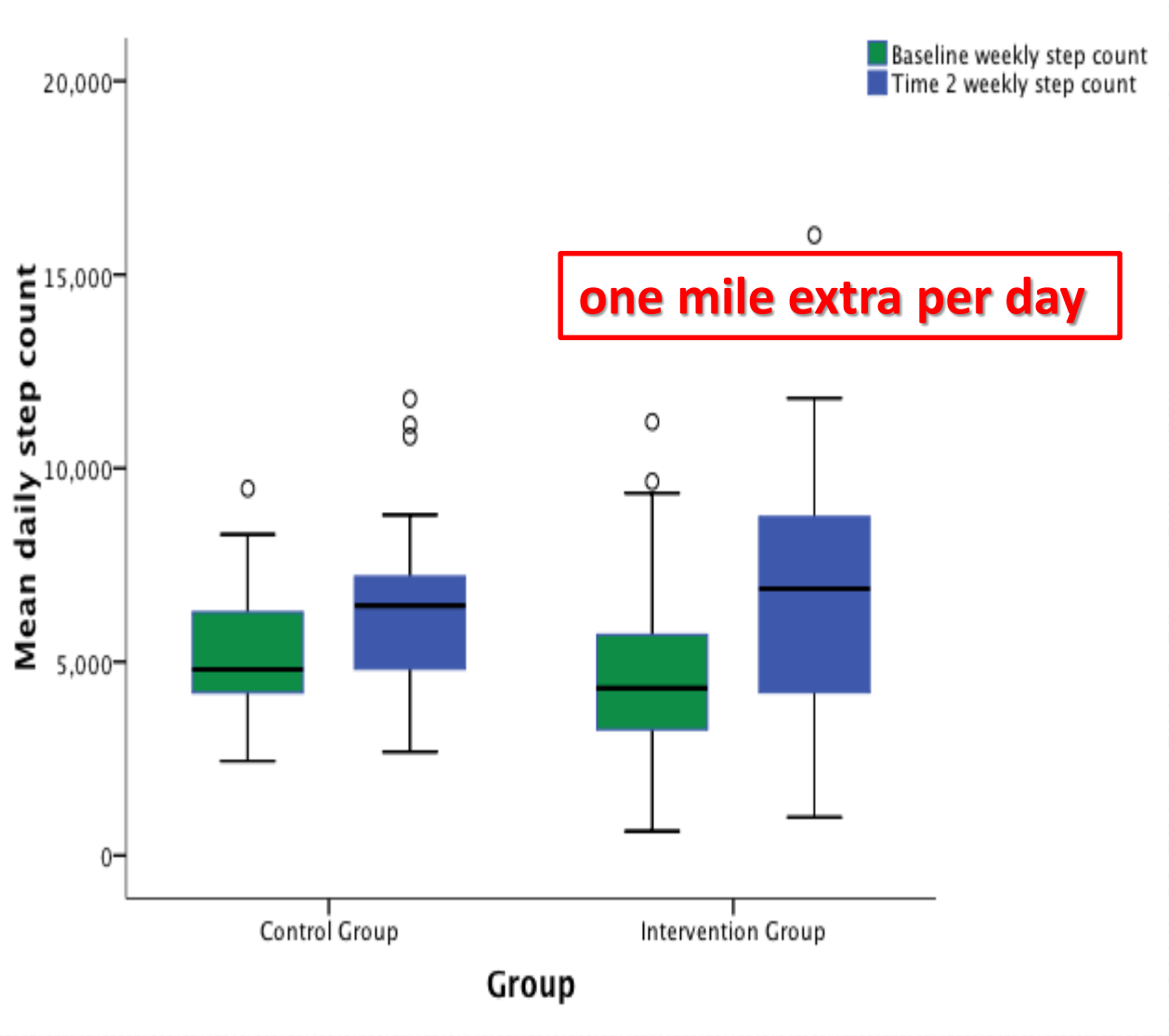
Step count group

Control group

Table 1. Linking intervention functions, COM-B model, TDF and BCTs to promote the use of a pedometer smartphone application.

COM-B	*Barrier*	*TDF*	*Intervention function*	*BCTs from BCT Taxonomy v1*
Psychological capability of students	Lack of awareness/ information about app functions and ability to use app effectively	Procedural knowledge Skills	Enablement Education Training	6.1 Demonstration of behavior 4.1 **Instruction** on how to perform a behaviour 2.1 **Monitoring** of behaviour by others without feedback 2.4 **Self-monitoring** of outcome(s) of behaviour,
Reflective Motivation	Lack of awareness about	Goal Setting	Education Training	1.3 **Goal setting** (outcome)

USING APP STEP COUNT GOALS WORKED!



JMIR mHealth and uHealth
JMIR Publications

Original Paper

An mHealth Intervention Using a Smartphone App to Increase Walking Behavior in Young Adults: A Pilot Study

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PATIENTS WITH CHRONIC DISEASE

- Glynn et al (2014) found this app used in a primary care setting increased Physical Activity, decreased weight & BP compared to controls.

WHY/HOW DID IT WORK?

- Qualitative work suggested that using app facilitated an **interactive process** of positive change in patients' exercise behaviour through increase in:
  - Knowledge
  - goal setting
  - use of feedback

(Glynn et al., 2015)

So what's the Solution?

REMIND

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- ***Understand/define the problem***
  - ***Medical, behavioural, impact***
- ***State-of-the-art scientific evidence***
  - ***Content, Methods, New technology***
- ***Partnership with Industry***
  - ***Bring evidence-based solutions to market faster***

iPLUS Building automation

SWEDISH ADRENALINE

ageing_lab foundation

Personalised solutions are key
STAKEHOLDER INVOLVEMENT ('Person-based' approach)

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Quality multidisciplinary research is key…

Technologist meets **Psychologist** meets **Doctor** meets **Entrepreneur** meets **Economist**!

?

REMIND

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School of Psychology, National University of Ireland, Galway

THANK YOU!
QUESTIONS?

Dr Jane Walsh

Connected Health Summer School, Florence

27 June 2017

NUI Galway
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